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WINDS IN THE UPPER TROPOSPHERE
AND LOWER STRATOSPHERE OVER
THE UNITED STATES

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Aerological Division, U. S. Weather Bureau, Washington, D. C., January 1937]

INTRODUCTION

Due to the increasing interest of aeronautical engineers, meteorologists, and others in the possible advantage of high-altitude flying, it is deemed appropriate to publish at this time the results of wind measurements made by the United States Weather Bureau during the past several years for altitudes between 6 and 14 kilometers (20,000 to 46,000 feet, approximately) above sea level. A summary of the winds in the lower levels over the eastern section of the United States was published in the MONTHLY WEATHER REVIEW SUPPLEMENT No. 35, and another summary for the central and western sections of the country will be published in a similar manner in the near future. For the information of those interested in the other elements in the free air, reference is also made to another publication soon to be issued as a supplement to the MONTHLY WEATHER REVIEW, entitled "Summary of Aerological Observations Obtained by Means of Kites, Airplanes, and Sounding Balloons in the United States". Data are given herein for 30 stations, shown in table 1, which were selected according to their geographical location and number of observations available for high altitudes.

whole. Summarized data are not shown for any season or level having less than 15 observations. This minimum number is believed to be too small, in most cases, to give true seasonal averages but was decided upon in order that, for the purpose of comparison, the graphical representation might be as complete as possible and the tabular matter reduced to a minimum. Data for seasons having less than 15 observations are shown in tabular form, each individual wind observation being listed separately.

TABLE 2.—*Tabulation of individual wind observations by seasons for levels having less than 15 observations and not shown graphically in the accompanying charts. Velocities in meters per second*

AMARILLO, TEX.								
Season	8 km		10 km		12 km		14 km	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
Winter	-----	-----	-----	-----	SE.	13	-----	-----
Spring	-----	-----	-----	-----	W.	5	E.	6
Summer	-----	-----	-----	-----	-----	-----	E.	7
Do.	-----	-----	-----	-----	-----	-----	ESE.	13
Do.	-----	-----	-----	-----	-----	-----	ESE.	7
Do.	-----	-----	-----	-----	-----	-----	SSE.	8
Do.	-----	-----	-----	-----	-----	-----	SSW.	7
Do.	-----	-----	-----	-----	-----	-----	WSW.	11
Do.	-----	-----	-----	-----	-----	-----	WSW.	12
Do.	-----	-----	-----	-----	-----	-----	WSW.	12
Do.	-----	-----	-----	-----	-----	-----	WSW.	13
Do.	-----	-----	-----	-----	-----	-----	NW.	2
Do.	-----	-----	-----	-----	-----	-----	NNW.	27
Do.	-----	-----	-----	-----	-----	-----	WNW.	13
Autumn	-----	-----	-----	-----	-----	-----	-----	-----

BOISE, IDAHO								
Season	8 km		10 km		12 km		14 km	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
Winter	-----	-----	-----	-----	SW.	8	-----	-----
Do.	-----	-----	-----	-----	SW.	10	-----	-----
Do.	-----	-----	-----	-----	WNW.	13	-----	-----
Do.	-----	-----	-----	-----	WNW.	12	-----	-----
Do.	-----	-----	-----	-----	NW.	16	-----	-----
Do.	-----	-----	-----	-----	NNW.	9	-----	-----
Spring	-----	-----	-----	-----	-----	-----	N.	5
Do.	-----	-----	-----	-----	-----	-----	N.	16
Do.	-----	-----	-----	-----	-----	-----	SSE.	29
Do.	-----	-----	-----	-----	-----	-----	ESE.	11
Summer	-----	-----	-----	-----	-----	-----	WSW.	21
Do.	-----	-----	-----	-----	-----	-----	WSW.	30
Do.	-----	-----	-----	-----	-----	-----	NNE.	13
Autumn	-----	-----	-----	-----	-----	-----	ESE.	21
Do.	-----	-----	-----	-----	-----	-----	WSW.	8
Do.	-----	-----	-----	-----	-----	-----	W.	22
Do.	-----	-----	-----	-----	-----	-----	WNW.	23

BROKEN ARROW, OKLA.								
Season	8 km		10 km		12 km		14 km	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
Winter	-----	-----	-----	-----	-----	-----	SSW.	3
Do.	-----	-----	-----	-----	-----	-----	SW.	17
Do.	-----	-----	-----	-----	-----	-----	WSW.	36
Do.	-----	-----	-----	-----	-----	-----	W.	24
Do.	-----	-----	-----	-----	-----	-----	W.	32
Do.	-----	-----	-----	-----	-----	-----	W.	26
Do.	-----	-----	-----	-----	-----	-----	W.	25
Do.	-----	-----	-----	-----	-----	-----	W.	34
Do.	-----	-----	-----	-----	-----	-----	WNW.	17
Do.	-----	-----	-----	-----	-----	-----	NW.	27
Do.	-----	-----	-----	-----	-----	-----	NW.	20
Do.	-----	-----	-----	-----	-----	-----	WSW.	10
Spring	-----	-----	-----	-----	-----	-----	W.	19
Do.	-----	-----	-----	-----	-----	-----	WNW.	12
Do.	-----	-----	-----	-----	-----	-----	WNW.	21

TABLE 1.—*List of stations showing elevation above sea level, period of record, and number of daily observations*

Station	Elevation	Period of record	Number of daily observations
	<i>Meters</i>		
Amarillo, Tex.	1,117	May 1932-Feb. 1936	4
Boise, Idaho	850	Dec. 1926-Dec. 1935	3
Broken Arrow, Okla.	293	Oct. 1918-June 1933	2
Brownsville, Tex.	12	Aug. 1929-Feb. 1936	3
Burlington, Vt.	132	Jan. 1920-Aug. 1935	2
Cheyenne, Wyo.	1,873	Sept. 1926-Nov. 1935	3
Due West, S. O.	217	Dec. 1920-May 1932	2
Ellendale, N. Dak.	444	Oct. 1918-Feb. 1932	2
El Paso, Tex.	1,196	Apr. 1932-Dec. 1935	3
Evansville, Ind.	124	Oct. 1929-Feb. 1936	4
Greensboro, N. C.	271	May 1928-Feb. 1936	3
Groesbeck, Tex.	139	Oct. 1918-May 1931	2
Hays, Mont.	782	Aug. 1927-July 1935	2
Jacksonville, Fla.	14	Oct. 1928-July 1935	2
Key West, Fla.	11	July 1920-Jan. 1936	2
Lansing, Mich.	263	June 1919-Oct. 1926	1
Los Angeles, Calif.	217	Sept. 1926-Dec. 1935	3
Madison, Wis.	307	May 1919-Feb. 1927	1
Memphis, Tenn.	146	July 1923-July 1935	2
Modena, Utah	1,665	Aug. 1927-Dec. 1935	2
New Orleans, La.	25	Oct. 1926-Feb. 1936	2
Omaha, Nebr.	321	Jan. 1919-Sept. 1935	3
Portland, Oreg.	24	July 1923-Oct. 1935	3
Redding, Calif.	223	Apr. 1929-Feb. 1936	3
Royal Center, Ind.	225	Oct. 1918-Mar. 1932	2
San Francisco, Calif.	8	June 1921-Nov. 1935	3
Sault Ste. Marie, Mich.	198	Nov. 1926-Feb. 1936	2
Sheridan, Wyo.	1,153	Aug. 1927-June 1934	2
Washington, D. C.	10	Jan. 1919-July 1935	3
Winslow, Ariz.	1,488	Dec. 1931-Jan. 1936	4

Since the data are rather meager for these altitudes at most stations, the summarized results for each level are shown only for the four seasons and for the year as a

TABLE 2.—Tabulation of individual wind observations by seasons for levels having less than 15 observations and not shown graphically in the accompanying charts. Velocities in meters per second—Contd.

BROWNSVILLE, TEX.

Season	8 km		10 km		12 km		14 km	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
Winter			SW.	22				
Do			WSW.	18				
Do			W.	64				
Do			W.	18				
Do			W.	22				
Do			WNW.	24				
Spring			SW.	6	WSW.	12	SW.	23
Do			WSW.	8	WSW.	12		
Do			W.	25	W.	17		
Do			W.	15	NW.	30		
Do			W.	14				
Do			WNW.	21				
Do			NW.	9				
Do			NW.	28				
Summer							E.	6
Do							E.	22
Do							SE.	12
Autumn					N.	9		
Do					N.	20		
Do					SW.	19		
Do					W.	4		
Do					W.	10		
Do					W.	9		
Do					W.	25		
Do					WNW.	2		
Do					WNW.	7		
Do					NW.	8		
Do					NW.	7		
Do					NW.	13		
Do					NW.	12		
Do					NNW.	3		

BURLINGTON, VT.

Winter	N.	24	SSW.	10	WSW.	16		
Do	N.	5	SW.	4	NW.	21		
Do	NNE.	7	SW.	14				
Do	SSW.	8	W.	12				
Do	SSW.	7	W.	13				
Do	SW.	3	WNW.	13				
Do	WSW.	2	NW.	19				
Do	W.	13						
Do	W.	9						
Do	WNW.	19						
Do	WNW.	12						
Do	WNW.	37						
Do	WNW.	12						
Do	WNW.	10						
Spring			SSE.	8	S.	8	W.	16
Do			SW.	6	WSW.	19		
Do			WSW.	11	W.	8		
Do			W.	16				
Do			WNW.	17				
Do			WNW.	17				
Do			WNW.	10				
Do			WNW.	4				
Do			NW.	15				
Do			NW.	7				
Summer					N.	10		
Do					ESE.	16		
Do					ESE.	7		
Do					WSW.	20		
Do					W.	32		
Do					WNW.	7		
Do					WNW.	6		
Do					NNW.	9		
Do					N.	35	NW.	32
Do					NE.	8	SE.	12
Do					SW.	11		
Do					WSW.	19		
Do					WSW.	18		
Do					W.	14		
Do					W.	18		
Do					WNW.	15		
Do					WNW.	12		
Do					WNW.	4		
Do					NW.	12		

CHEYENNE, WYO.

Winter					SSW.	5		
Do					WSW.	17		
Do					W.	12		
Spring					NE.	14	ESE.	25
Do					ESE.	11	WNW.	25
Do					SE.	2		
Do					S.	27		
Do					SSW.	19		
Do					WSW.	17		
Do					W.	15		
Do					WNW.	14		
Do					WNW.	16		

TABLE 2.—Tabulation of individual wind observations by seasons for levels having less than 15 observations and not shown graphically in the accompanying charts. Velocities in meters per second—Contd.

CHEYENNE, WYO.—Continued

Season	8 km		10 km		12 km		14 km	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
Spring							NW.	28
Do							NNW.	17
Autumn							N.	3
Do							N.	3
Do							S.	6
Do							WSW.	3
Do							NW.	6
Do							WNW.	9
Do							WNW.	9

DUE WEST, S. C.

Winter					W.	24		
Do					W.	42		
Do					WNW.	30		
Do					NW.	31		
Do					NNW.	8		
Spring							SW.	19
Do							NNW.	6
Do							N.	5
Autumn							NNE.	13
Do							ESE.	6
Do							SSE.	3
Do							WSW.	16
Do							WSW.	19
Do							W.	24
Do							WNW.	8
Do							WNW.	9
Do							NNW.	6

ELLENDALE, N. DAK.

Winter					W.	18	NW.	17
Do					WNW.	21		
Do					WNW.	15		
Do					NW.	15		
Do					NW.	10		
Do					NNW.	12		
Spring							N.	9
Do							NE.	27
Do							WSW.	12
Do							WNW.	12
Summer							NNE.	15
Do							WSW.	19
Do							WSW.	11
Do							WSW.	22
Do							W.	8
Do							W.	10
Do							W.	10
Do							W.	15
Do							W.	19
Do							WNW.	10
Do							WNW.	18
Do							WNW.	24
Do							NW.	11
Do							NNW.	9
Do							N.	14
Autumn							WSW.	12
Do							W.	3
Do							W.	10
Do							WNW.	19
Do							NW.	9

EL PASO, TEX.

Winter					N.	15	W.	29
Do					NNE.	44		
Do					ENE.	10		
Do					ENE.	15		
Do					E.	8		
Do					SW.	10		
Do					WSW.	28		
Do					W.	22		
Do					W.	16		
Do					W.	13		
Do					WNW.	9		
Do					NW.	11		
Do					NW.	8		
Do					NNW.	12		
Spring					NNE.	4		
Do					SSE.	3		
Do					SW.	18		
Do					WSW.	17		
Do					W.	11		
Do					W.	31		
Do					W.	25		
Do					WNW.	18		
Do					WNW.	25		
Do					WNW.	40		

TABLE 2.—Tabulation of individual wind observations by seasons for levels having less than 15 observations and not shown graphically in the accompanying charts. Velocities in meters per second—Contd.

TABLE 2.—Tabulation of individual wind observations by seasons for levels having less than 15 observations and not shown graphically in the accompanying charts. Velocities in meters per second—Contd.

EVANSVILLE, IND.

Season	8 km		10 km		12 km		14 km	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
Winter	WNW.	20						
Do	WNW.	25						
Do	NNW.	9						
Spring							SW.	10
Do							WNW.	17
Summer					N.	16	NE.	2
Do					NE.	3	SW.	4
Do					SSW.	8	WSW.	8
Do					SW.	9	W.	16
Do					WSW.	6	NW.	12
Do					W.	13	NW.	10
Do					W.	13		
Do					W.	11		
Do					WNW.	3		
Do					WNW.	14		
Do					NNW.	8		
Do					NNW.	12		
Do					NNW.	12		
Autumn					N.	15	E.	29
Do					N.	3	WSW.	8
Do					NE.	7	WSW.	46
Do					NE.	19	NW.	31
Do					E.	12		
Do					WSW.	1		
Do					WSW.	26		
Do					WSW.	25		
Do					W.	7		
Do					WNW.	17		
Do					NW.	30		
Do					NW.	24		

JACKSONVILLE, FLA.

Season	8 km		10 km		12 km		14 km	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
Winter			NE.	12	WNW.	9		
Do			WNW.	9				
Do			WNW.	21				
Do			WNW.	22				
Do			NW.	8				
Do			NW.	18				
Do			NNW.	21				
Spring							N.	16
Do							NNE.	22
Do							WSW.	10
Do							NW.	10
Do							NE.	11
Autumn							S.	16
Do							SSW.	17
Do							SW.	26
Do							WSW.	7
Do							WNW.	12
Do							NNW.	9

KEY WEST, FLA.

Winter							SW.	21
Do							SW.	9
Do							W.	34
Do							W.	28
Do							SE.	12
Spring							WNW.	6
Do								

GREENSBORO, N. C.

Winter	N.	35	NNE.	50	WSW.	18		
Do	N.	10	WSW.	22				
Do	NNE.	12						
Do	WSW.	21						
Do	WSW.	7						
Do	WSW.	24						
Do	WSW.	17						
Do	W.	19						
Do	W.	7						
Do	WNW.	22						
Do	WNW.	36						
Do	WNW.	24						
Do	NW.	11						
Do	NNW.	18						
Spring						S.	12	
Do						W.	38	
Do						WNW.	11	
Do						NW.	23	
Do						NW.	14	
Do						NNW.	8	
Autumn						NNW.	12	
Do						N.	12	
Do						W.	7	
Do						WNW.	8	
Do						NW.	17	
Do						NNW.	14	

LANSING, MICH.

Winter	NE.	4	N.	4	ENE.	10		
Do	WNW.	26	WNW.	15	WNW.	9		
Do	WNW.	27	NW.	27				
Do	WNW.	26	NNW.	12				
Do	WNW.	18						
Do	WNW.	21						
Do	NW.	28						
Do	NW.	6						
Do	NW.	15						
Do	NNW.	13						
Spring					N.	29	WSW.	19
Do					N.	10	NW.	18
Do					WSW.	7	NW.	14
Do					W.	5	NW.	12
Do					WNW.	7		
Do					WNW.	29		
Do					NW.	27		
Do					NW.	5		
Do					NW.	7		
Do					NNW.	8		
Do					NNW.	13		
Summer							S.	24
Do							WNW.	7
Autumn							N.	6
Do							N.	22
Do							WNW.	18
Do							WNW.	27
Do							NW.	24

GROESBECK, TEX.

Winter						WNW.	24
Do						WNW.	9
Spring						S.	6
Do						SSW.	9
Do						W.	14
Do						W.	20

LOS ANGELES, CALIF.

Winter					SW.	5	WSW.	6
Do					SW.	2		
Do					WSW.	20		
Do					W.	6		
Do					WNW.	20		
Do					NW.	6		
Do					NW.	14		
Do					NE.	5	WSW.	15
Spring					ESE.	4	WSW.	9
Do					SW.	8		
Do					WSW.	10		
Do					WSW.	17		
Do					W.	11		
Do					W.	18		
Do					WNW.	12		
Do					WNW.	12		
Do					NNW.	6		
Summer							S.	6
Do							SSW.	5
Do							WSW.	12
Do							W.	10
Do							NNE.	24
Autumn							W.	10
Do							WNW.	8
Do							NW.	11
Do							NNW.	3

HAVRE, MONT.

Winter				ENE.	20		
Do				SSE.	2		
Do				SSW.	5		
Spring				N.	6	W.	6
Do				N.	10		
Do				SSW.	10		
Do				SW.	24		
Do				WSW.	6		
Do				W.	10		
Do				WNW.	6		
Summer				NW.	5		
Autumn						NW.	14
Do						WNW.	11
Do						W.	10

As for the reliability of these data, it should be pointed out here that most of the observations were based on the single theodolite method, wherein the ascensional rate of the balloon is assumed rather than measured; also, that pilot-balloon observations are not made when precipitation is falling or low clouds prevail. It is essential, furthermore, that relatively low velocities prevail in the lower levels in order that observations may reach the high levels, for high velocities in the lower levels cause the balloons to be carried out at such low angles that they are usually lost from sight before reaching great heights. In general, however, it is believed that these data are quite representative of average wind conditions, especially for the first three levels of 6, 8, and 10 kilometers, corresponding approximately to 20,000, 26,000, and 33,000 feet, respectively. For the higher levels, also, certain stations have sufficient data to show fairly reliable averages. Wind directions referred to herein always indicate the direction from which the wind blows. All velocities are given in meters per second, with the English measure equivalents indicated where appropriate.

This summary consists of (1) wind roses, (2) resultant winds, (3) average velocities, (4) frequency of high velocities, and (5) extreme velocities. Wind roses and resultant winds are given in graphical form on the accompanying charts.

WIND ROSES

In figures 1-23, wind roses are shown for each of the 5 levels 6, 8, 10, 12, and 14 kilometers for the four seasons and for the year, insofar as sufficient data are available. It will be noted that, for the year as a whole, the prevailing directions are, for the most part, between WSW. and NW. at all levels, although there is an apparent shift to N. or NE. in the higher levels over the southeastern part of the country. The latter is probably due to the fact that most of the observations reaching these levels at these stations were made during the summer and autumn months when, in general, easterly directions are more prevalent. The greatest variation from the yearly average occurs during the summer season when the northward movement of the belt of northeast trade winds causes a decided increase in the frequency of easterly winds and a marked decrease in velocities south of about latitude 35°. There is also greater variation in direction at all stations during this season. In general, the average velocities are highest from the prevailing directions and higher in winter than in summer; the difference in velocities between winter and summer being greatest in the more southern latitudes. For the year as a whole, there is an increase in velocity with height up to a level varying from about 14 kilometers over the extreme south portion of the country to about 10 kilometers over the extreme north portion. This limiting level—above which, on the average, velocities do not increase—corresponds closely to the average height of the tropopause over these latitudes. During the winter season, however, when the tropopause is lowest, the increase in velocity does not extend even to the 8-kilometer level over the northern part of the Rocky Mountain and western Plateau regions. This may be due to the fact that balloons are more likely to be observed to high levels, during this season, when relatively low velocities prevail at all levels; or, it may be due to the fact that this region lies in the path of frequent outbreaks of polar air masses from western Canada, which bring with them the characteristic conditions (including a low tropopause) of the more northern latitudes. In general, also, there is an increase in velocity with latitude. This is more pronounced in sum-

mer than in winter and more pronounced at 6 kilometers than at higher levels, becoming less at each successive level above 6 kilometers. During the winter season, however, highest velocities appear to occur over the east-central part of the country at all levels.

In table 3 the annual percentage frequencies of the winds from all directions are combined into four figures showing the total frequency from each of the four cardinal directions. In arriving at these figures, the total frequencies of winds from NNW., N., and NNE., and $\frac{1}{2}$ (NW. plus NE.) were grouped as N.; the total frequencies of ENE., E., ESE., and $\frac{1}{2}$ (NE. plus SE.) were grouped as E., the total frequencies of SSE., S., SSW., and $\frac{1}{2}$ (SE. plus SW.) were grouped as S., and the total frequencies of WSW., W., WNW., and $\frac{1}{2}$ (SW. plus NW.) were grouped as W.

TABLE 3.—Annual percentage frequency of wind directions from each of the 4 quadrants: North winds include NNW., N., NNE., and $\frac{1}{2}$ (NW.+NE.); east winds include ENE., E., ESE., and $\frac{1}{2}$ (NE.+SE.); south winds include SSE., S., SSW., and $\frac{1}{2}$ (SE.+SW.); and west winds include WSW., W., WNW., and $\frac{1}{2}$ (SW.+NW.)

AMARILLO, TEX.					
Quadrant	6 km	8 km	10 km	12 km	14 km
N.....	27	28	27	17	-----
E.....	10	13	15	15	-----
S.....	13	13	17	21	-----
W.....	50	46	41	47	-----
BOISE, IDAHO					
N.....	21	23	27	19	-----
E.....	6	6	11	10	-----
S.....	17	16	13	17	-----
W.....	56	55	49	54	-----
BROKEN ARROW, OKLA.					
N.....	28	30	33	28	24
E.....	7	10	11	10	15
S.....	11	10	8	10	8
W.....	54	50	48	52	53
BROWNSVILLE, TEX.					
N.....	23	25	31	25	-----
E.....	20	18	15	16	-----
S.....	13	11	10	8	-----
W.....	44	45	43	51	-----
BURLINGTON, VT.					
N.....	26	33	27	18	-----
E.....	5	6	1	10	-----
S.....	8	6	14	6	-----
W.....	61	55	57	66	-----
CHEYENNE, WYO.					
N.....	21	25	28	26	-----
E.....	4	7	10	11	-----
S.....	12	9	12	18	-----
W.....	63	59	50	45	-----
DUE WEST, S. C.					
N.....	21	24	26	35	33
E.....	9	9	12	18	25
S.....	8	7	10	5	14
W.....	62	60	52	42	28
ELLENDALE, N. DAK.					
N.....	27	30	32	32	24
E.....	4	5	5	3	2
S.....	5	7	5	3	0
W.....	64	58	58	62	74

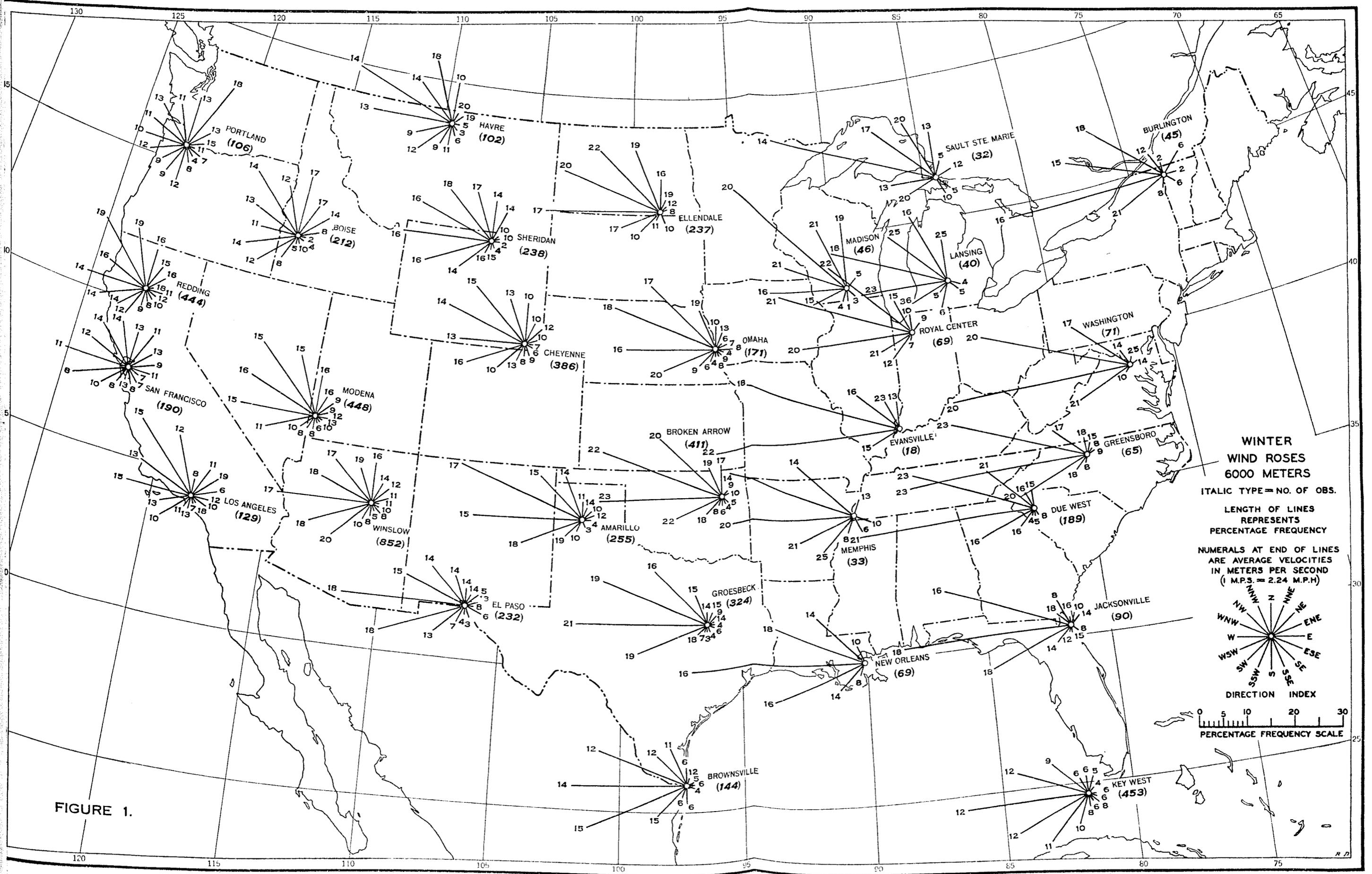
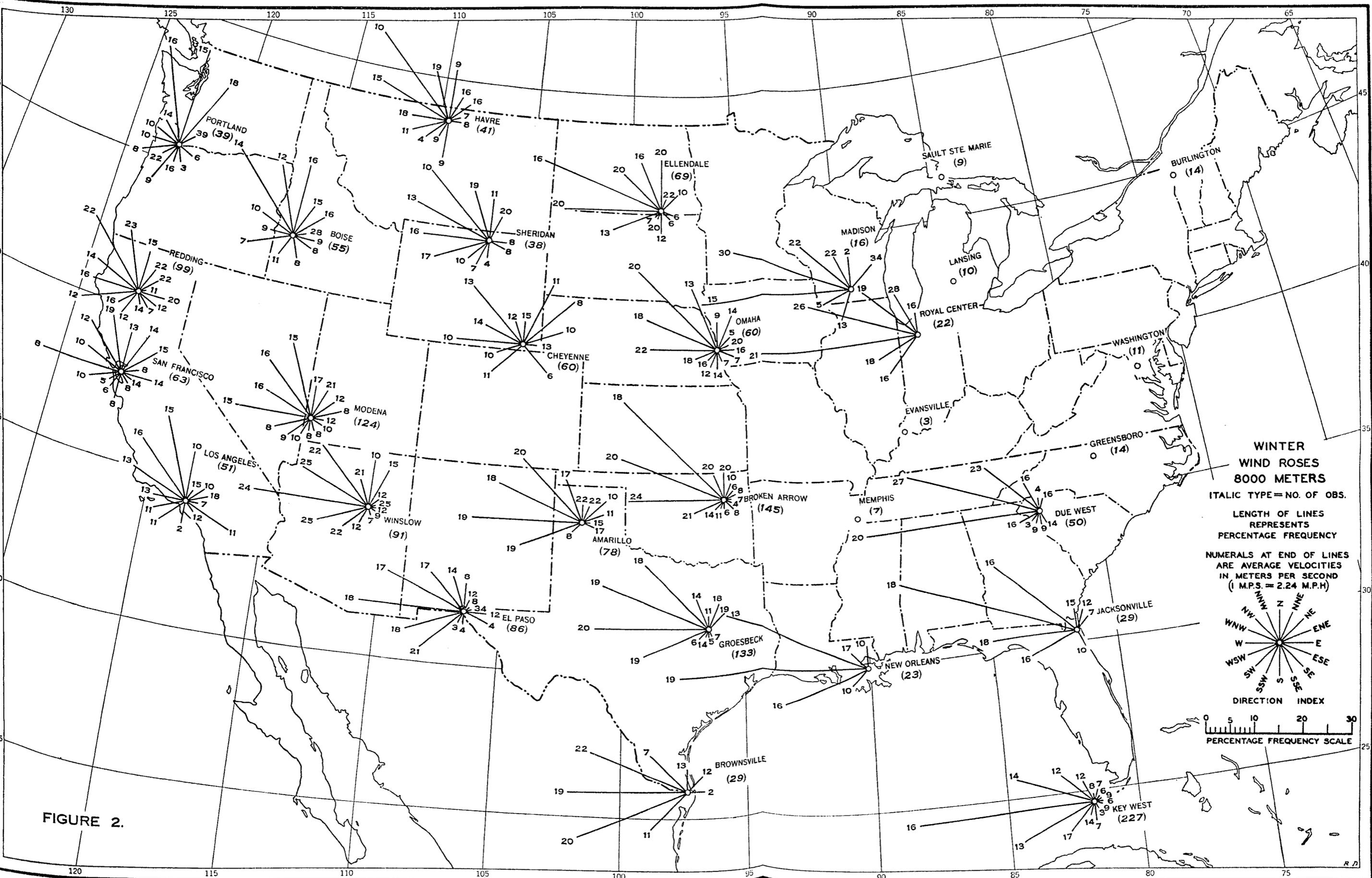


FIGURE 1.



**WINTER
WIND ROSES
8000 METERS**

ITALIC TYPE = NO. OF OBS.

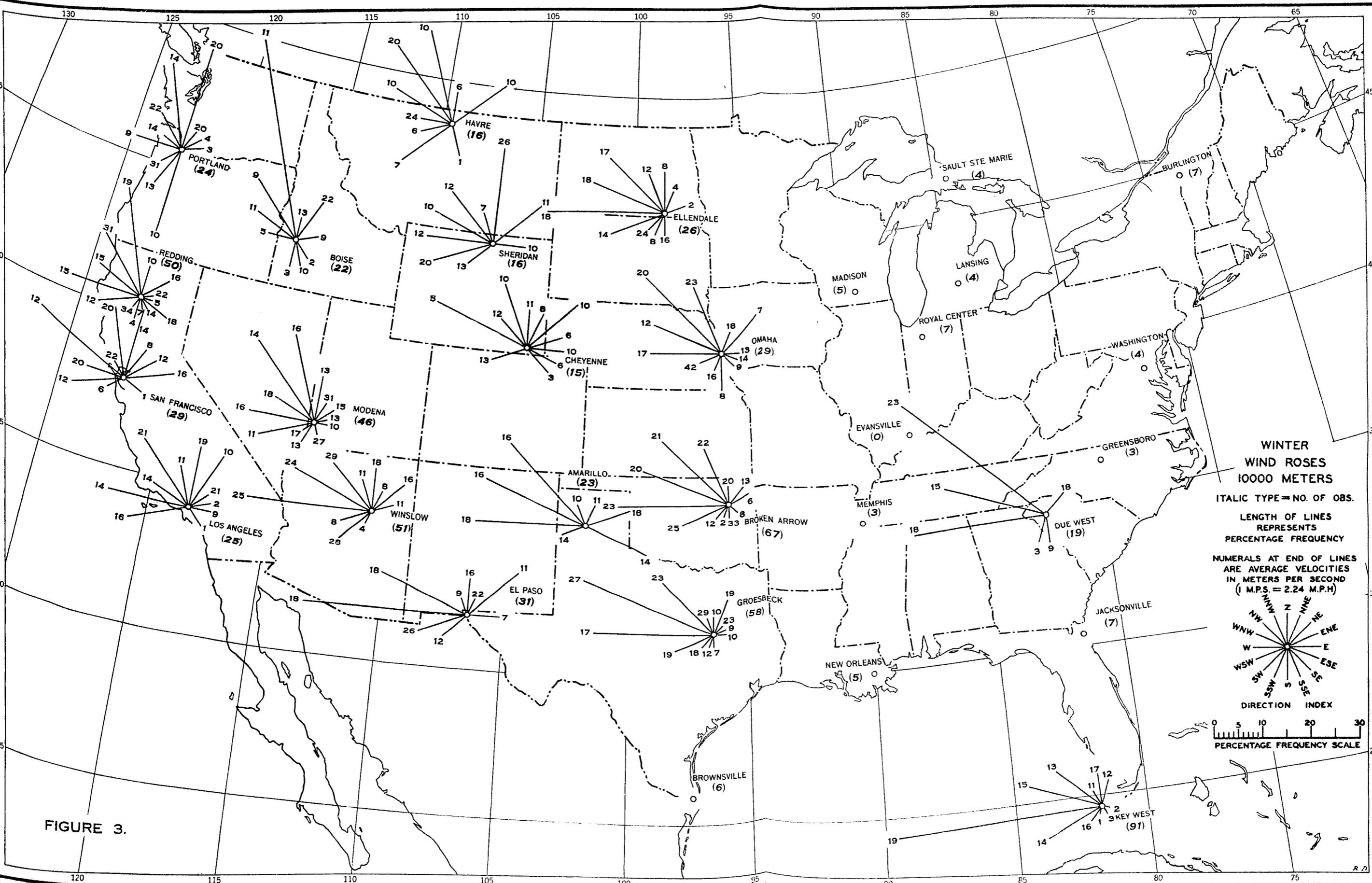
LENGTH OF LINES
REPRESENTS
PERCENTAGE FREQUENCY

NUMERALS AT END OF LINES
ARE AVERAGE VELOCITIES
IN METERS PER SECOND
(1 M.P.S. = 2.24 M.P.H.)

DIRECTION INDEX

PERCENTAGE FREQUENCY SCALE

FIGURE 2.



WINTER WIND ROSES 10000 METERS
 ITALIC TYPE = NO. OF OBS.
 LENGTH OF LINES REPRESENTS PERCENTAGE FREQUENCY
 NUMERALS AT END OF LINES ARE AVERAGE VELOCITIES IN METERS PER SECOND (1 M.P.S. = 2.24 M.P.H.)

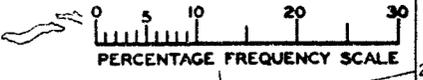
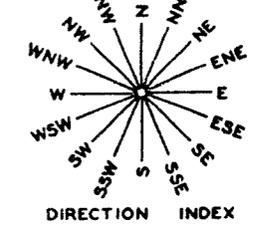


FIGURE 3.

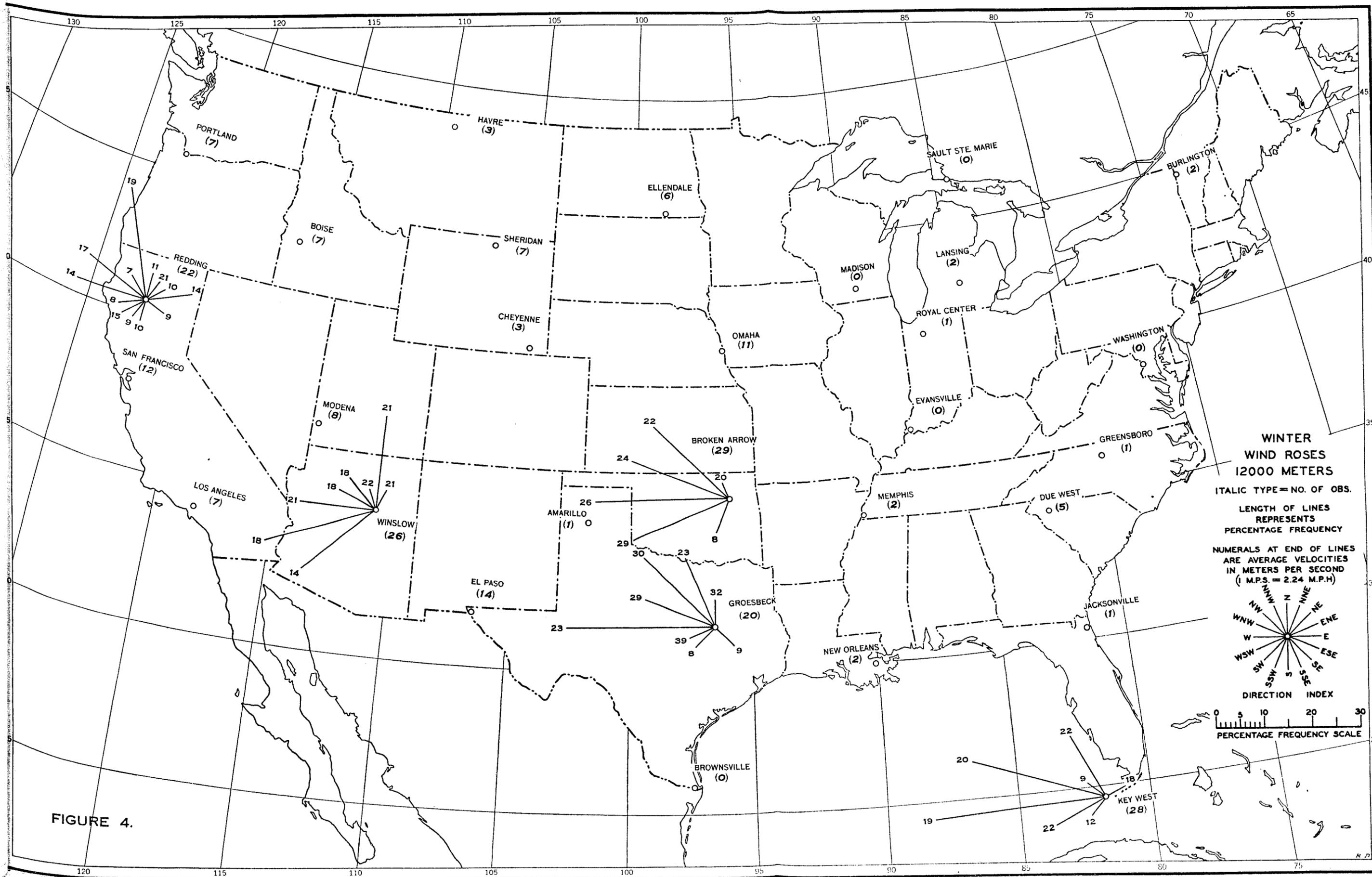


FIGURE 4.

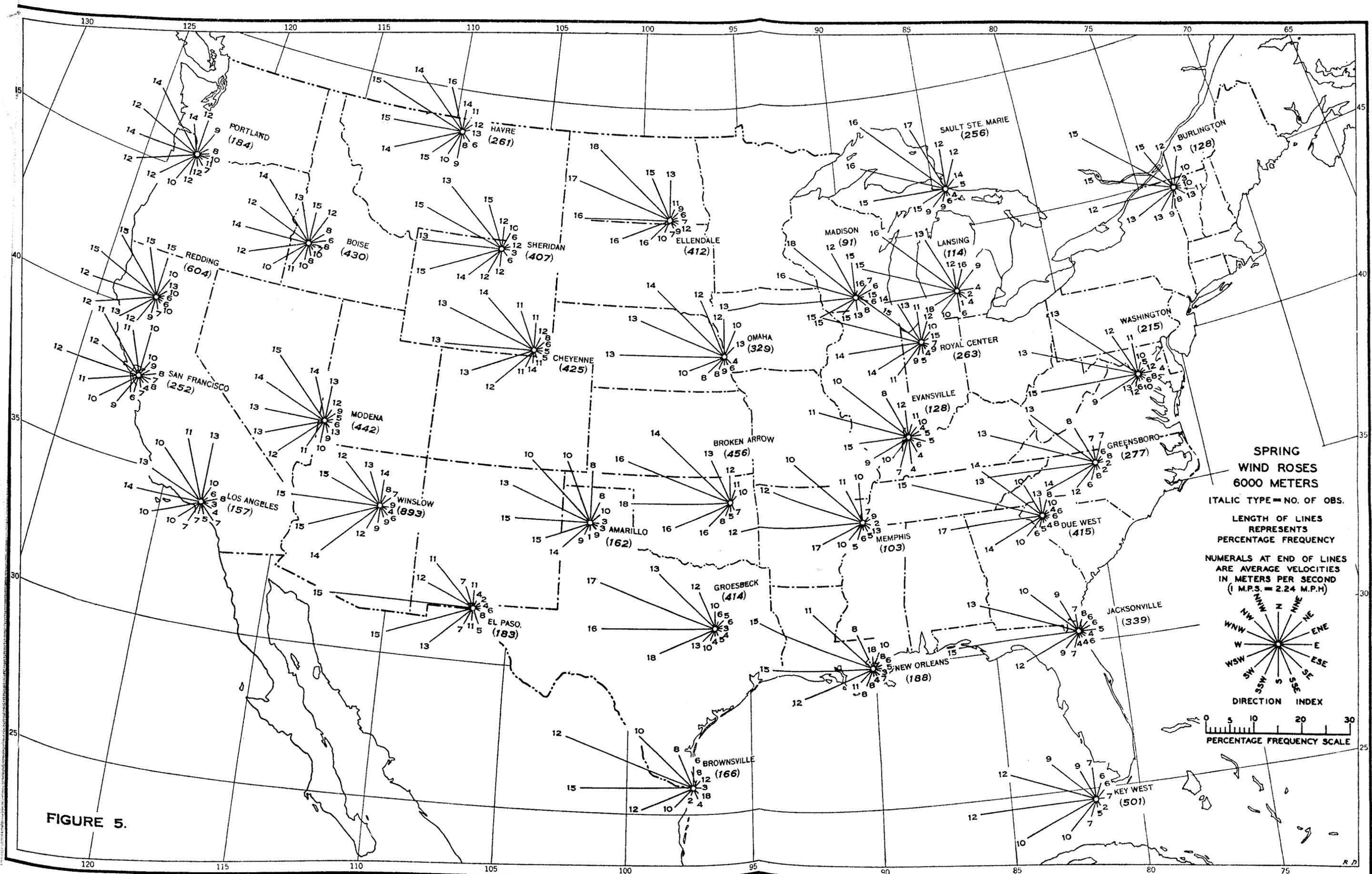
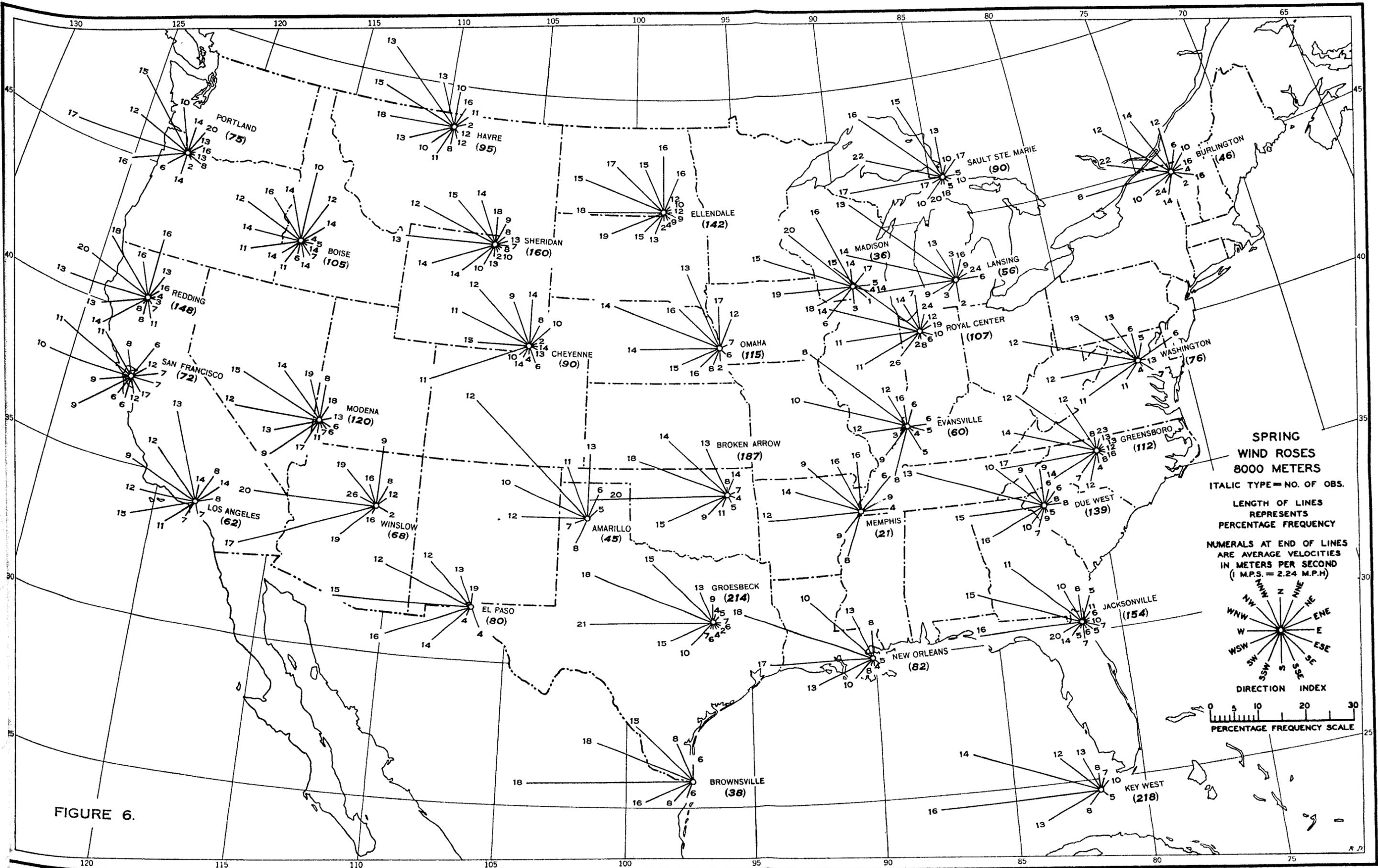


FIGURE 5.



**SPRING
WIND ROSES
8000 METERS**

ITALIC TYPE = NO. OF OBS.

LENGTH OF LINES
REPRESENTS
PERCENTAGE FREQUENCY

NUMERALS AT END OF LINES
ARE AVERAGE VELOCITIES
IN METERS PER SECOND
(1 M.P.S. = 2.24 M.P.H.)

DIRECTION INDEX

0 5 10 20 30
PERCENTAGE FREQUENCY SCALE

FIGURE 6.

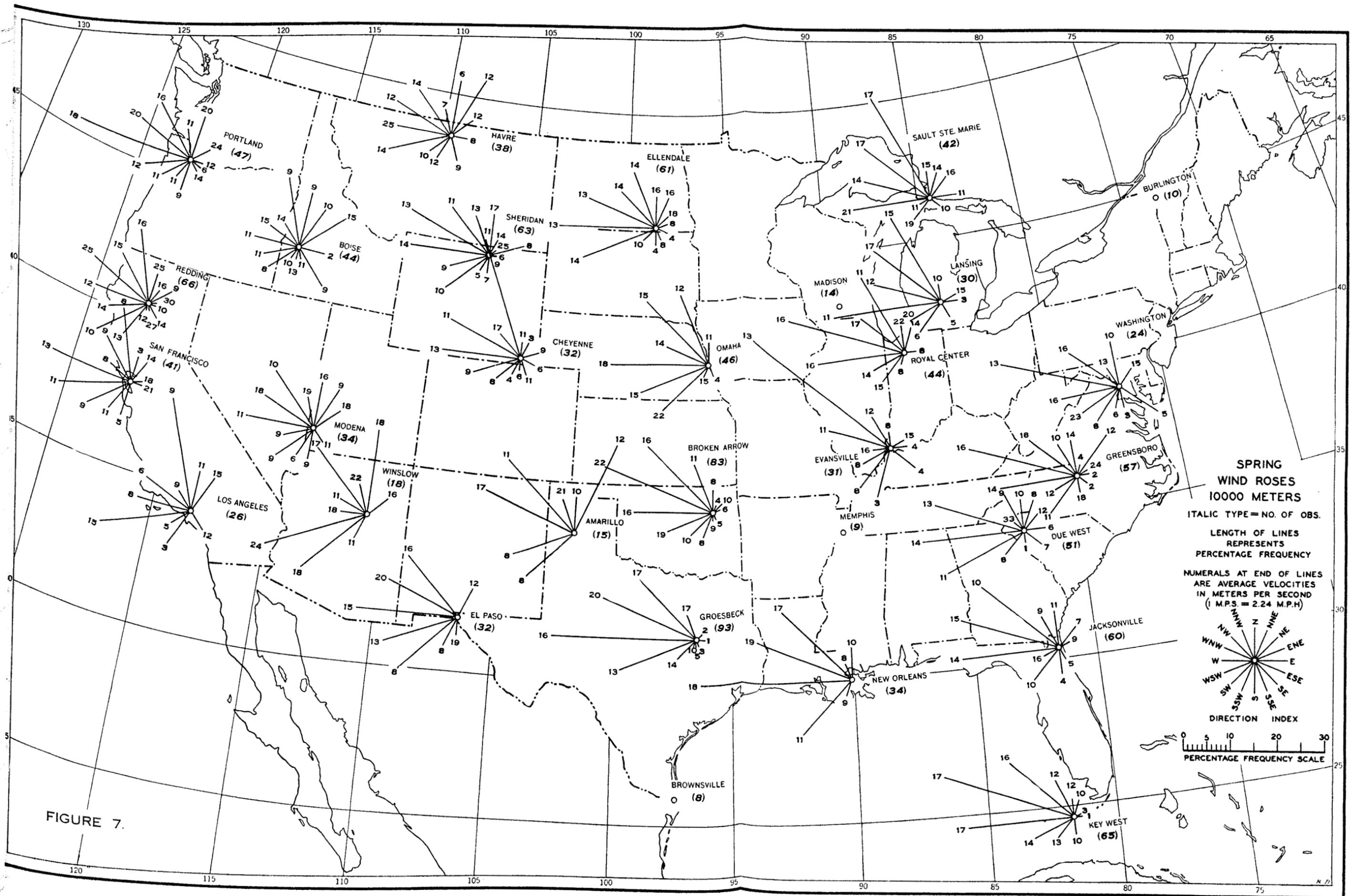


FIGURE 7.

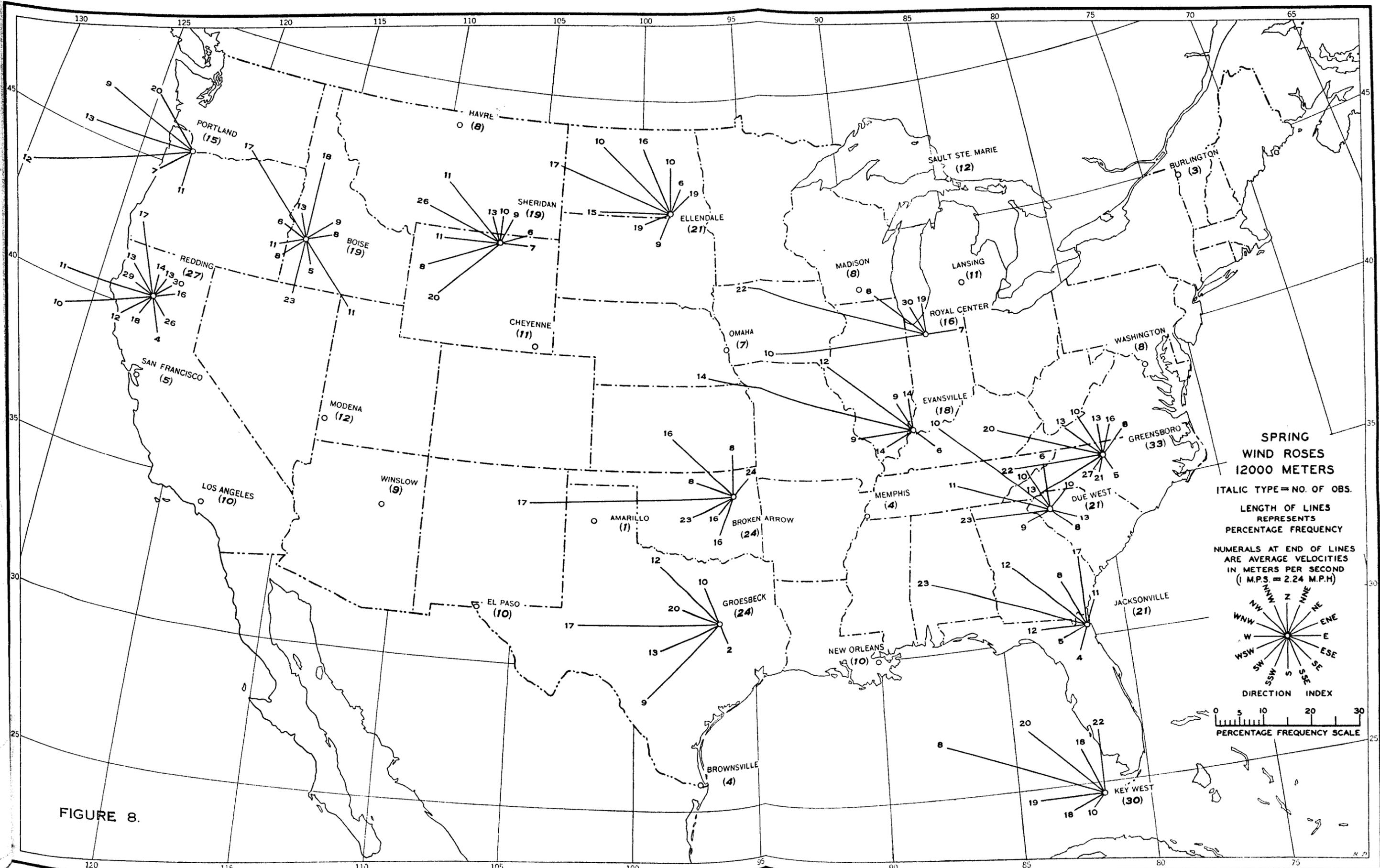


FIGURE 8.

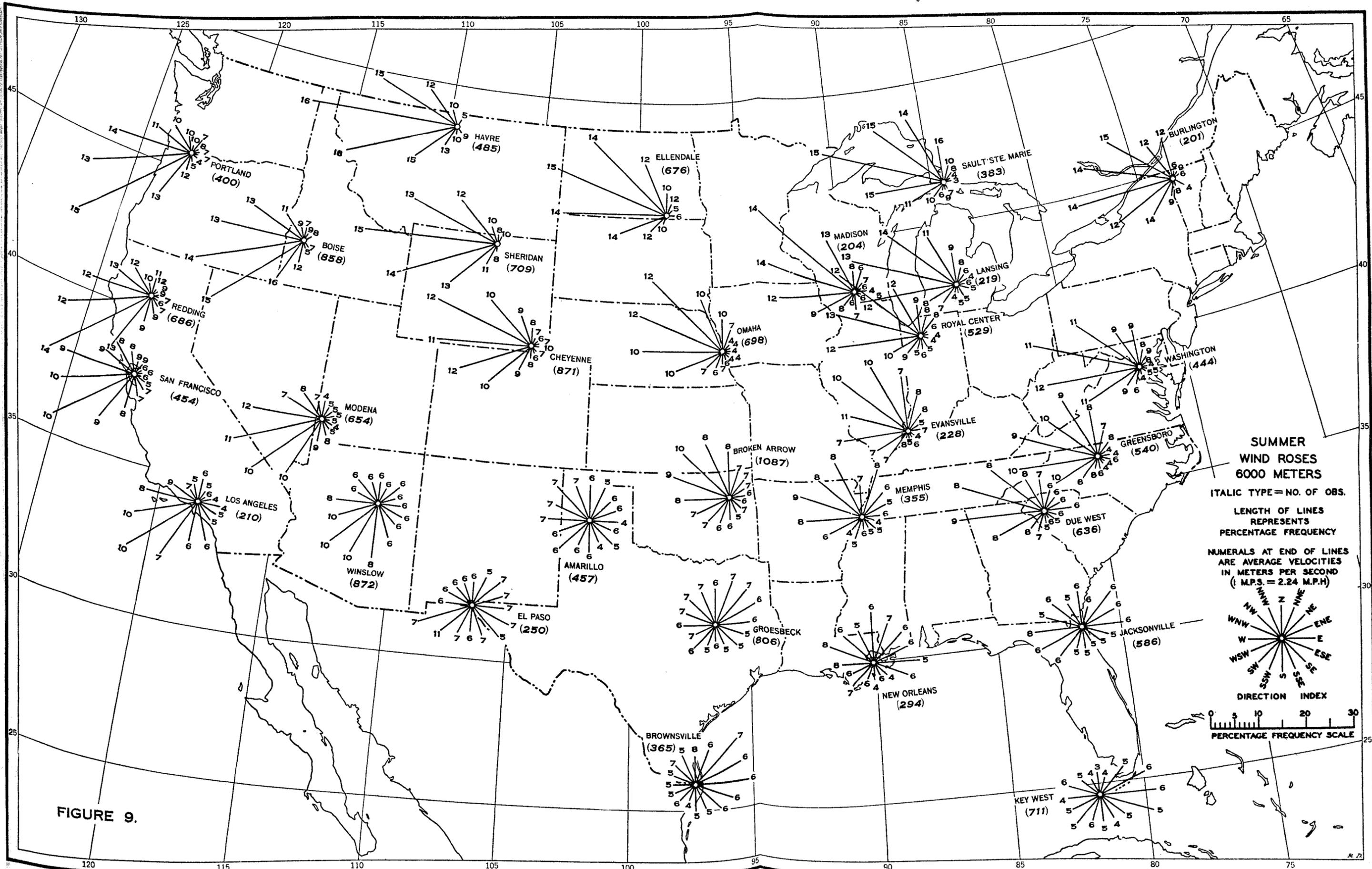


FIGURE 9.

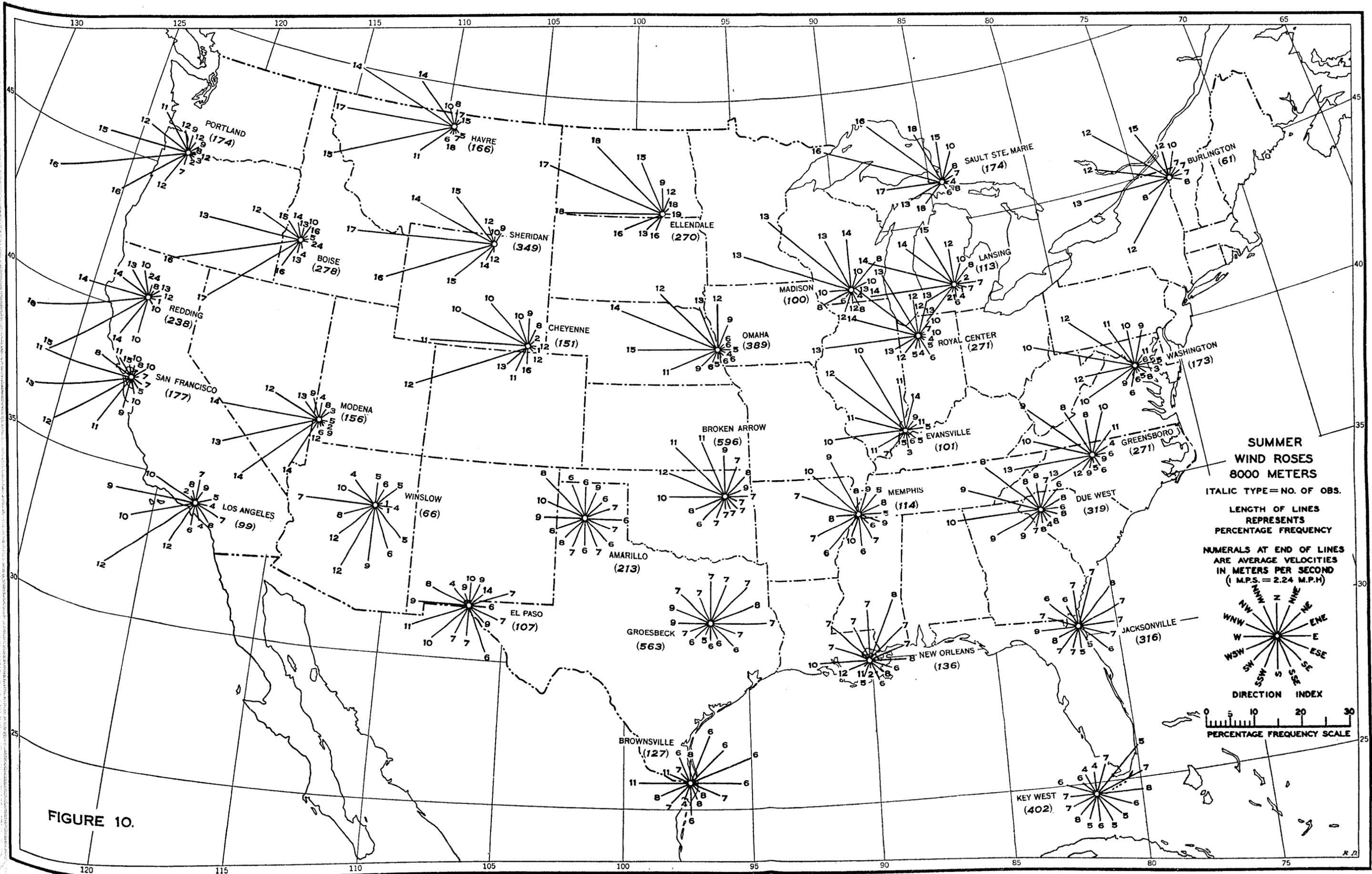


FIGURE 10.

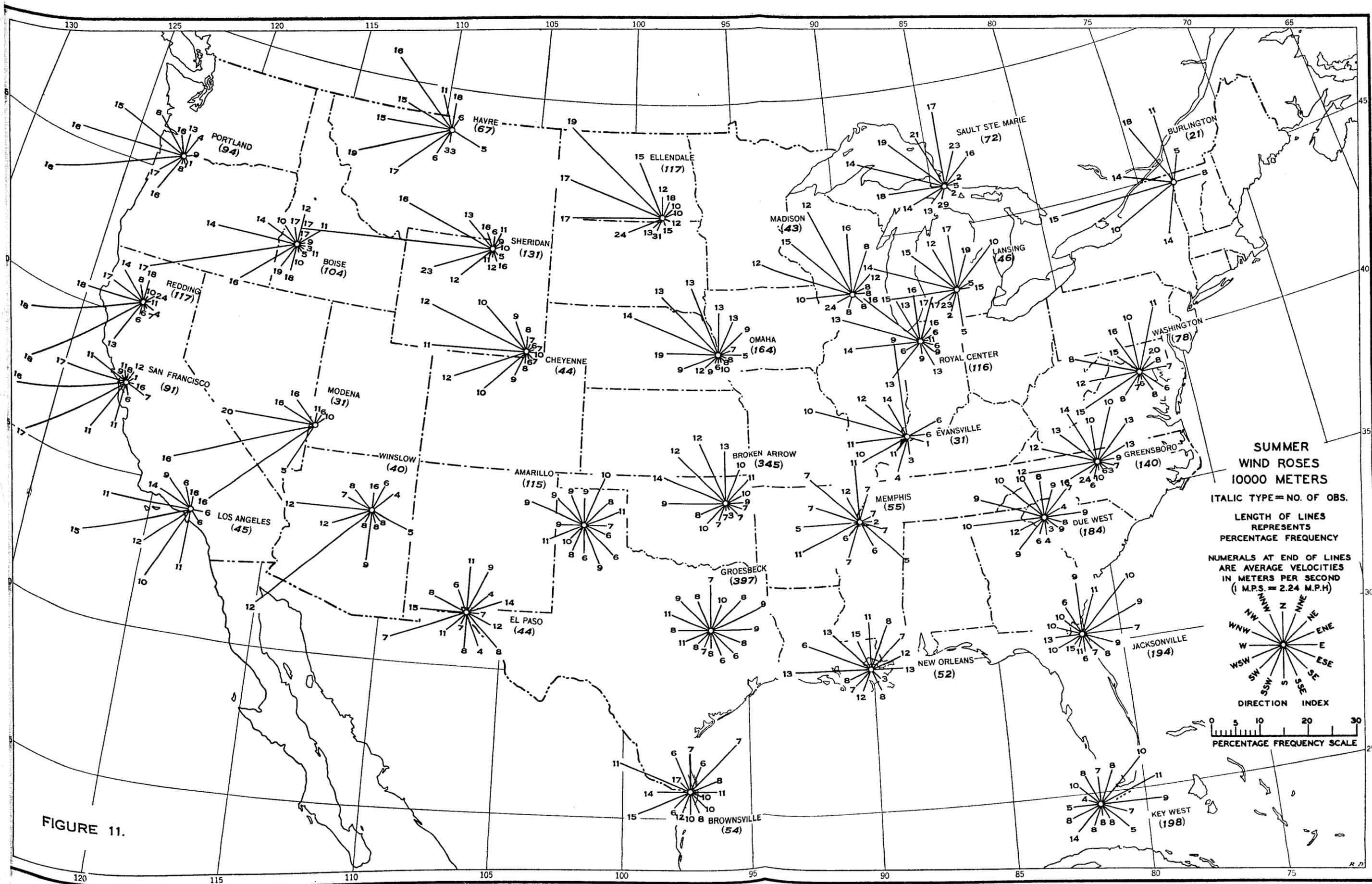


FIGURE 11.

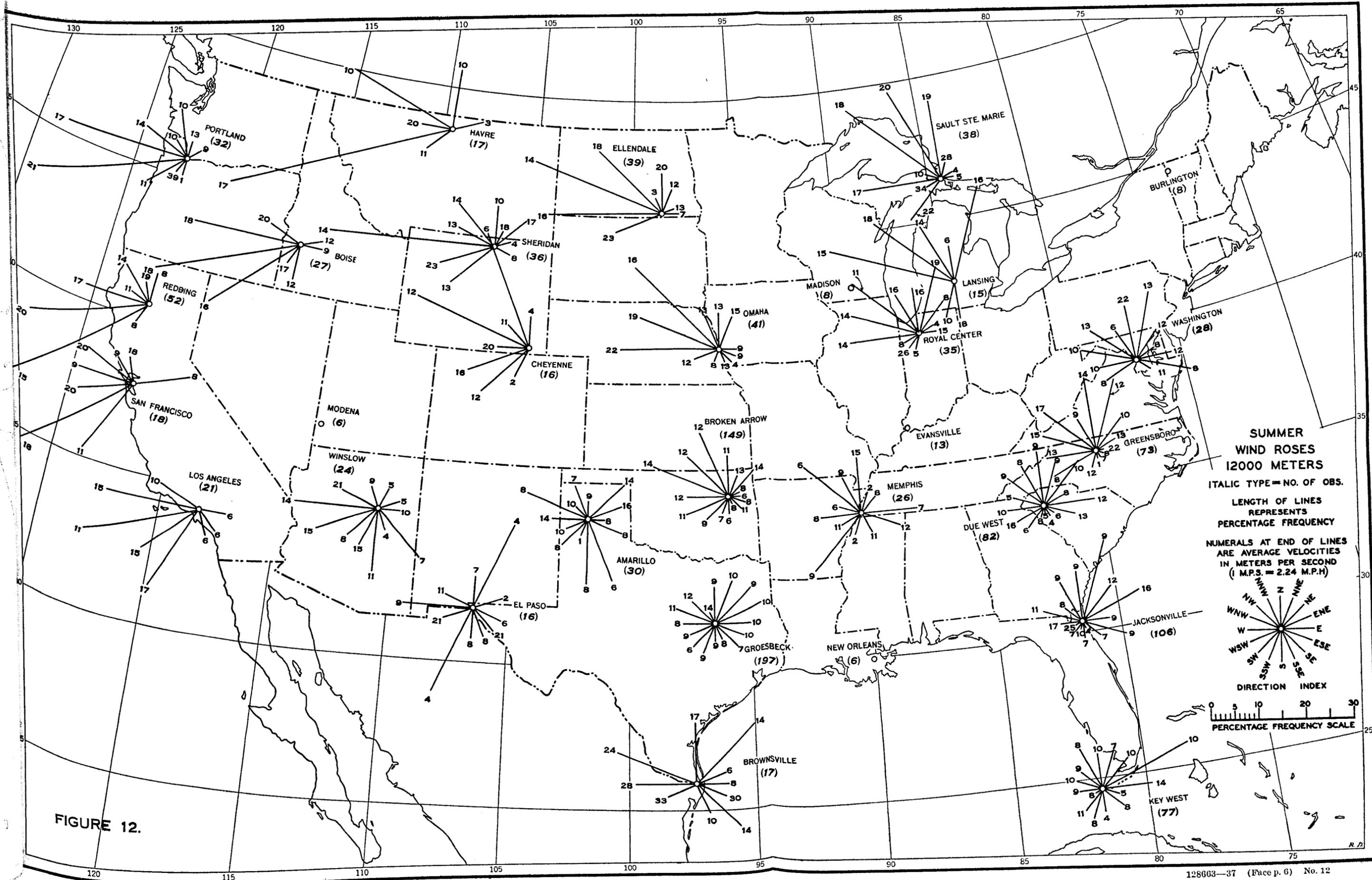


FIGURE 12.

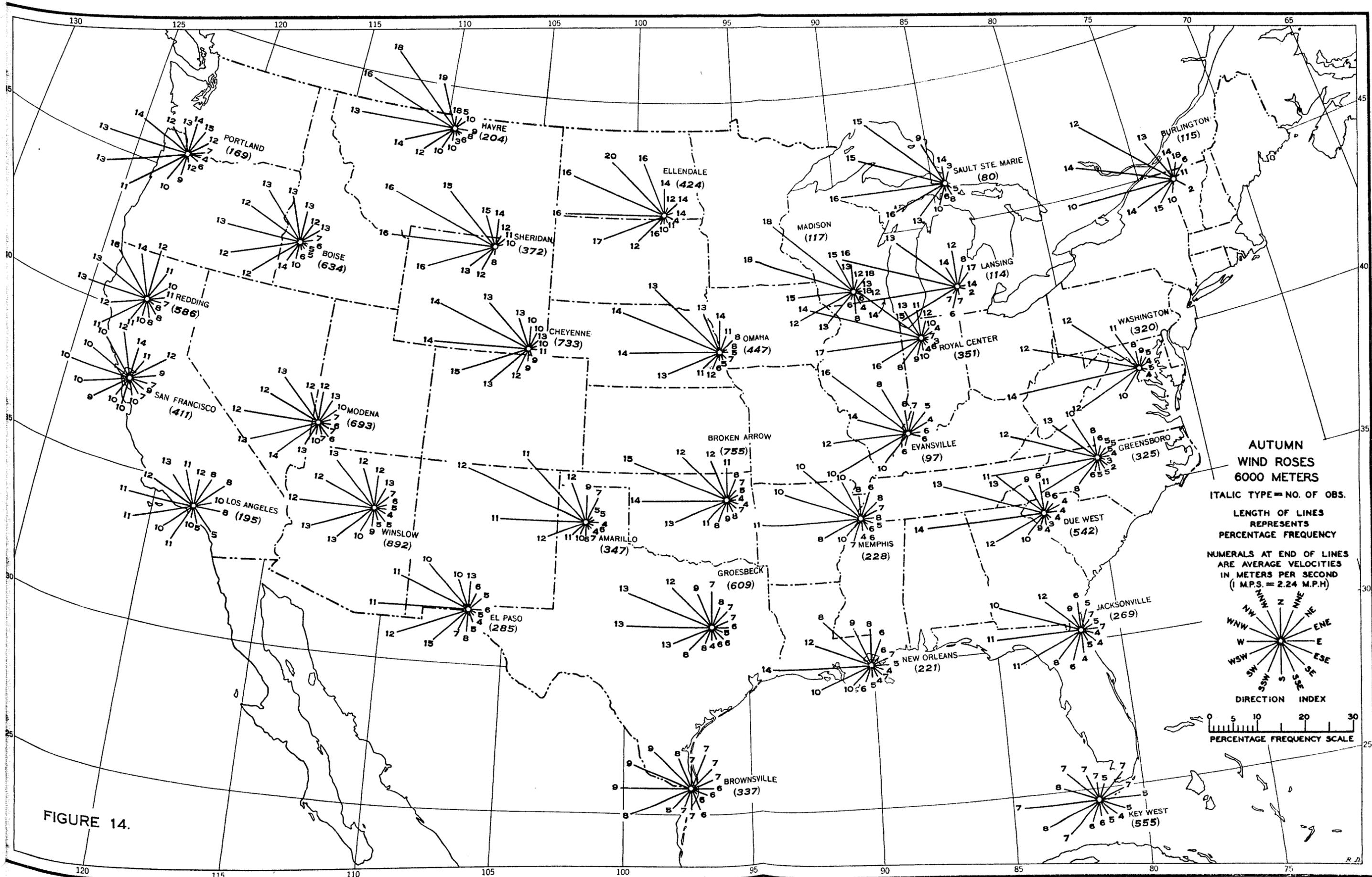


FIGURE 14.

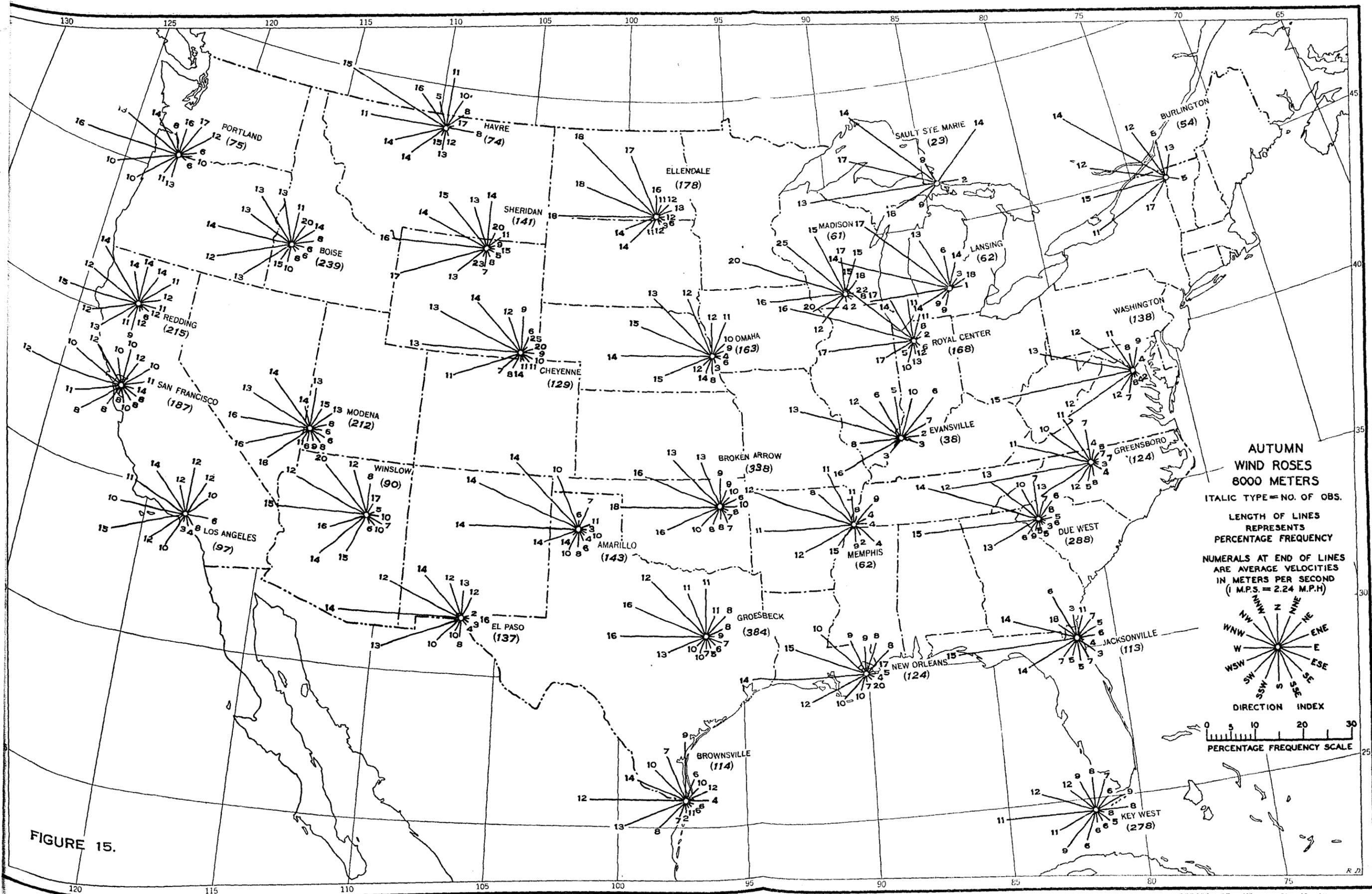
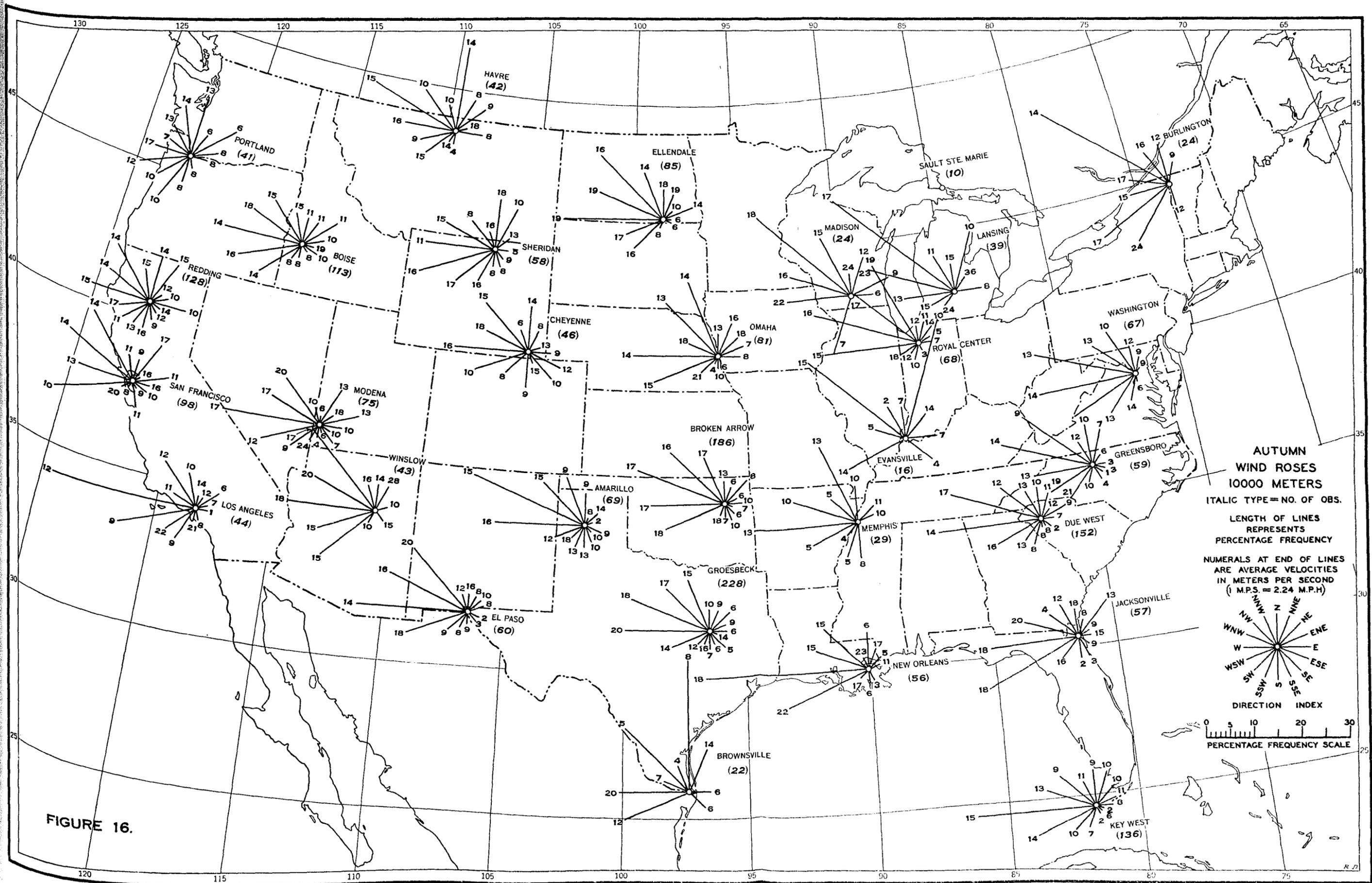


FIGURE 15.



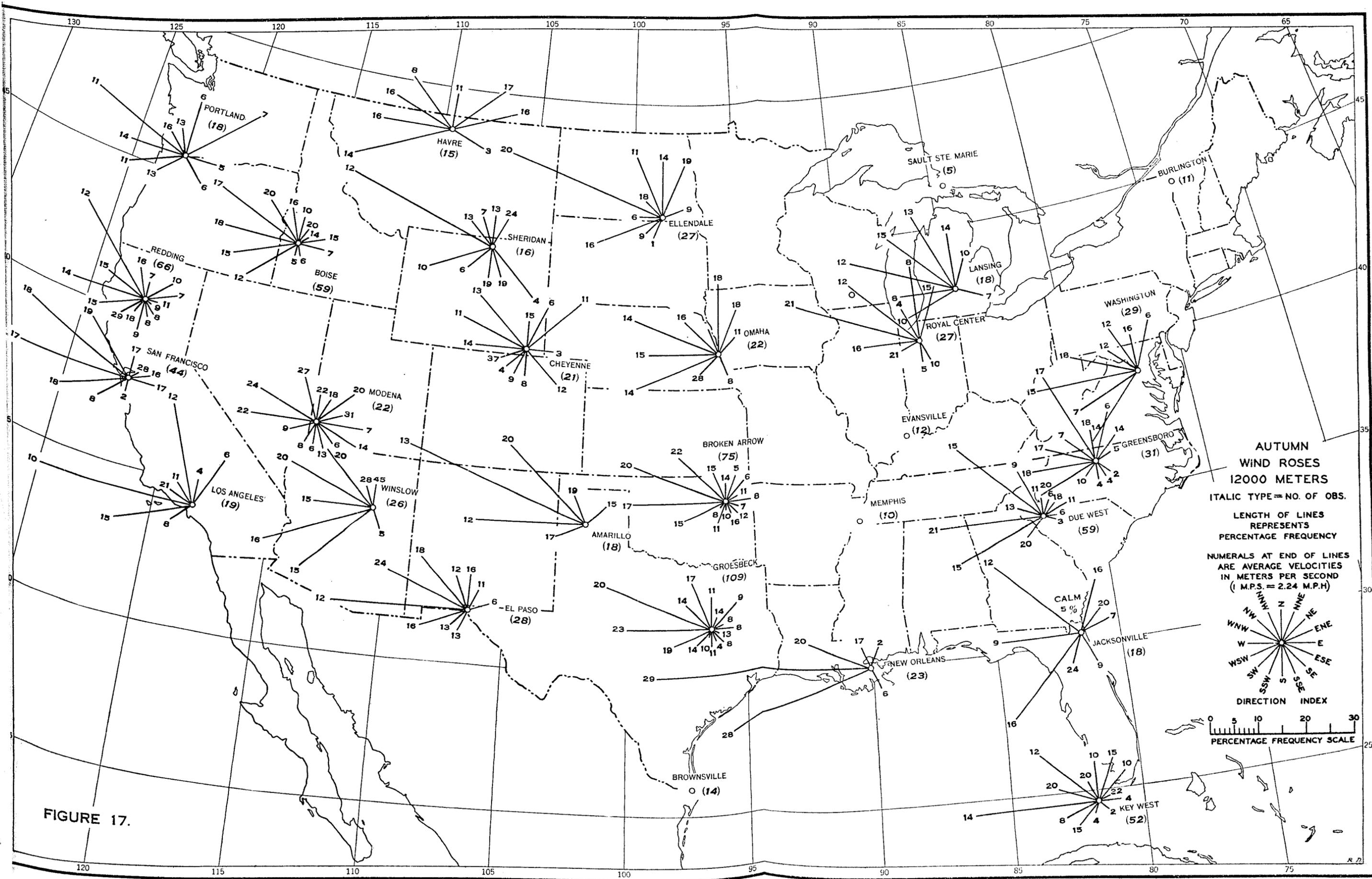
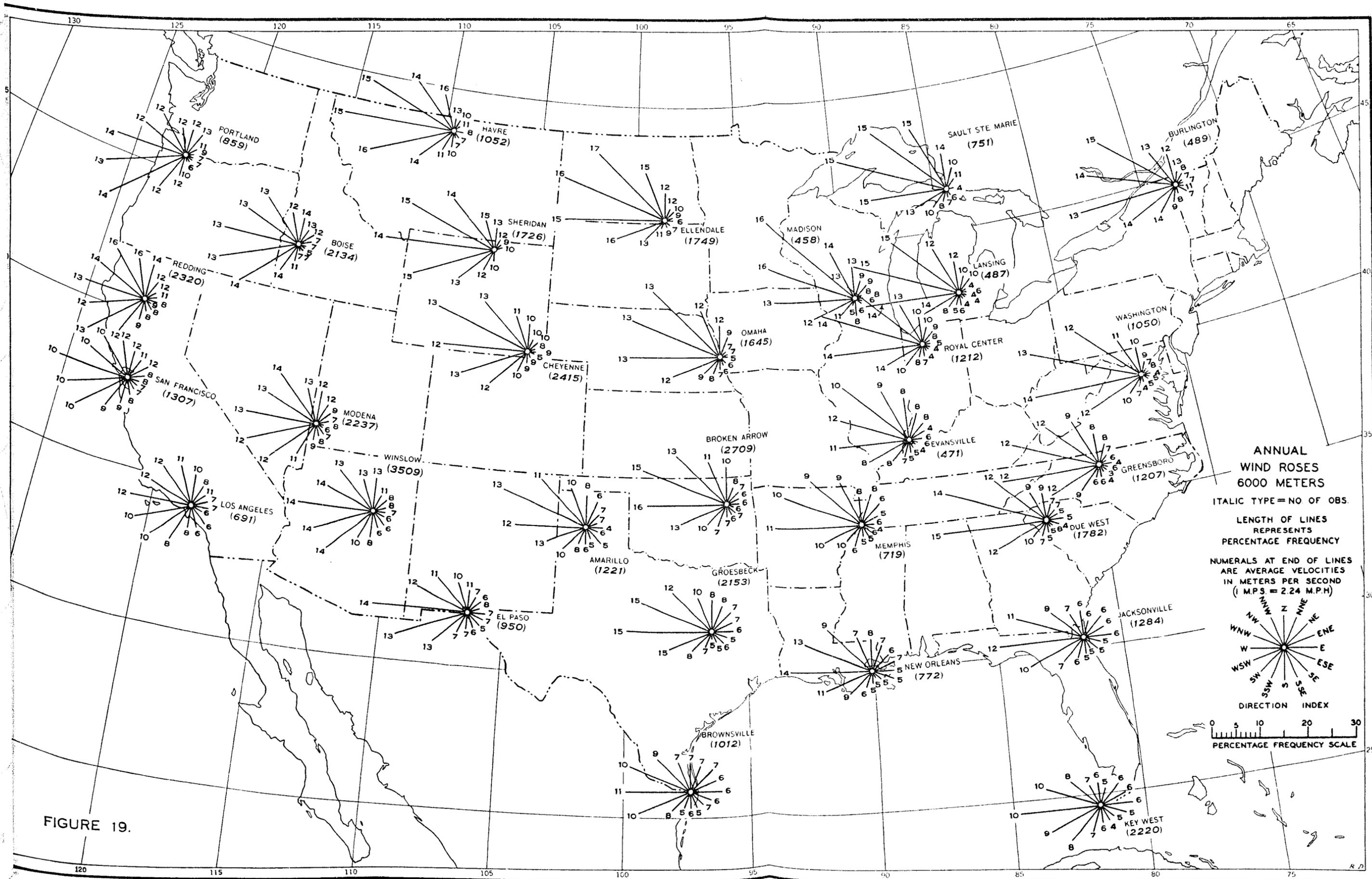


FIGURE 17.



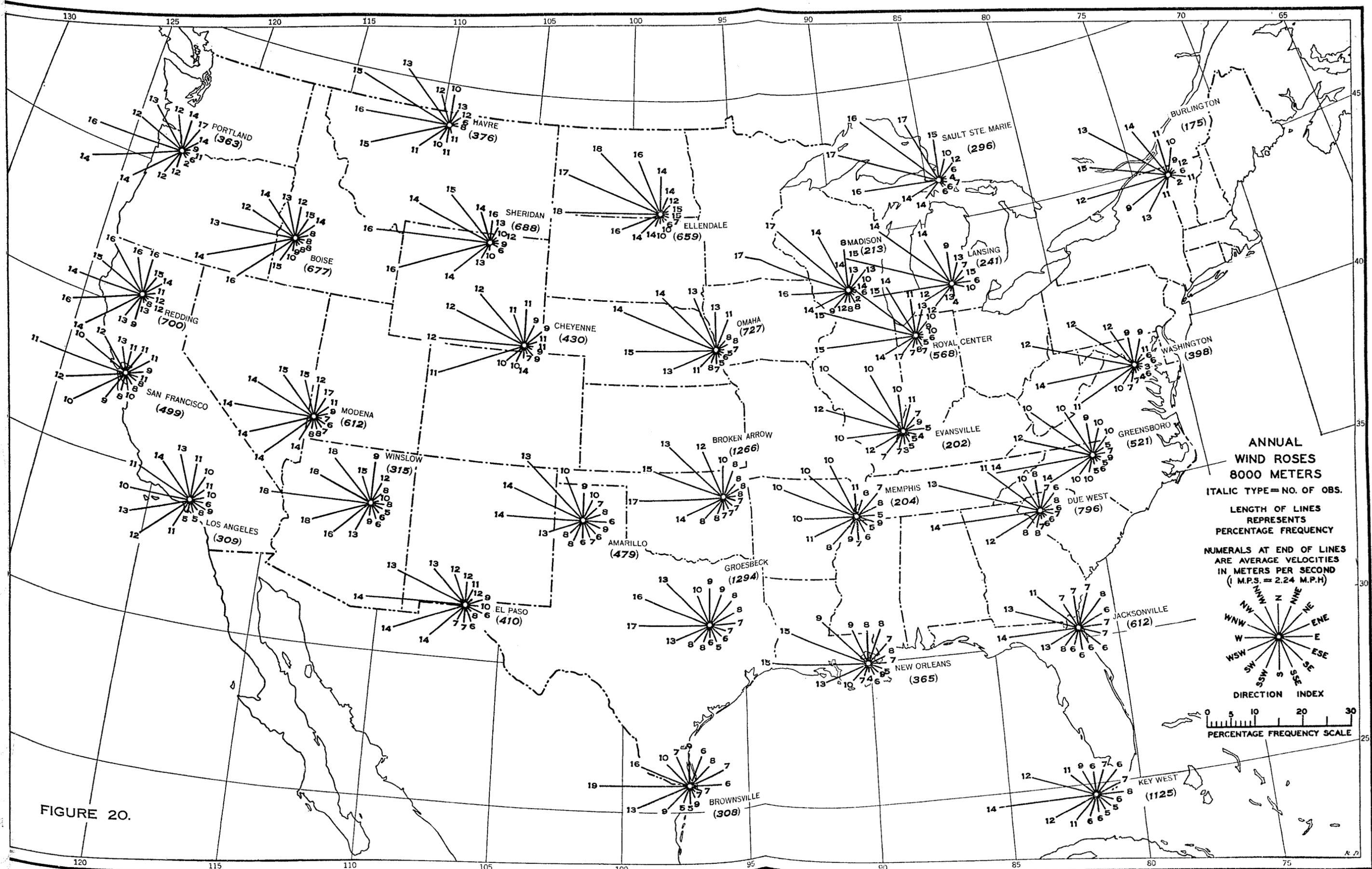


FIGURE 20.

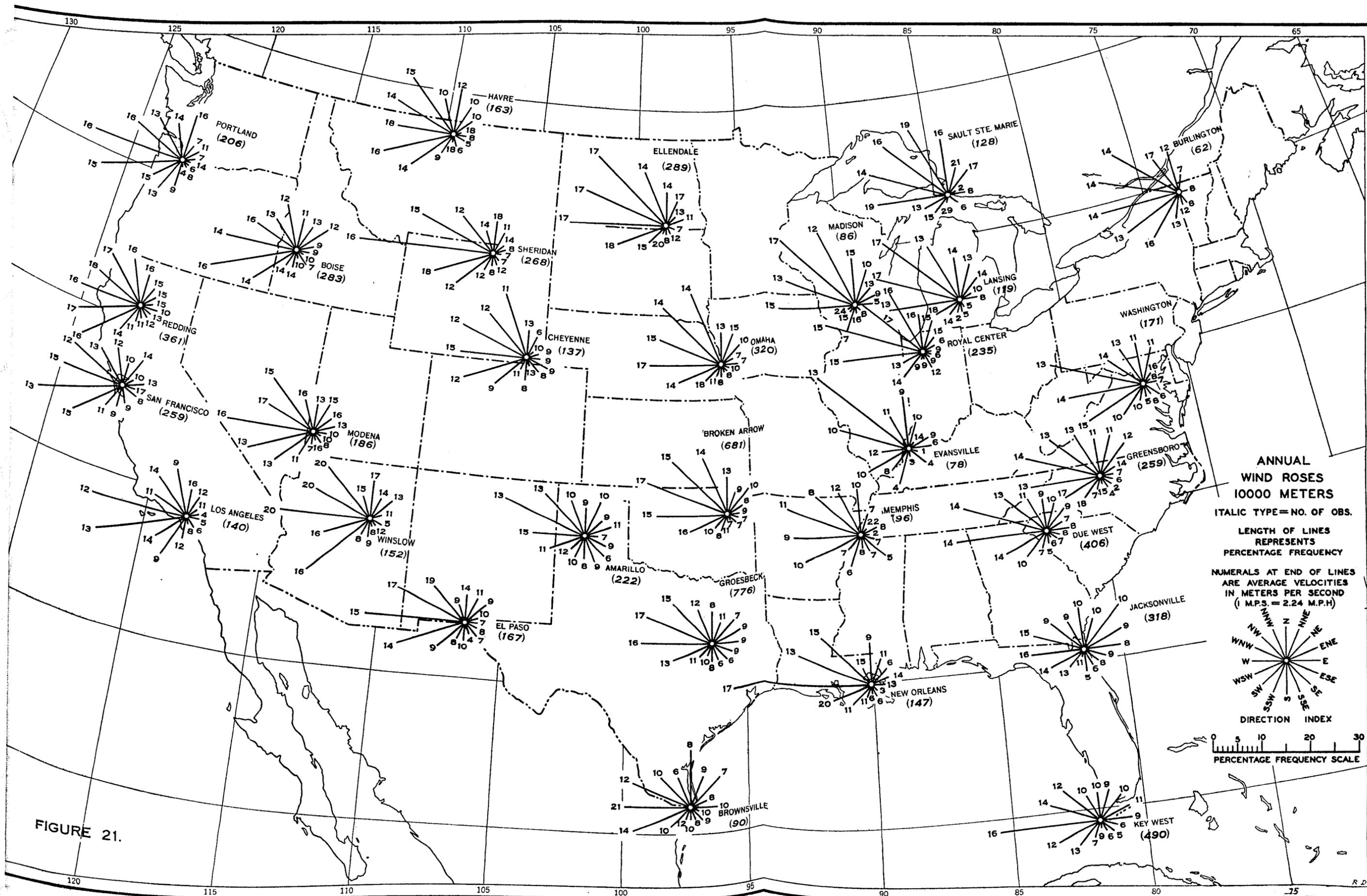


FIGURE 21.

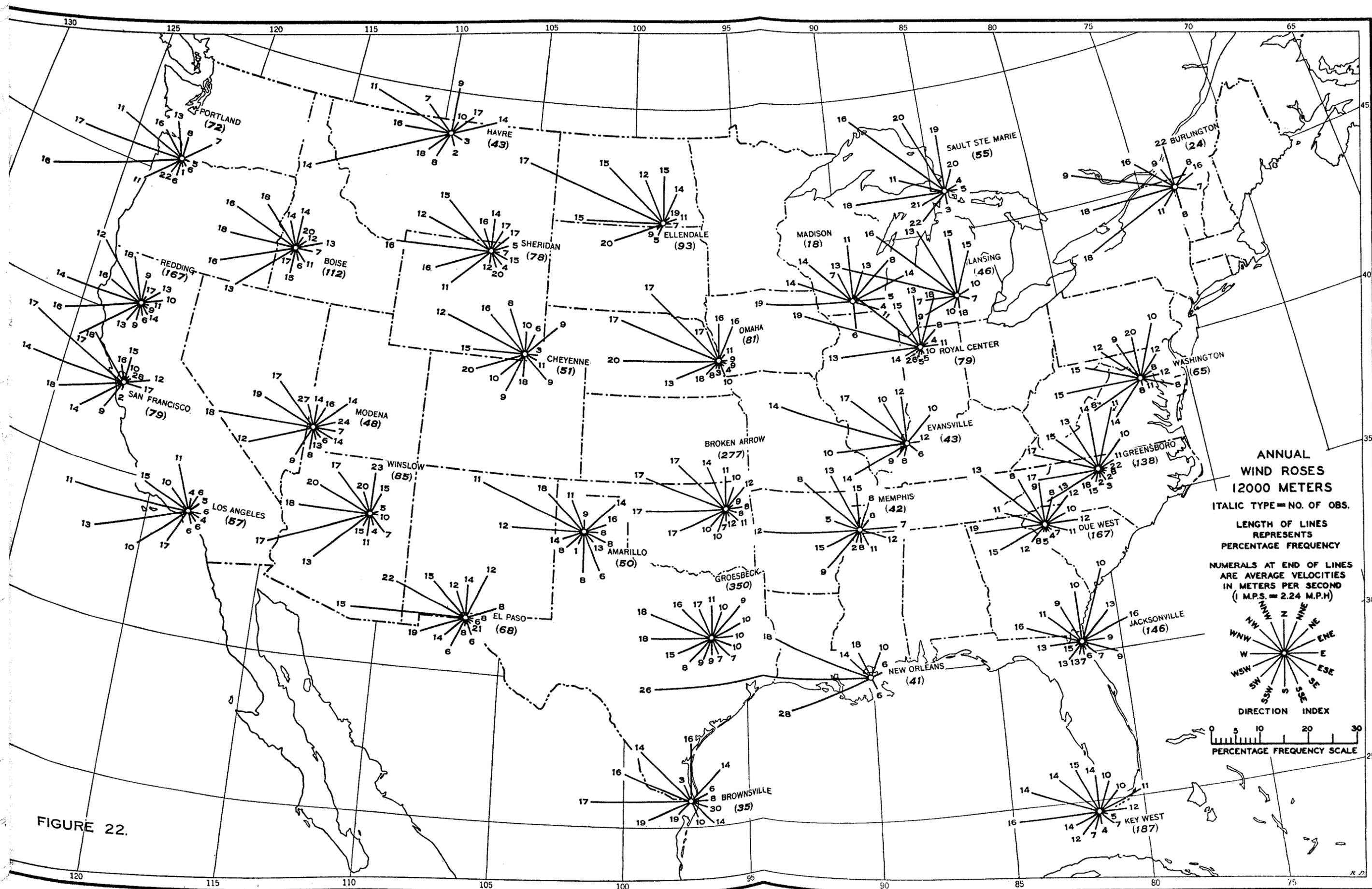


FIGURE 22.

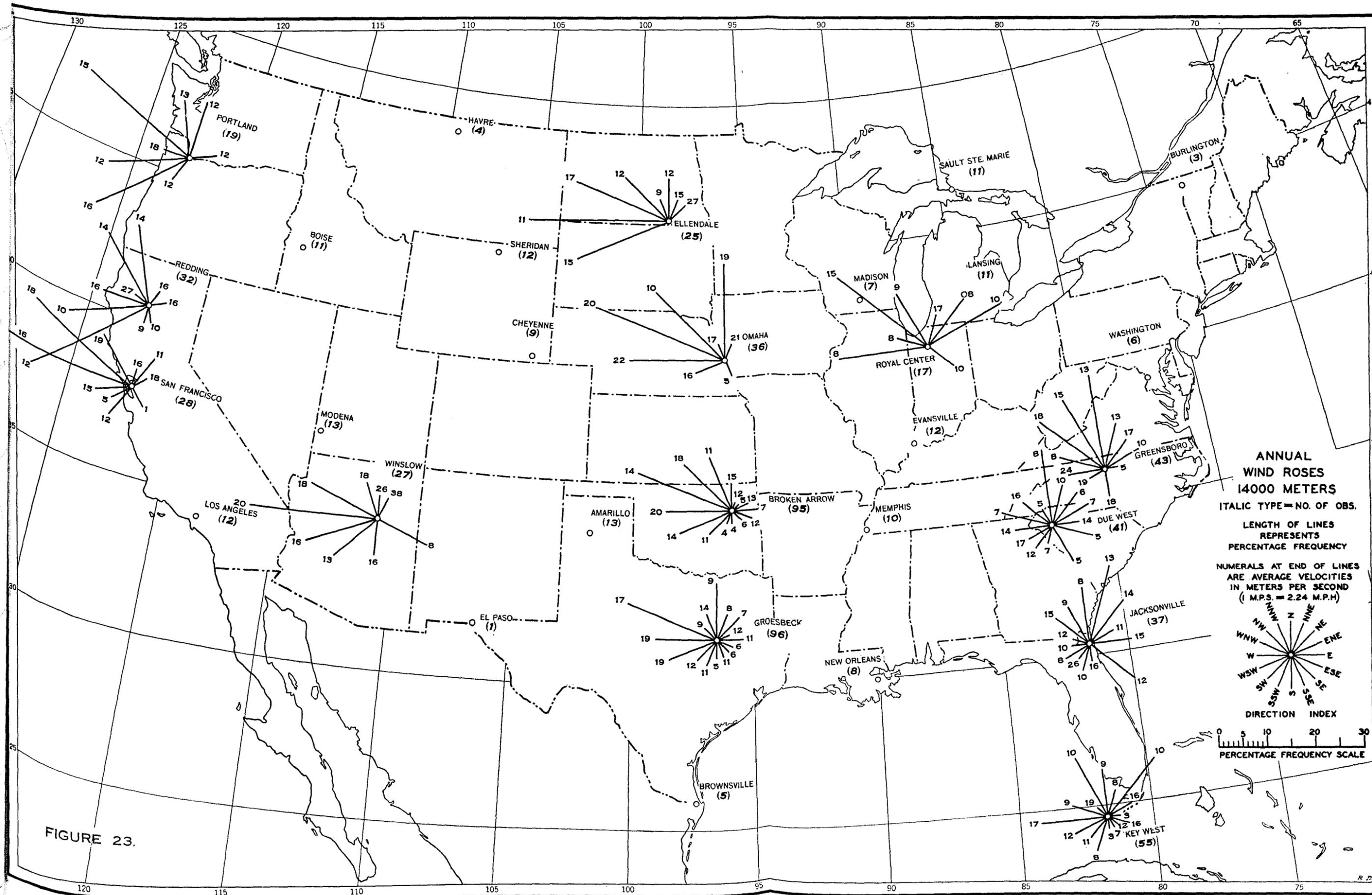
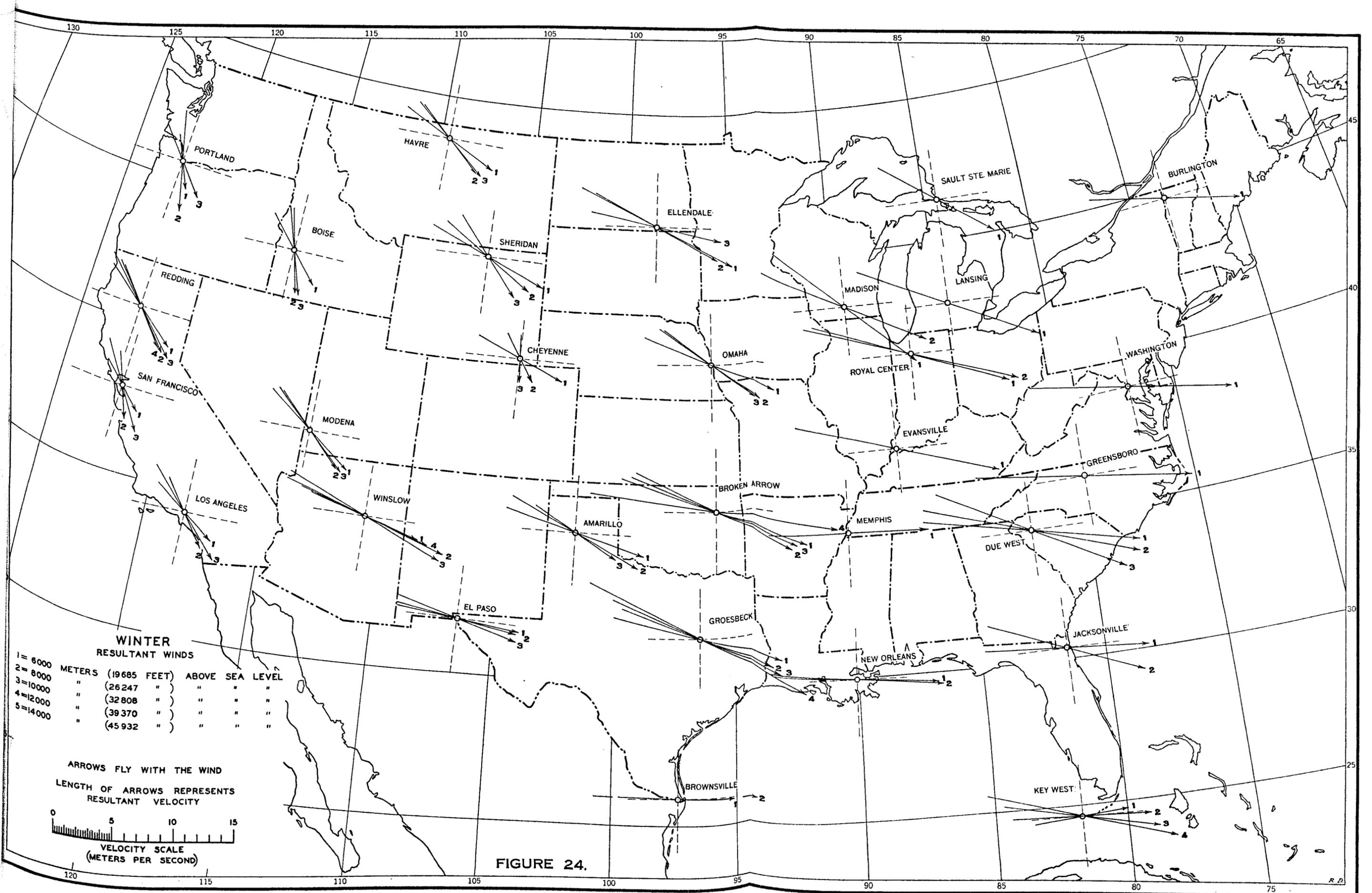


FIGURE 23.



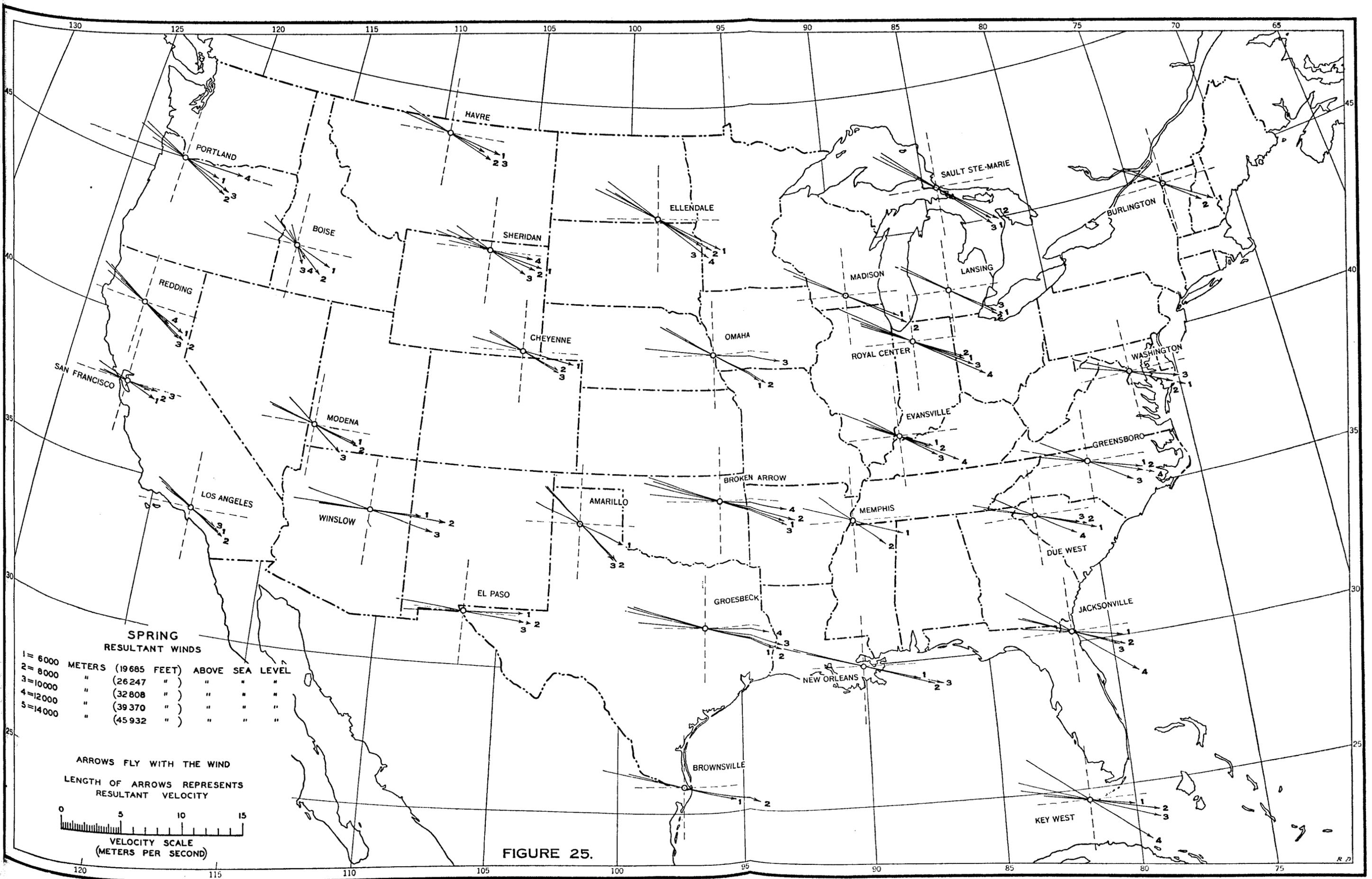
**WINTER
RESULTANT WINDS**

1 = 6000	METERS (19685 FEET)	ABOVE SEA LEVEL
2 = 8000	" (26247 "	" " "
3 = 10000	" (32808 "	" " "
4 = 12000	" (39370 "	" " "
5 = 14000	" (45932 "	" " "

ARROWS FLY WITH THE WIND
LENGTH OF ARROWS REPRESENTS
RESULTANT VELOCITY

0 5 10 15
VELOCITY SCALE
(METERS PER SECOND)

FIGURE 24.



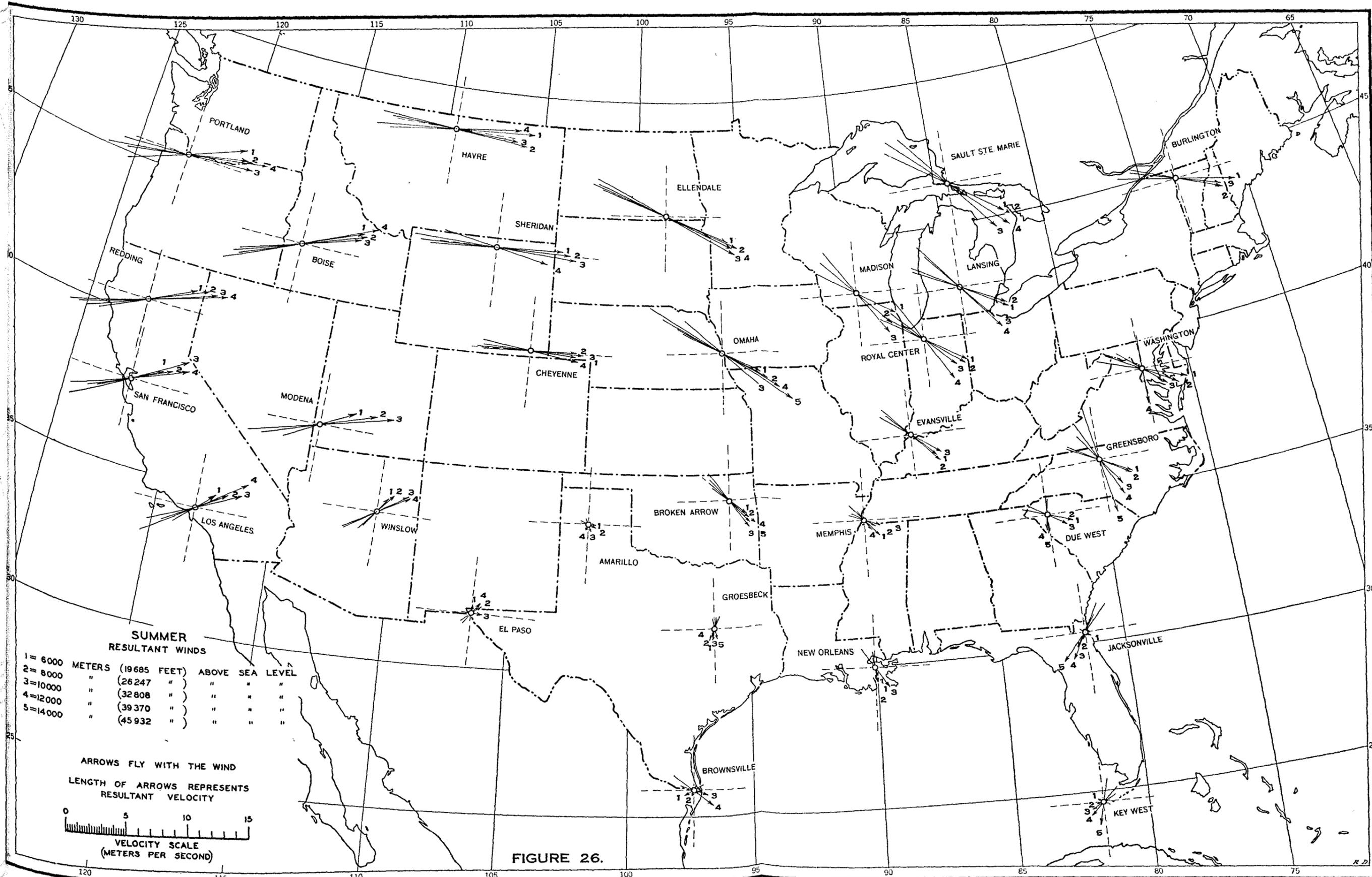
**SPRING
RESULTANT WINDS**

1	= 6000	METERS (19685 FEET)	ABOVE SEA LEVEL
2	= 8000	" (26247 "	" " "
3	= 10000	" (32808 "	" " "
4	= 12000	" (39370 "	" " "
5	= 14000	" (45932 "	" " "

ARROWS FLY WITH THE WIND
 LENGTH OF ARROWS REPRESENTS
 RESULTANT VELOCITY

0 5 10 15
 VELOCITY SCALE
 (METERS PER SECOND)

FIGURE 25.



SUMMER RESULTANT WINDS

1 = 6000	METERS (19685 FEET)	ABOVE SEA LEVEL
2 = 8000	" (26247 "	" " "
3 = 10000	" (32808 "	" " "
4 = 12000	" (39370 "	" " "
5 = 14000	" (45932 "	" " "

ARROWS FLY WITH THE WIND
 LENGTH OF ARROWS REPRESENTS
 RESULTANT VELOCITY

0 5 10 15
 VELOCITY SCALE
 (METERS PER SECOND)

FIGURE 26.

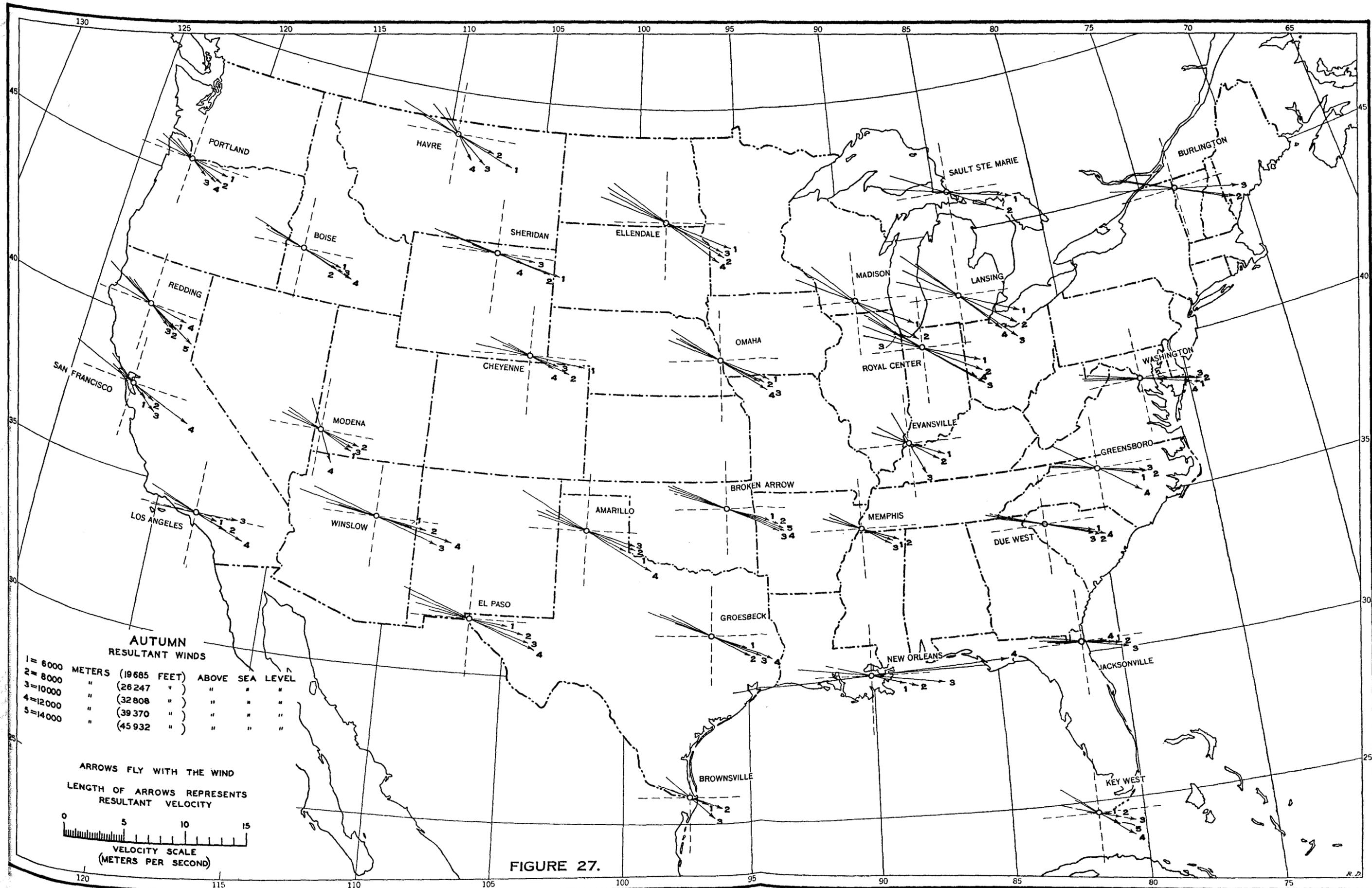


FIGURE 27.

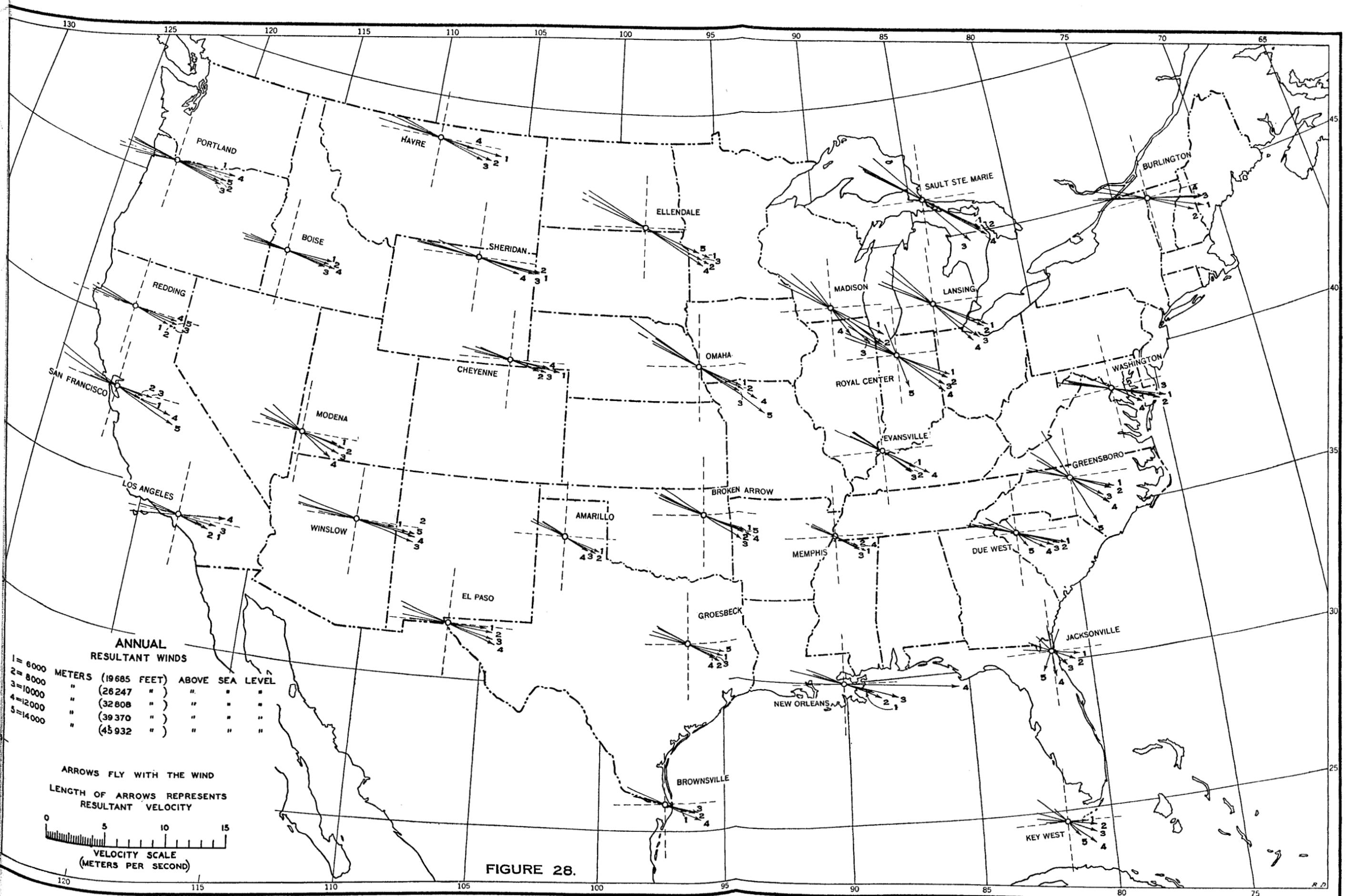


FIGURE 28.

TABLE 3.—Annual percentage frequency of wind directions from each of the 4 quadrants: North winds include NNW., N., NNE., and ½ (NW.+NE.); east winds include ENE., E., ESE., and ½ (NE.+SE.); south winds include SSE., S., SSW., and ½ (SE.+SW.), and west winds include WSW., W., WNW., and ½ (SW.+NW.)—Continued

EL PASO, TEX.

Quadrant	6 km	8 km	10 km	12 km	14 km
N	19	18	20	24	-----
E	11	9	10	9	-----
S	16	14	13	13	-----
W	54	59	57	54	-----

EVANSVILLE, IND.

N	34	36	34	29	-----
E	9	9	11	6	-----
S	9	10	13	5	-----
W	48	45	42	60	-----

GREENSBORO, N. C.

N	27	30	34	42	56
E	6	8	12	9	12
S	8	7	9	6	5
W	50	55	45	43	27

GROESBECK, TEX.

N	26	28	25	25	25
E	15	18	20	21	16
S	10	11	12	15	16
W	49	48	43	39	45

HAVRE, MONT.

N	18	23	31	17	-----
E	2	3	7	13	-----
S	12	11	12	10	-----
W	68	63	50	60	-----

JACKSONVILLE, FLA.

N	20	27	30	41	45
E	16	19	26	27	24
S	13	14	11	8	15
W	50	40	33	24	16

KEY WEST, FLA.

N	17	20	23	30	36
E	20	18	20	19	19
S	17	14	10	9	15
W	46	48	47	42	30

LANSING, MICH.

N	29	31	39	45	-----
E	5	8	7	4	-----
S	7	6	7	4	-----
W	59	55	47	47	-----

LOS ANGELES, CALIF.

N	24	27	23	17	-----
E	11	9	6	6	-----
S	23	17	19	16	-----
W	42	47	52	61	-----

MADISON, WIS.

N	32	35	43	34	-----
E	5	6	10	27	-----
S	6	8	7	5	-----
W	57	51	40	34	-----

MEMPHIS, TENN.

N	29	27	28	32	-----
E	10	14	9	13	-----
S	11	15	16	12	-----
W	50	43	47	43	-----

TABLE 3.—Annual percentage frequency of wind directions from each of the 4 quadrants: North winds include NNW., N., NNE., and ½ (NW.+NE.); east winds include ENE., E., ESE., and ½ (NE.+SE.); south winds include SSE., S., SSW., and ½ (SE.+SW.), and west winds include WSW., W., WNW., and ½ (SW.+NW.)—Continued

MODENA, UTAH.

Quadrant	6 km	8 km	10 km	12 km	14 km
N	25	24	25	21	-----
E	6	7	10	17	-----
S	19	16	14	13	-----
W	50	53	51	49	-----

NEW ORLEANS, LA.

N	26	29	24	12	-----
E	15	11	8	2	-----
S	10	8	8	2	-----
W	49	52	60	84	-----

OMAHA, NEBR.

N	30	32	38	30	34
E	3	6	9	3	0
S	8	7	7	7	3
W	59	55	46	60	63

PORTLAND, OREG.

N	20	25	25	17	22
E	5	5	6	5	5
S	21	14	16	11	10
W	54	55	53	67	57

REDDING, CALIF.

N	25	25	26	23	27
E	7	8	9	9	3
S	22	18	19	17	20
W	46	49	46	51	50

ROYAL CENTER, IND.

N	28	33	35	38	35
E	5	5	6	6	26
S	8	7	8	4	3
W	59	55	51	52	36

SAN FRANCISCO, CALIF.

N	22	21	22	15	17
E	10	10	10	8	3
S	22	19	18	12	11
W	46	50	50	65	69

SAULT STE. MARIE, MICH.

N	35	37	42	43	-----
E	2	6	8	4	-----
S	6	3	4	6	-----
W	57	54	45	47	-----

SHERIDAN, WYO.

N	19	20	19	22	-----
E	1	3	5	11	-----
S	11	9	12	11	-----
W	69	68	64	56	-----

WASHINGTON, D. C.

N	24	26	28	34	-----
E	4	6	6	14	-----
S	5	7	12	6	-----
W	67	61	54	46	-----

WINSLOW, ARIZ.

N	22	23	24	21	15
E	9	7	7	4	11
S	21	17	15	17	13
W	48	53	54	58	61

From an examination of the table it will be noted that, for the year as a whole, westerly winds predominate at all stations and all levels except Jacksonville at the 12- and 14-kilometer levels, Key West at the 14-kilometer level, and Madison at the 10-kilometer level, where northerly winds prevail. Northerly winds are next in frequency, except as noted above, with southerly winds next, and easterly winds least frequent except at the southernmost stations of Due West, Jacksonville, Key West, New Orleans, Groesbeck, and Brownsville, where easterly winds are more frequent than southerly winds.

The table also shows that, on the average, between 70 and 80 percent of the winds at all levels and for all stations are from the north and west quadrants. It appears, also, that the annual percentage frequency of westerly winds reaches a maximum at 5 or 6 kilometers, except over the extreme south, southwest, and Pacific coast regions, where the frequency of westerly winds increases up to 8 kilometers at most stations and up to 10 or 12 kilometers at others.

RESULTANT WINDS

Resultant winds, based on the same records used in computing the wind roses, are shown graphically in figures 24 to 28, inclusive. In computing these data each individual wind observation is handled as a vector, and in arriving at the final results these vectors are combined into a single vector, or value, representing the resultant or mass movement of the air. For example, a north wind of 12 meters per second, when combined with a south wind of 8 meters per second, will give a resultant wind of north 4 meters per second, which is the mass movement of air as measured by these two observations. Resultants are of most value, of course, when based on a large number of frequent observations. They can be used to advantage for long-time planning of air-line schedules and in the study of the general circulation of the atmosphere.

It will be noted that, for the year as a whole, there is remarkably close agreement in both the direction and velocity of the resultant winds between levels and between adjoining stations. With a very few exceptions, the annual resultant directions fall between W. and NW. at all stations and at all levels. The exceptions are: NNW. at Madison and N. at Jacksonville at 12 kilometers, and NNW. at Greensboro and Royal Center and NNE. at Jacksonville at 14 kilometers. The resultant velocities for the year, as a whole, average about 10 meters per second for the northern part of the country, decreasing to about 6 meters per second over the extreme southern part. For the individual seasons the greatest variations from the annual values occur during the winter and summer. During the winter season there is a marked increase in resultant velocities at most stations, especially over the eastern part of the country where the average is approximately 16 meters per second at 6 and 8 kilometers. Above 8 kilometers there is a decrease in velocity over the northern part of the country, but a continued increase up to the 14-kilometer level over the extreme southern part. The former is apparently due to the fact that the base of the stratosphere is reached at 8 or 9 kilometers over that part of the country during this season, above which a decrease in mass air movement is to be expected. As the tropopause slopes upward rather steeply from north to south during this season (reaching a level of about 15 kilometers at latitude 25° north), it is also to be expected that the average air movement should increase in velocity up to the 14-kilometer level over the southern portion of the country. During the summer season lighter resultant velocities prevail over all sections and at all levels, except

at the lower levels over the northern Rocky Mountain region where they are generally greater than during the winter season. This is apparently due to the fact that the tropopause is considerably higher over this region in summer than in winter. The increase in velocity, consequently extends to higher levels during the summer season. The resultant directions, during the summer season, shift to SW. or WSW. over the western Rocky Mountain and Pacific coast regions and to N. or NE. over the southeastern part of the country. This circulation indicates the existence of a high-level anticyclone, located approximately over the State of Texas. The existence of this anticyclonic circulation at high level was brought out in an article published by Thomas R. Reed, of the San Francisco, Calif., Weather Bureau office.¹ The statement made by him in that article, to the effect that there were indications of this anticyclone extending up to the tropopause, is verified by the present study. It is interesting to note that Shaw² also shows a center of high pressure at about the same location in his computed normal-pressure map for 8 kilometers for the month of July.

AVERAGE VELOCITIES

In table 4 average velocities are shown for each station by levels and seasons. These values are obtained without regard to wind direction by dividing the velocity totals for all directions by the corresponding number of observations.

TABLE 4.—Average velocities in meters per second (obtained by dividing total velocity of all directions by total number of observations). One meter per second is equivalent to 2.24 miles per hour

Altitude (meters)	AMARILLO, TEX.					BOISE, IDAHO				
	Winter	Spring	Summer	Autumn	Annual	Winter	Spring	Summer	Autumn	Annual
6,000	15.4	11.5	5.9	10.5	9.9	13.1	12.1	13.3	12.2	12.7
8,000	17.6	10.7	7.3	12.4	10.8	12.3	12.3	14.7	12.8	13.5
10,000	15.8	12.2	8.5	13.2	11.0	10.4	10.6	15.2	13.8	13.6
12,000	(¹)	(¹)	9.2	15.0	11.3	(¹)	13.6	16.5	15.3	15.1
14,000	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)				
BROKEN ARROW, OKLA.					BROWNSVILLE, TEX.					
6,000	19.9	14.8	7.7	11.9	11.9	12.4	11.5	5.9	7.7	8.2
8,000	18.4	15.8	9.2	13.4	12.4	16.8	15.4	7.1	9.9	10.1
10,000	20.3	15.7	10.7	14.7	13.3	(¹)	(¹)	9.5	9.7	11.2
12,000	23.8	16.1	11.5	15.4	14.2	(¹)	(¹)	18.8	(¹)	16.4
14,000	(¹)	(¹)	10.9	14.8	13.6	(¹)				
BURLINGTON, VT.					CHEYENNE, WYO.					
6,000	15.1	13.3	13.0	12.4	13.1	12.6	12.4	10.5	13.1	12.0
8,000	(¹)	12.6	11.8	12.5	12.2	10.7	11.2	10.8	11.8	11.2
10,000	(¹)	(¹)	12.4	15.8	13.5	8.2	10.5	11.8	12.4	11.3
12,000	(¹)	(¹)	(¹)	(¹)	14.4	(¹)	(¹)	10.2	11.6	12.2
14,000	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)				
DUE WEST, S. C.					ELLENDALE, N. DAK.					
6,000	20.3	13.4	7.7	11.2	11.4	17.9	15.5	13.6	15.8	15.2
8,000	20.9	11.7	8.4	11.8	11.0	16.5	15.8	16.4	16.2	16.2
10,000	20.0	11.4	8.9	13.0	11.3	14.6	13.4	17.3	16.5	16.0
12,000	(¹)	11.6	9.4	14.7	12.1	(¹)	14.0	16.1	15.6	15.4
14,000	(¹)	(¹)	8.4	(¹)	9.2	(¹)	(¹)	(¹)	(¹)	15.8
EL PASO, TEX.					EVANSVILLE, IND.					
6,000	14.6	12.6	6.8	10.3	10.9	19.1	9.4	8.3	9.6	9.3
8,000	15.5	13.7	8.4	12.6	12.3	(¹)	8.8	9.9	9.5	9.6
10,000	16.4	13.9	8.5	14.5	13.1	(¹)	10.0	9.2	10.2	9.7
12,000	(¹)	(¹)	8.0	15.5	14.4	(¹)	12.4	(¹)	(¹)	12.5
14,000	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)				

¹ Less than 15 observations.

² Reed, Thomas R. The North American High-Level Anticyclone—Monthly Weather Review, November 1933, pp. 321-325.

³ Sir Napier Shaw, Manual of Meteorology, vol. II, fig. 167, p. 262.

TABLE 5.—Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions

AMARILLO, TEX.
WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N						1.3						
NNE	0.4					1.3						
NE												
ENE									4.4			
E												
ESE												
SE												
SSE												
S												
SSW	.4			40								
SW	.4	0.8	0.4									
WSW	3.1	1.6	0.4		2.6	1.3	1.3	40				
W	2.0	1.6			3.9	2.6				4.4		37
WNW	6.0	2.0			6.5				4.4			
NW	2.0	.4			3.9	3.9						
NNW	.4											
Total	13.7	6.4	0.8		16.9	10.4	1.3		4.4	4.4	4.4	

SPRING

N					2.2							
NNE	0.6											
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW				35								
SW	.6	0.6										
WSW	1.2	.6										
W	2.4	.6										
WNW	1.8	.6						6.7				22
NW					2.2			23				
NNW												
Total	6.6	2.4			4.4			6.7				

SUMMER

N									0.9			
NNE									.9			23
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW								.9				
W								.9				
WNW					0.5	0.5		31				
NW	0.2											
NNW												
Total	.2				.5	.5		3.6				

AUTUMN

N	0.3											
NNE	.3											
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW	.3				1.4							
WSW		0.3	0.3	37	2.1	0.7		34	4.2			
W	.3				2.8				1.4	2.8		32
WNW	.9	.6			1.4				1.4			
NW	.3				0.7							
NNW	.9	.3										
Total	3.3	1.2	.3		8.4	.7		7.0	2.8			

TABLE 5.—Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions—Continued

BOISE, IDAHO
WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N	1.5	1.0	1.0	39								
NNE	1.5	1.0			1.8	1.8		36				29
NE	1.0	.5	.5							4.5		
ENE						1.8						
E												
ESE												
SE												
SSE												
S												
SSW	.5											
SW	2.0											
WSW	.5											
W	.5											
WNW	.5											
NW	2.0	1.0			1.8	1.8						
NNW	.5											
Total	10.5	3.5	1.5		3.6	5.4				4.5		

SPRING

N	0.4	0.6			2.0							
NNE	.4				1.0							27
NE							1.0	37	4.6			
ENE												
E												
ESE												
SE					1.0							
SSE												
S		2										
SSW	.2											
SW												
WSW	1.2	.4			1.0							
W		.4			1.0							
WNW	.8	.2										
NW	1.8	.2	0.2	37	2.0							
NNW	.8	.2										
Total	5.6	2.2	.2		7.0	1.0	1.0		4.6			

SUMMER

N						0.4						
NNE						0.4						
NE									1.0			
ENE												
E						.4						
ESE												
SE												
SSE												
S	0.1										1.0	
SSW	.6	0.5	0.1		1.6	.4					2.0	
SW	1.8	.4			6.0	.8			3.0	1.0		
WSW	1.7	.1	.1	44	5.2	.8		36	9.0	3.0		
W	1.2	.2			1.2	1.6			3.0	1.0		
WNW	1.1	.1	.1		.8	.8			1.0			
NW		.1			.4							
NNW					.4				1.0			
Total	6.5	1.4	.3		16.4	4.8			18.0	8.0		

AUTUMN

N	0.6	0.4	0.2	41		0.4	0.4		0.9			
NNE	.6	.2				1.2	.8	0.4	49	.9		
NE												
ENE												
E									.9			
ESE												
SE												
SSE												
S												
SSW	.4	.2	.2			.4	.4					
SW	.8	.6				.4	.4		.9			
WSW	.8	.4				1.2	.8		1.8	1.8	0.9	
W	2.4	.4				2.0	.8		1.8	.9	3.6	
WNW	1.0	.4	.2			.4	.4		1.8			
NW	1.0	1.4				.4	.4					
NNW	.6	.8				.4	.4			.9		
Total	8.2	4.8	.6		6.0	3.6	.8		9.0	7.2	.9	

TABLE 5.—Percentage frequency of high velocities of 22-27 meters per second (48-60 miles per hour), 28-36 meters per second (61-80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions—Continued

BROKEN ARROW, OKLA.

Velocity	WINTER											
	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N												
NNE	0.6								1.5			
NE		0.4	0.2			0.7						
ENE												
E												
ESE												
SE												
SSE												
S												
SSW									1.5			
SW												
WSW	.4	.4	.2		.7				1.5	1.5		
W	2.4	2.0			.7	.7			1.5	1.5		
WNW	4.8	4.4	1.2	50	3.5	2.8	2.8	50	1.5	1.5	40	
NW	3.8	3.0	.4		3.5	2.8			4.5			
NNW	2.8	2.6			4.2	2.1	1.4		3.0	1.5		
	.8	.4				.7			1.5			
Total	15.6	13.4	2.0		12.6	9.8	4.2		7.5	9.0	4.5	

Velocity	SPRING											
	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N												
NNE	0.2											
NE		.2			1.0							
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW					.5							
WSW	.6	.6	.2						1.2	3.6		
W	.8	1.4	.4		1.5	1.0	0.5		1.2	3.6		
WNW	2.6	1.8	.6		4.0	4.5	2.5	61	1.2	1.2	1.2	
NW	3.2	.6	.2		1.5	1.5			4.8	2.4	2.4	53
NNW	1.8	.2	.2		1.0	.5			3.0		1.2	
	.4				1.0	.5						
Total	9.8	4.6	1.6		10.5	8.0	3.0		10.8	6.0	4.8	

Velocity	SUMMER											
	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N												
NNE	0.1				0.2				0.9	0.3		
NE									.3			
ENE					.2				.3			
E					.2							
ESE												
SE												
SSE	.1											
S												
SSW												
SW					.2				.8			
WSW												
W	.2				.8				.3			
WNW	.3				1.0				2.1	.3		
NW	.1	.1			.4	0.2			1.2	.3		
NNW					.4				.6	.3		
					.4							
Total	.8	.1			3.4	.2			6.8	1.2		

Velocity	AUTUMN											
	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N												
NNE	0.1				0.6							
NE	.1											
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW					.3				0.3			
WSW		.1							.8			
W	.4	.4	.3		1.2	1.2	.9	50	1.0	1.0	1.5	49
WNW	.8	1.0	.3		3.3	.9	.3		1.0	3.0	1.5	
NW	1.4	.5	.4		3.0	.3	.3		2.5	1.0	1.5	
NNW	.7	.1	.2		.6	.3	.3		1.5	2.0		
	.7	.2				.3	.3		1.5	1.0		
Total	4.2	2.5	1.3		9.0	3.0	2.1		6.5	8.0	3.0	

TABLE 5.—Percentage frequency of high velocities of 22-27 meters per second (48-60 miles per hour), 28-36 meters per second (61-80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions—Continued

BROWNSVILLE, TEX.

Velocity	WINTER											
	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N												
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW	4.9	0.7	0.7	38					3.4	6.8		
W	2.1	2.1							6.8	6.8		
WNW	1.4								6.8	3.4		32
NW	.7	.7										
NNW												
Total	9.1	3.5	.7						10.2	17.0		

Velocity	SPRING											
	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N												
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW	0.6	0.6						23				
W	2.4								7.8	2.6		30
WNW	1.8								5.2			
NW									2.6			
NNW												
Total	4.8	.6							16.6	2.6		

Velocity	SUMMER											
	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N												
NNE									21			
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW												
W									0.8		22	1.8
WNW												26
NW												
NNW												
Total									.8		1.8	

Velocity	AUTUMN											
	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N												
NNE									0.9		27	
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW		.1										
W	.4	.4	.3		1.2	1.2	.9	50	1.0	1.0	1.5	49
WNW	.8	1.0	.3		3.3	.9	.3		1.0	3.0	1.5	
NW	1.4	.5	.4		3.0	.3	.3		2.5	1.0	1.5	
NNW	.7	.1	.2		.6	.3	.3		1.5	2.0		
	.7	.2				.3	.3		1.5	1.0		
Total	.3								5.4		4.5	23

TABLE 5.—Percentage frequency of high velocities of 22-27 meters per second (48-60 miles per hour), 28-36 meters per second (61-80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions—Continued

BURLINGTON, VT.

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N												
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW	4.4											
W	6.6		2.2	41								
WNW	4.4											
NW		2.2										
NNW												
Total	15.4	2.2	2.2									

SPRING

N												
NNE												
NE												
ENE												
E												
ESE					2.2							
SE												
SSE												
S												
SSW												
SW		0.8			2.2							
WSW	1.6											
W	.8	.8										
WNW	.8	.8	0.8	41		2.2	38					
NW	4.0	.8										
NNW	1.6				2.2							
Total	8.8	3.2	.8		6.6		2.2					

SUMMER

N					1.6							
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW	0.5											
SW		0.5			3.2							
WSW	1.0	1.5										
W	1.5	1.0			1.6							
WNW	1.0											
NW	2.0	1.0		33	1.6							
NNW	.5				1.6		30	4.8				27
Total	0.5	3.0			8.0	1.6		4.8				

AUTUMN

N												
NNE	0.9											
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW	.9	0.9	40		1.8	30		8.2				35
WSW	.9							4.1	8.2			
W	1.8											
WNW	1.8				1.8							
NW	1.8				3.6			4.1				
NNW	.9				1.8							
Total	9.0	.9			7.2	1.8		8.2	8.2			

TABLE 5.—Percentage frequency of high velocities of 22-27 meters per second (48-60 miles per hour), 28-36 meters per second (61-80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions—Continued

CHEYENNE, WYO.

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N	0.6											
NNE	.6											
NE					1.6							
ENE												
E												
ESE												
SE												
SSE												
S												
SSW	.3											
SW	.6	0.6										
WSW	2.1	.9										
W	.6				1.6							
WNW	1.5	.3										
NW	2.1	1.2	0.3	46	1.6			24				
NNW	.6	.6										16
Total	8.4	4.2	.3		4.8							

SPRING

N	0.4				1.1							
NNE	.4											
NE												
ENE												
E												
ESE												
SE	.2											
SSE	.2											
S												
SSW	.2											
SW	.6											
WSW	.8	0.2										
W	1.6				2.2	1.1		29				
WNW	1.6	.4										
NW	.6	.4	0.4	42	1.1							20
NNW	.2											
Total	6.6	1.0	.4		4.4	1.1						

SUMMER

N												
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW						0.7		36				
SW	0.2	0.1										
WSW	.8				3.5				2.3	2.3	2.3	37
W	.5	.3										
WNW	1.1	.3		34	2.1				2.3	2.3		
NW	.3	.1										
NNW	.1											
Total	3.0	.8			5.6	.7			4.0	2.3	2.3	

AUTUMN

N	0.1					0.7						
NNE	.1											
NE	.1	0.1		36	0.7							
ENE					.7							
E	.1											
ESE												
SE												
SSE												
S												
SSW	.4											
SW	1.0	.1										
WSW	1.8	.2			.7							
W	1.1	.5			1.4	.7		31	4.4	4.4		
WNW	1.2	.2			.7	.7			4.4			
NW	.7				.7					2.2		
NNW	.4	.2			1.4							31
Total	7.0	1.3			6.3	2.1			8.8	2.2		

TABLE 5.—Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions—Continued

DUE WEST, S. C.

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N												
NNE	1.0											
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW	.5	0.5										
WSW	1.0	.5			2.0							
W	11.0	7.0	1.5		10.0	4.0	2.0	65	5.3			
WNW	8.5	4.5	2.5		6.0	14.0	2.0		10.6			
NW	2.0	2.0	1.0	61	8.0		2.0		5.3	5.3		47
NNW												
Total	24.0	14.5	5.0		26.0	18.0	6.0		15.0	21.2	5.3	

SPRING

N												
NNE	0.2	0.2										
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW			0.2									
WSW	.2	.2	.2		1.4		1.4	48			2.0	39
W	1.6	1.2	.8		2.1	1.4			2.0			
WNW	1.2	1.0	.2	49	2.1	1.4			2.0	2.0		
NW	.6				3.5	0.7						
NNW												
Total	3.8	2.8	1.4		9.1	3.5	1.4		4.0	4.0	2.0	

SUMMER

N												
NNE	0.2											
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW	.2											
W	.2					0.3		29		0.5		
WNW									1.5			27
NW										.5		
NNW												
Total	.8	.2				.3				2.5		

AUTUMN

N												
NNE	0.2								0.6			
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW			0.2									
WSW	1.0	0.4			0.3	0.6			1.2	1.2	0.6	
W	4.4	.8			1.5	1.5	0.9	44	1.8			
WNW	3.0	1.2	.2		1.2	1.2	.3		4.8	.6	.6	69
NW	.8	.8	.6	48	.9				.6			
NNW					.3							
Total	9.4	3.8	1.0		4.2	3.3	1.2		9.0	1.8	1.2	

TABLE 5.—Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions—Continued

ELLEDALE, N. DAK.

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N	0.4	0.4			1.4	1.4						
NNE	.4	.4			1.4							
NE	.4											
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW	1.6									3.8		
WSW	2.0	1.2	0.4		1.4	2.8	1.4	37	3.8			
W	4.4	2.4	1.2	47	5.6	1.4			3.8			30
WNW	2.4	3.2	1.2		2.8	1.4			7.6			
NW	1.2	2.0	.4									
NNW												
Total	12.8	9.6	3.2		12.6	8.4	1.4		15.2	3.8		

SPRING

N	0.8				2.1	0.7					1.6	
NNE	.2					1.4				1.6		
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW	.2											
SW	.2	0.6				1.4						
WSW	.6	.6	0.2		2.8	1.4			1.6	1.6		30
W	1.4	1.4	.2		2.1	1.4	0.7	37	3.2			
WNW	3.2	1.0			1.4	.7			3.2			
NW	3.0	2.4	.4	38	1.4	1.4			3.2			
NNW	1.4	.2	.2		2.8				3.2			
Total	11.0	6.2	1.0		12.6	8.4	.7		14.4	3.2		

SUMMER

N					0.3							
NNE					.3					0.8		
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW					.6				.8			0.8
SW	0.1	0.1			.6				.8			
WSW	.4	.5			1.2	0.3			2.4	0.8	.8	
W	2.0	.2			1.8	2.4	0.6	40	2.4	.8	.8	40
WNW	2.1	.5			5.1	1.2			4.0	1.6		
NW	1.4	.2			3.0	.9			6.4	3.2	.8	
NNW	.2	.1			1.2	.6			1.6			
Total	6.2	1.6			14.1	5.4	.6		17.6	8.0	3.2	

AUTUMN

N	1.0				1.2					1.2		
NNE	.2									1.2		
NE	.2	0.2			.6							
ENE					1.2							
E												
ESE												
SE												
SSE												
S												
SSW	.4				1.2				1.2	1.2		
SW	.8				.6				1.2			
WSW	1.6	.6	0.4		3.6	1.2	1.2		2.4	3.6		35
W	2.4	1.0	.4		1.2	2.4			3.6	1.2		
WNW	2.8	1.4	.2		3.6	1.8	.6	62	2.4			
NW	2.4	1.2	.6		2.4	1.2			1.2			
NNW	1.4		.2	50								
Total	13.2	4.4	1.8		15.6	6.6	1.8		12.0	8.4		

TABLE 5.—Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions—Continued

EL PASO, TEX.

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N		0.4										
NNE	0.4								3.2			
NE												
ENE						1.2						
E												
ESE												
SE												
SSE												
SSW												
SW	2.0	.4			1.2	2.4	1.2	38				
WSW	3.2	1.6			1.2	2.4				3.2		
W	4.4	2.4	1.2	39	4.8	1.2			6.4	3.2	3.2	40
WNW	2.0	.4			3.6	4.8				6.4		
NW	.4		.4		3.6							
NNW	.8	.4			1.2							
Total	13.2	5.6	1.6		15.6	12.0	1.2		9.6	9.6	6.4	

SPRING

N												
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S	0.5											
SSW	.5											
SW	.5	1.5		35	1.2	2.4	1.2	38				
WSW	3.5	1.5			4.8	2.4			6.2			
W	4.5	1.5			4.8	2.4	1.2	38	6.2		6.2	30
WNW	.5								3.1			
NW												
NNW												
Total	10.5	3.0			6.0	3.6	1.2		9.3	6.2		

SUMMER

N												
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW	0.4	0.4		28					23			
WSW					2.0				2.3			23
W												
WNW												
NW												
NNW												
Total	.4	.4			2.0				2.3			

AUTUMN

N												
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW	0.8	0.4	0.4	39	0.7				5.1			
WSW	2.0				1.4	0.7			3.4			
W	.8				.7	.7	46		3.4			
WNW	.8	.8			1.4				3.4	1.7		
NW	.8				.7	1.4			5.1		1.7	50
NNW	.8				.7							
Total	6.0	1.2	.4		4.2	4.2	.7		17.0	1.7	1.7	

TABLE 5.—Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions—Continued

EVANSVILLE, IND.

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N												
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW												
W	11.2											
WNW		5.6										
NW			5.6									
NNW												
Total	22.4	5.6	5.6									

SPRING

N	0.8											
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW												
W	1.6	0.8			1.6							
WNW		.8					32					
NW	.8											
NNW									1.6		24	3.2
Total	3.2	1.6			3.2						24	3.2

SUMMER

N												
NNE									1.0			
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW												
W												
WNW	0.4								1.0		26	
NW	.4								2.0			
NNW	.4								1.0			
Total	1.2								5.0		26	

AUTUMN

N												
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW									2.6	2.6		28
W												
WNW	2.0											
NW	2.0											
NNW												
Total	4.0								2.6	2.6		28

TABLE 5.—Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions—Continued

GREENSBORO, N. C.

Velocity	WINTER											
	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N												
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW					Insufficient data				Insufficient data.			
WSW												
W	3.0		3.0									
WNW	6.0	13.5	1.5									
NW	7.5	3.0	3.0	44								
NNW												
Total	16.5	16.5	7.5									

Velocity	SPRING											
	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N												
NNE							0.9	38	1.8			
NE									1.8			
ENE												
E									1.8			
ESE												
SE												
SSE												
S												
SSW												
SW					0.9							
WSW		0.4										
W	0.4	.4	0.4	49	1.8	2.7			1.8			
WNW	2.4	1.2			2.7	.9			1.8	3.6		35
NW	2.0		.4		.9				1.8	1.8		
NNW	2.0	.4			.9							
Total	6.8	2.4	.8		10.8	3.6	.9		10.8	5.4		

Velocity	SUMMER											
	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N												
NNE	0.2											
NE	.2							0.7	.7			
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW	.2	0.2		28	0.4				.7	.7		
W					1.2				1.4	.7		
WNW	.2				.4	0.4		28	.7			
NW	.2								1.4			
NNW	.4								.7	1.4		34
Total	1.4	.2			2.0	.4			6.3	3.5		

Velocity	AUTUMN											
	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N												
NNE	0.3											
NE		0.3										
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW	.3				0.8				1.7	1.7	1.7	41
W		.3			.8				1.7	1.7		
WNW	.6		0.3	41	4.8	0.8			3.4	1.7		
NW	.6	.3			1.6							
NNW	.6	.9			.8			33				
Total	2.7	1.8	.3		9.6	1.6			5.1	3.4	3.4	

TABLE 5.—Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions—Continued

GROESBECK, TEX.

Velocity	WINTER											
	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N												
NNE	0.6							0.8				
NE	.3	0.3						.8	0.8			1.7
ENE								1.6				1.7
E												
ESE												
SE												
SSE												
S												
SSW												
SW	.3											
WSW	2.4	3.0						4.8	1.6	0.8		1.7
W	3.0	4.5	1.8					8.0	1.6	1.0	60	5.1
WNW	3.9	3.0	.3		45	5.6	1.6	1.0	3.4	1.7		1.7
NW	2.4	.9	.3					4.0	2.4			3.4
NNW	1.2							.8				1.7
Total	15.0	11.7	2.7		26.4	8.0	4.0		22.1	10.2	6.8	

Velocity	SPRING											
	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N												
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW		0.2						0.5				
W	2.0	1.0						1.0	1.0			44
WNW	3.4	2.2						5.0	4.0	2.0	51	1.1
NW	4.8	1.0	0.2	41	5.5	4.0	1.0	2.5	6.6	2.2	1.1	2.2
NNW	1.2	.4			2.5	1.0	.5		2.2	4.4	1.1	1.1
Total	11.6	4.8	.2		14.5	10.0	3.5		14.3	9.9	2.2	

Velocity	SUMMER											
	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N												
NNE												
NE												0.2
ENE												.2
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW												
W												
WNW								0.2			25	.2
NW	0.1										.6	.2
NNW								23	2			.2
Total	.1							.4			1.2	.4

Velocity	AUTUMN											
	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N												
NNE								0.6				0.8
NE												.4
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW	.4								0.3			0.4
W	1.4	0.2			.3				.3			.4
WNW	1.4	1.2			1.8	2.1	0.3	37	2.4	2.4	0.8	46
NW	2.0	.8			3.3	1.2			3.2	1.2		1.2
NNW	.6	.4			1.5	.6			1.6	.8		.4
Total	6.2	2.8			8.1	4.5	.3		9.6	5.6	.8	

TABLE 5.—Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions—Continued

HAVRE, MONT.

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N												
NNE		1.0			2.4							
NE	1.0											
ENE												
E												
ESE												
SE												
SSE												
S					2.4							
SSW												
SW	1.0											
WSW												
W					2.4		32	6.3				
WNW	5.0	1.0		32								
NW	1.0	1.0						12.6				25
NNW	2.0	1.0			2.4							
Total	10.0	4.0			7.2	2.4		18.9				

SPRING

N	0.4											
NNE	.4											
NE	.8							2.6				
ENE	.4											
E												
ESE												
SE												
SSE												
S	.4											
SSW												
SW	.8	0.4										
WSW	2.0											
W	1.6	.4			1.1	1.1	1.1	37	2.6	2.6	2.6	41
WNW	1.6	1.2			2.2							
NW	1.6	.4	0.4	39	3.3							
NNW	.8	1.2										
Total	10.8	3.6	.4		6.6	1.1	1.1		5.2	2.6	2.6	

SUMMER

N									3.0			
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S										1.5		
SSW		0.4										
SW	0.8	.4	0.2	47	0.6				1.5			35
WSW	4.2	1.2	.2		4.8	0.6			4.5	1.5		
W	4.6	.6			4.8	1.2		31	1.5			
WNW	1.6	.2			1.2				1.5	1.5		
NW	.2				1.2				1.5			
NNW					.6							
Total	11.4	2.8	.4		13.2	1.8			10.5	6.0		

AUTUMN

N	0.5	0.5							2.4	2.4		35
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW								1.4	38			
WSW	2.0											
W	2.0	1.0										
WNW	2.5	2.5			1.4	4.2			4.8			
NW	3.0	2.5			1.4	1.4						
NNW	1.0	2.5			1.4							
Total	11.0	9.0			2.8	7.0	1.4		7.2	2.4		

TABLE 5.—Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions—Continued

JACKSONVILLE, FLA.

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N												
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW	3.3	1.1						3.4				
W	7.7	3.3						3.4	3.4			
WNW	4.4	2.2						6.8	6.8			29
NW	1.1							3.4				
NNW												
Total	16.5	6.6						17.0	10.2			

Insufficient data

SPRING

N												
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW	0.3											
WSW	.3							0.6		0.6	47	
W	3.9	1.2						1.8	1.2			31
WNW	1.5	.9						1.8	1.2	.6		3.2
NW	.3	.3						.6				1.6
NNW												1.6
Total	6.3	2.4						4.8	2.4	1.2		4.8

SUMMER

N												
NNE												
NE								0.3				0.5
ENE												.5
E												
ESE												.5
SE												
SSE												
S												
SSW												
SW												.5
WSW												.5
W								.3	0.3			28
WNW	0.2											.5
NW												0.5
NNW												
Total	.2							.6	.3			3.0

AUTUMN

N												
NNE												1.8
NE												1.8
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW	0.4											1.8
WSW	.8											1.8
W	.8							3.6	2.7			35
WNW	.8							1.8	.9			7.2
NW	.8	0.4						.9	.9			5.4
NNW												1.8
Total	3.6	.4						6.3	3.6			21.6

TABLE 5.—Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions—Continued

KEY WEST, FLA.

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N												
NNE									1.1	1.1		
NE												
ENE												
E												
ESE												
SE												
SSE	0.2											
S												
SSW	.2									1.1		
SW	.2				0.4				1.1	1.1		
WSW	.4	0.4		30	1.2	0.4			1.1	1.1		
W	.4				2.8	3.6			11.0	1.1	2.2	38
WNW	.8				.4	1.2	0.4	43	2.2	1.1		
NW	.2				.8				1.1			
NNW												
Total	2.4	.6			5.6	5.2	.4		16.5	5.5	2.2	

SPRING

N	0.2											
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW	.4											
WSW	1.2	0.2		31	4.4	0.4	0.8	42	12.0	1.5	1.5	31
W	1.0				2.4	1.2			3.0	3.0		
WNW	.2				1.2				3.0			
NW	.2				.4				1.5			
NNW												
Total	3.2	.2			8.4	2.0	.8		21.0	4.5		

SUMMER

N												
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW										1.0	0.5	38
W												
WNW					0.2							
NW											26	
NNW												
Total					.2					1.0	.5	

AUTUMN

N										0.7		
NNE												
NE												
ENE												
E												
ESE												
SE					0.3							
SSE												
S												
SSW												
SW												
WSW												
W												
WNW	0.2									.7		
NW										4.9		27
NNW					.6	.3				2.1		
Total	.2				1.2	.6				8.4		

TABLE 5.—Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions—Continued

LANSING, MICH.

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N	2.5	2.5										
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW	2.5	2.5										
W	2.5	2.5	2.5									
WNW	5.0	2.5										
NW			2.5	81								
NNW	2.5											
Total	15.0	10.0	7.5									

SPRING

N	0.9											
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW	.9											
WSW	1.8											
W	3.6										3.3	28
WNW	1.8	0.9	0.9	50	5.4	1.8	1.8				3.3	
NW	4.5							1.8	37		6.6	
NNW	.9							1.8			6.6	
Total	14.4	.9	.9		12.6	1.8	1.8				19.8	3.3

SUMMER

N											2.1	
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW												
W	1.5											
WNW	1.0											
NW	1.5											
NNW												
Total	4.0										11.7	.9

AUTUMN

N	0.9											
NNE												
NE		0.9										
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW	2.7											
W	1.8	2.7										
WNW	2.7	1.8	0.9	39	1.6	1.6	1.6					2.6
NW	.9	.9										2.6
NNW												
Total	9.0	6.3	.9								13.0	7.8

TABLE 5.—Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions—Continued

LOS ANGELES, CALIF.

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N									4.0	4.0		
NNE												
NE	0.7	1.4			2.0							
ENE												
E	.7											
ESE												
SE												
SSE												
S												
SSW												
SW									4.0			
WSW	.7								4.0			
W	2.8											
WNW	1.4			32	2.0							
NW	1.4	.7			2.0				4.0			32
NNW	.7				2.0	2.0		28				
Total	8.4	2.1			8.0	2.0			12.0	8.0		

SPRING

N	1.8											
NNE	.6											
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW	.6				1.6				3.8	3.8		30
W	2.4	0.6		33	1.6							
WNW	1.2				1.6							
NW												
NNW	.6				3.2			26				
Total	7.2	.6			8.0				3.8	3.8		

SUMMER

N												
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW									2.2			
SW	9.5			23	1.0			30	4.4			24
WSW												
W												
WNW												
NW												
NNW												
Total	9.5				1.0				6.6			

AUTUMN

N	0.5											
NNE												
NE	.5											
ENE												
E												
ESE												
SE												
SSE												
S												
SSW	.5											
SW									2.3	2.3		28
WSW	.5					1.0		49	2.3			
W		0.5		31	1.0							
WNW	1.0				1.0							
NW	.5				1.0							
NNW												
Total	4.0	.5			3.0		1.0		4.6	2.3		

TABLE 5.—Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions—Continued

MADISON, WIS.

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N	6.6											
NNE												
NE									6.3			
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW	2.2											
W	2.2								6.3			
WNW	2.2		2.2		49	6.3	18.9			34		
NW	4.4	4.4	2.2			6.3	6.3					
NNW	2.2		2.2			6.3						
Total	19.8	4.4	6.6			18.9	31.5					

Insufficient data.

SPRING

N	1.1											
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW	1.1						2.8					
W	5.5						5.6					
WNW		1.1	1.1		38	2.8			2.8	40		
NW	1.1	3.3				2.8						
NNW						2.8						
Total	8.8	4.4	1.1			8.4	8.4	2.8				

Insufficient data.

SUMMER

N							1.0	1.0		29	2.3		
NNE													
NE													
ENE													
E													
ESE													
SE													
SSE													
S													
SSW													
SW													
WSW	0.5										2.3		
W	1.0	0.5											
WNW	2.0						3.0				2.3		
NW	1.5	1.0					4.0	1.0			2.3		28
NNW	1.0										2.3		
Total	6.0	1.5					8.0	2.0			9.2	2.3	

AUTUMN

N							3.2				4.2		
NNE							3.2						
NE	0.9												
ENE													
E							1.6						
ESE													
SE													
SSE													
S	.9												
SSW													
SW	1.8						1.6						
WSW	.9						3.2						
W	1.8						4.8				8.4		28
WNW	3.6	1.8					0.4	1.6					
NW	2.7	.9	0.9			47	1.6	1.6	1.6	58			
NNW	.9						3.2		1.6				
Total	13.5	3.6	.9				28.8	3.2	3.2		12.6		

TABLE 5.—Percentage frequency of high velocities of 22-27 meters per second (48-60 miles per hour), 28-36 meters per second (61-80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions—Continued

MEMPHIS, TENN.

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N												
NNE												
NE												
ENE												
E												
ESE												
SE												
S												
SSW												
SW												
WSW	3.0	3.0										
W			3.0	38								
WNW	6.0	3.0										
NW	6.0											
NNW												
Total	15.0	6.0	3.0									

SPRING

N												
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW	2.0											
W				27								
WNW	2.0											
NW	1.0										20	
NNW	1.0											
Total	6.0											

SUMMER

N												
NNE												
NE												
ENE												25
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW												
W												
WNW	0.6	0.3										
NW	.3	.3										
NNW												
Total	.9	.0										1.8

AUTUMN

N												
NNE												
NE												
ENE												22
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW												
W												
WNW	0.9											
NW	.9											
NNW												
Total	1.8											3.2

MODENA, UTAH

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters							
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.				
N	1.4	0.4							0.8		0.8	40	2.2			
NNE	1.0	.2							1.6	1.6				4.4		31
NE									1.6							
ENE																
E																
ESE																
SE																
SSE													2.2			
S																
SSW																
SW																
WSW	.4															
W	1.2	.6							.8	.8				2.2		
WNW	1.0	1.0							1.6							
NW	1.0	1.0	0.4	58					2.4	.8	.8					
NNW	1.4	.4	.2						2.4	3.2				6.6		
Total	7.4	3.6	.6						11.2	6.4	1.6			11.0	6.6	

SPRING

N	0.2	0.8														
NNE			0.2						0.8						2.9	
NE														2.9		
ENE																
E																
ESE																
SE		.2														
SSE		.2														
S		.2														
SSW	.4								.8	.8						
SW	1.0	.2														
WSW	1.2								1.6					2.9		
W	.6	.6							1.6							
WNW	1.4	.6							4.8						2.9	37
NW	2.2	1.0	.2	43					1.6	.8				30		
NNW	1.0	.4	.2						3.2					2.9		
Total	8.0	4.2	.6						14.4	1.6				5.8	5.8	2.9

SUMMER

N																
NNE																
NE																
ENE																
E																
ESE																
SE																
SSE																
S	0.2															
SSW	.6	0.2							1.8							
SW	.8	.4							1.8	0.6				30	3.3	
WSW	.8	.2							1.2	.6				6.6		
W	1.0								1.8						6.6	36
WNW	.4								.6							
NW																
NNW																
Total	3.8	.8							7.2	1.2				9.9	6.6	

AUTUMN

N	0.2	0.3	0.1						1.0							
NNE	.5	.1	.1						.5	.5					1.3	
NE		.2							1.0	.5				36	1.3	
ENE	.1														1.3	
E																
ESE																
SE																
SSE																
S																
SSW	.1	.2													1.3	
SW	.6	.3							2.5	1.6						
WSW	.6	.1							3.0	1.5				3.9	1.3	2.6
W	.6	.3							2.0						2.6	1.3
WNW	.6	.1							1.0	.5				1.3	1.3	
NW	.5	.4							2.0	1.0				2.6	2.6	
NNW	.3		.1	40						.5						
Total	3.8	2.0	.3						13.0	6.0				9.1	11.7	3.9

TABLE 5.—Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions—Continued

TABLE 5.—Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions—Continued

NEW ORLEANS, LA.

OMAHA, NEBR.

WINTER

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N												
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW		1.5										
WSW	4.5											
W	4.5	1.5		32	4.4	8.8					34	
WNW	3.0	1.5			4.4							
NW		1.5										
NNW												
Total	12.0	6.0			8.8	8.8						

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N												
NNE	0.6					1.7		28				
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW	2.4	0.6	1.2									
W	6	1.2	.6	47						3.4		28
WNW	3.0	.6										
NW	6	1.8							1.7			
NNW	2.4											
Total	9.6	4.2	1.8		1.7	1.7				3.4		

SPRING

SPRING

N												
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW									2.9			
SW												
WSW	1.0	1.0			1.2	1.2						
W	3.5	.5			6.0	1.2			5.8		2.9	43
WNW	2.5	1.0	0.5	40	4.8	3.6			33	8.7		
NW		.5			1.2					2.9		
NNW												
Total	7.5	2.5	.5		13.2	6.0			17.4	2.9	2.9	

N	0.9								0.9			
NNE									.9			
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW											2.2	
WSW									0.9		2.2	33
W	1.8	0.3							.9	38	4.4	
WNW	.6								5.4		2.2	
NW	2.1								.9		4.4	
NNW	.3	.3						31	.9	.9	2.2	
Total	5.7	.6							9.0	2.7	.9	

SUMMER

SUMMER

N												
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW										20		
W									1.9	1.9		31
WNW												
NW												
NNW									1.9			
Total									3.8	1.9		

N	0.2										1.2	
NNE											.6	
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW											.6	
WSW	.2										.6	0.6
W	.2								1.2	0.6	.6	1.2
WNW	.7								2.1	.3	31	1.8
NW									.9	.3		2.4
NNW	.1	0.1						28	1.8	.3	.6	1.2
Total	1.4	.1							6.0	1.5		7.8

AUTUMN

AUTUMN

N												
NNE									1.8			
NE												
ENE									1.8			
E												
ESE												
SE												
SSE												
S												
SSW												
SW	0.5											
WSW	1.0				1.6				3.6	1.8		37
W	2.0	1.5		32	2.4				5.4	5.4		
WNW	1.5				3.2				3.6			27
NW									1.8	1.8		
NNW									1.8			
Total	5.0	1.5			7.2				16.2	10.8	1.8	

N	0.6	0.2										
NNE		.4									1.2	
NE		.2										
ENE												
E												
ESE												
SE												
SSE												
S												
SSW		.2										
SW	.4								0.6		1.2	
WSW	1.0	.2							.6	0.6	.6	33
W	1.2	.2							.6	.6		1.2
WNW	1.8								1.2	.6		1.2
NW	1.8	.2							.6	.6		1.2
NNW	.2	.2							.6		1.2	
Total	7.0	1.8	.4						3.6	1.8	1.2	9.6

TABLE 5.—Percentage frequency of high velocities of 22-27 meters per second (48-60 miles per hour), 28-36 meters per second (61-80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions—Continued

PORTLAND, OREG.

Velocity	WINTER											
	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N												
NNE	1.8	0.9				5.2			4.1	4.1		35
NE		2.7	0.9	48		2.6						
ENE	.9						2.6	39				
E		.9										
ESE												
SE												
SSE												
S												
SSW												
SW					2.6							
WSW									4.1			
W												
WNW	.9											
NW			.9						4.1			
NNW					2.6				4.1			
Total	3.6	4.5	1.8		5.2	7.8	2.6		12.3	8.2		

Velocity	SPRING											
	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N												
NNE	0.5								2.1			
NE					1.3					2.1		
ENE												
E												
ESE												
SE												
SSE												
S									2.1			
SSW												
SW												
WSW					1.3	1.3						
W												
WNW	1.5				5.2		1.3	38	2.1	2.1		33
NW	.5								2.1	2.1		
NNW	2.0	0.5			2.6							
Total	4.5	1.0			10.4	1.3	1.3		8.4	6.3		

Velocity	SUMMER											
	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N												
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW	0.2				0.6				2.2			
SW	1.0	0.2			2.4				1.1	1.1		
WSW	2.6	.8			4.2	0.6			3.3	3.3		31
W	1.4	.2			1.8		0.6	37	3.3	1.1		
WNW	.6	.8							2.2			
NW	.4											
NNW	.2											
Total	6.4	2.0	.2		9.6	1.8	.6		13.2	5.5		

Velocity	AUTUMN											
	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N												
NNE	0.6					1.3						
NE	1.2	1.2			2.6							
ENE					1.3							
E												
ESE												
SE												
SSE												
S												
SSW												
SW	.6											
WSW	3.0											
W	.6											
WNW	1.2	.6			1.3	1.3		32				
NW	.6				3.9				2.4			27
NNW	.6				1.3				2.4			
Total	7.8	1.8			10.4	2.6			4.8			

TABLE 5.—Percentage frequency of high velocities of 22-27 meters per second (48-60 miles per hour), 28-36 meters per second (61-80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions—Continued

REDDING, CALIF.

Velocity	WINTER											
	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N	0.6	1.2										
NNE	.8	.2				2.0						
NE	.2	.2	0.2	48	1.0	3.0	1.0					
ENE	.4	.2								2.0		
E	.2				1.0	1.0						
ESE										2.0		
SE												
SSE												
S	.2											
SSW	.4								1.0			
SW	.2								1.0			
WSW	.6	.6										
W	.8	.2								1.0		
WNW	1.0	.6						2.0		2.0		
NW	3.4	1.4	1.2					2.0	2.0	3.0		
NNW	2.0	1.4	.6					1.0	1.0	3.0	48	
Total	10.8	6.0	2.0					7.0	11.0	8.0		

Velocity	SPRING														
	6,000 meters				8,000 meters				10,000 meters						
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.			
N	0.6	0.6	0.4	45	2.1	1.4					3.0		1.5	39	
NNE	.2	.2			.7										
NE	.2				.7										
ENE	.2										1.5				
E															
ESE															
SE	.2														
SSE											1.5				
S	.2														
SSW	.6	.4									1.5				
SW	1.0	.2													
WSW	.6							2.8							
W	1.8							1.4							
WNW	1.8	.8	.6					2.1	2.1	1.4			6.0	1.5	
NW	3.0	.4						2.1	.7		60		3.0		
NNW	2.0	.8						2.1	.7				1.5		
Total	12.2	3.4	1.0					16.1	4.2	2.8			10.5	9.0	3.0

Velocity	SUMMER														
	6,000 meters				8,000 meters				10,000 meters						
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.			
N										0.4	37		0.8		
NNE	0.2	0.2													
NE	.2								0.4				0.8	40	
ENE									0.4						
E															
ESE															
SE															
SSE	.2								.4						
S															
SSW	.8	.2							.8	.4			0.8		
SW	3.0	.6							.4	2.0			4.8	2.4	
WSW	1.4								4.8	1.6			7.2	1.6	
W	1.0	.2							1.6				1.6	1.6	
WNW	.4	.2	.2						1.8				2.4		
NW	.4	.4	.2								37		1.6		
NNW	.2	.2							.4						
Total	7.8	2.0	.4						9.6	4.4	.4		18.4	6.4	.8

Velocity	AUTUMN														
	6,000 meters				8,000 meters				10,000 meters						
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.			
N	1.0	0.4											0.8	1.6	
NNE	.8								1.0	0.5					
NE	.2								.5	.5					
ENE	.2								.5						
E															
ESE										.5			.8		
SE															
SSE															
S													1.6		
SSW	.6												1.6		
SW	.4	.2							1.5						
WSW	.6	.2													
W	1.6	.2							1.5		0.6		.8	.8	
WNW	1.0	1.0							1.0	1.0			.8		
NW	1.6	1.0	.6						2.0	.5		43	.8		
NNW	.2	.8	.2						.5	.5			.8	.8	37
Total	8.2	3.8	.8						7.5	3.5	1.0		8.0	3.2	.8

TABLE 5.—Percentage frequency of high velocities of 22-27 meters per second (48-60 miles per hour), 28-36 meters per second (61-80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions—Continued

ROYAL CENTER, IND.

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N												
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW	1.4	1.4			4.6							
W	4.2	2.8	1.4		9.2	4.6						
WNW	5.6	7.0			9.2		4.6	48				
NW	7.0	1.4	1.4	40	4.6							
NNW	2.8	1.4			4.6	4.6						
Total	21.0	14.0	2.8		32.2	9.2	4.6					

SPRING

N		0.4							2.3			
NNE	0.4				0.9	0.9						
NE					.9							
ENE	.4	.4			.9							
E												
ESE												
SE												
SSE												
S												
SSW												
SW	.4		.4	39	.9	.9	2.7	42	2.3			
WSW	.8	.4			.9	.9			2.3			
W	2.0				.9				2.3			
WNW	2.8	.8			1.8				2.3	2.3	2.3	44
NW	2.4	.8			1.8	.9			2.3			
NNW	.8				.9				2.3			
Total	10.0	2.8	.4		9.0	4.5	2.7		16.1	2.3	2.3	

SUMMER

N	0.2								0.9	0.9		
NNE					1.2	0.8			2.7			
NE									.9	.9		
ENE												
E												
ESE												
SE												
SSE									.9			
S												
SSW												
SW					.4				1.8	.0		
WSW		0.2			.4							
W	1.2				1.2	.4			1.8			
WNW	1.2	.2			1.2	.4			1.8			
NW	1.2	.4			.8	.4		31	1.8	.9		34
NNW	1.2				1.6				.9			
Total	5.0	.8			6.8	2.0			10.8	6.3		

AUTUMN

N	0.6								1.4			
NNE	.3	0.3										
NE	.3											
ENE												
E												
ESE												
SE												
SSE												
S					0.6							
SSW												
SW												
WSW	2.1	.3	.3		1.8	0.6			1.4			
W	3.9	1.5	.3	53	1.2	1.2	1.2	48	4.2			
WNW	2.1	.9			2.4	.6			4.2	1.4		
NW	.9	.6			3.0		.6		2.8		1.4	
NNW	.9				1.2	.6			1.4	1.4	1.4	39
Total	11.1	3.6	.6		10.2	3.0	1.8		15.4	2.8	2.8	

TABLE 5.—Percentage frequency of high velocities of 22-27 meters per second (48-60 miles per hour), 28-36 meters per second (61-80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions—Continued

SAN FRANCISCO, CALIF.

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N		1.0								3.4		
NNE									1.6			
NE	0.5								1.6			
ENE		.5						33		3.4		
E									1.6			
ESE												
SE												
SSE												
S												
SSW												
SW	.5											
WSW	.5											
W	.5									3.4		
WNW	1.0											
NW	2.0									3.4		
NNW	1.5	.5							1.6	1.6	46	3.4
Total	6.0	2.0							6.4	1.6		13.6

SPRING

N	0.4											
NNE												
NE												
ENE												
E												
ESE									1.4		22	
SE												
SSE												
S												
SSW												
SW		0.4										
WSW												
W	1.2									2.4		22
WNW	.4							29				
NW	.4											
NNW												
Total	2.0	.8							1.4			2.7

SUMMER

N	0.4							25				
NNE	.2											
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW									0.6			
SW									0.6		28	1.1
WSW									1.8		3.3	3.3
W									1.2		2.2	1.1
WNW											3.3	
NW									.6			
NNW									.6			
Total	.6								4.8	.6		9.9

AUTUMN

N	0.3	0.3	0.3									
NNE	.3								1.5			
NE	.3										1.0	
ENE		.6	.3									
E									.5			
ESE												
SE												
SSE												
S									.3			
SSW												
SW												
WSW	.3								1.0			1.0
W									1.5	0.5	29	1.0
WNW	.3	.3							.5		2.0	1.0
NW								.3	.5			
NNW		.3						47	.5		1.0	
Total	1.5	2.1	.6						5.0	.5		5.0

TABLE 5.—Percentage frequency of high velocities of 22-27 meters per second (48-60 miles per hour), 28-36 meters per second (61-80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions—Continued

SAULT STE. MARIE, MICH.

WINTER												
Velocity	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N												
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW												
W	3.1	3.1										
WNW	3.1											
NW		3.1										
NNW	3.1	3.1		31								
Total	9.3	9.3										

SPRING												
Velocity	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N	1.2											
NNE												
NE		0.4			1.1							
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW	.8				1.1							
W	1.2	.4	0.4	49	2.2	2.2			4.8	2.4		
WNW	1.6	.8	.4		3.3	5.5			2.4	2.4		35
NW	2.4	.8	.4		1.1	2.2	1.1	38	2.4	2.4		
NNW	3.2	.8			3.3				2.4	2.4		
Total	10.4	3.2	1.2		11.0	11.0	1.1		9.6	7.2		

SUMMER												
Velocity	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N	0.9	0.3			0.6	0.6			2.8	2.8		48
NNE	.3								1.4	1.4		
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW	.3				1.8		0.6	41		1.4		
WSW	2.1	.3			.6				1.4	1.4		
W	2.1	1.2	0.3	42	2.4	.6			4.2	2.8		
WNW	2.1	1.2	0.3		3.6	1.2			2.8	1.4		
NW	3.3	1.2			4.2	1.2			2.8	1.4		
NNW	1.8	.3			3.0	1.2			4.2		1.4	
Total	11.1	3.3	.3		16.2	4.8	.6		15.4	12.6	2.8	

AUTUMN												
Velocity	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N												
NNE												
NE					4.3							
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW	1.2											
W	1.2	1.2			4.3							
WNW	3.6				4.3	4.3						
NW					4.3	4.3			30			
NNW	3.6				4.3							
Total	9.6	2.4			17.2	8.6						

TABLE 5.—Percentage frequency of high velocities of 22-27 meters per second (48-60 miles per hour), 28-36 meters per second (61-80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions—Continued

SHERIDAN, WYO.

WINTER												
Velocity	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N	1.2	0.4							5.2			32
NNE	1.6								2.6			
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW		.4										
SW	.8											
WSW	2.4	.4							5.2			
W	1.2	.8									6.3	
WNW	2.0	1.6										
NW	1.2	.8	.4					55				
NNW	2.4	1.2							5.2			
Total	12.8	5.6	.4						15.6	2.6		

SPRING												
Velocity	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N		0.2							0.6	0.6	0.6	38
NNE	0.4											
NE											1.6	
ENE												
E												
ESE												
SE												
SSE												
S												
SSW	.4											
SW		.6							1.2			
WSW	1.8								1.2	.6		
W	.8	.2							1.8		1.6	
WNW	1.6	.6	0.2					50	1.2		1.6	
NW	1.2								1.2	1.2		
NNW	.6	.6							1.2		1.6	
Total	6.8	2.2	.2						8.4	2.4	.6	

SUMMER												
Velocity	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N												
NNE												
NE											0.8	
ENE												
E												
ESE												
SE												
SSE												
S												
SSW	0.2								0.3	0.3		
SW	1.4	0.4							2.4		.8	
WSW	3.2	.6							4.2	1.8	5.6	2.4
W	3.2	.4							5.7	.9	5.6	4.0
WNW	1.0	.8							2.7	.6	2.4	.8
NW	.6	.2							.3		.8	
NNW												
Total	0.6	2.4	.4						15.6	3.6	.9	

AUTUMN												
Velocity	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N		0.9							1.4			
NNE											0.7	
NE											1.7	
ENE												
E												
ESE												
SE												
SSE												
S												
SSW		.3							.7		1.7	
SW	0.9	.3							.7			1.7
WSW	1.8	.6							4.2	2.1	3.4	1.7
W	2.7	1.2							3.5	.7	3.8	1.7
WNW	3.9	1.8							2.8		1.7	
NW	2.1	.9							2.1			
NNW	.9	.6							1.4			
Total	12.3	6.6	1.5						16.8	2.8	1.4	

TABLE 5.—Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions—Continued

WASHINGTON, D. C.

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N												
NNE	1.4											
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW												
WSW	1.4	1.4	1.4	40								
W	11.2	4.2										
WNW	5.6	1.4	1.4									
NW	7.0											
NNW												
Total	26.6	7.0	2.8									

SPRING

N	0.5											
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW	.5											
SW	.5											
WSW								4.2				
W	3.5			1.3	1.3		30	4.2				
WNW	1.0				1.3		30	4.2				
NW	2.5	0.5						4.2				27
NNW												
Total	8.5	.5		1.3	1.3			12.6				

SUMMER

N	0.4				0.6				2.6			
NNE										1.3		
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW	.2											
SW												
WSW	1.0			1.2				1.3	2.6			32
W	.6			1.2				1.3				
WNW	.6	0.4										
NW	1.0							1.3				
NNW	.2			.6				1.3				
Total	4.0	.4		3.6				7.8	3.9			

AUTUMN

N												
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S												
SSW												
SW	0.3	0.3						1.5				
WSW	.3	.3		1.4				1.5				
W	2.4	.6	0.3	2.8	0.7		20	3.0				27
WNW	1.8			2.1				4.5				
NW	.9											
NNW		.3		.7								
Total	5.7	1.5	.3	7.0	.7			10.5				

TABLE 5.—Percentage frequency of high velocities of 22–27 meters per second (48–60 miles per hour), 28–36 meters per second (61–80 miles per hour), and over 36 meters per second (80 miles per hour), respectively and maximum velocities; classified by directions—Continued

WINSLOW, ARIZ.

WINTER

Velocity	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.	22-27	28-36	Over 36	Max.
N	1.0	0.6	0.4		1.1				2.0			
NNE	.2	.2	.2			1.1						
NE	.4								2.0			
ENE	.1	.1			1.1							
E												
ESE												
SE												
SSE												
S												
SSW	.1				1.1							
SW	1.0	1.7	.7		1.1		1.1		4.0		2.0	
WSW	1.8	.9	.5		3.3	3.3						
W	1.9	1.2	1.0		5.5	6.6	2.2		2.0	8.0	6.0	
WNW	1.1	1.7	.2	64	3.3	4.4	2.2		4.0	4.0	2.0	49
NW	1.7	.9	.4		3.3	1.1	2.2	47	2.0	2.0	4.0	
NNW	1.1	1.0	.3		2.2	1.1			2.0			
Total	10.4	8.3	3.7		20.9	18.7	7.7		18.0	14.0	14.0	

SPRING

N	0.5	0.7	0.1						5.6			
NNE		.1										
NE	.1											
ENE	.1											
E		.1										
ESE												
SE												
SSE	.1											
S	.2											
SSW	.4	.2	.1									
SW	1.0	1.0	.2		1.4	1.4			5.6		35	
WSW	1.4	.7	.1		4.2	2.8	1.4		11.2		5.6	
W	1.6	1.2	.2		4.2	5.6	1.4	40				
WNW	.9	.7	.2			1.4						
NW	.8	.1			2.8	1.4			5.6			
NNW	.6	.4	.1	48					5.6			
Total	7.7	5.2	1.0		12.6	12.6	2.8		28.0	5.6	5.0	

SUMMER

N												
NNE												
NE												
ENE												
E												
ESE												
SE												
SSE												
S	0.1											
SSW	.2	0.3			36	1.5	1.5	36				27
SW	.8	.1							5.0			
WSW	.2											
W	.1								2.5			
WNW												
NW												
NNW												
Total	1.4	.4				1.5	1.5		7.5			

AUTUMN

N	0.1	0.1	0.3									
NNE	.2	.2	.2						2.3	2.3		
NE	.1											
ENE												
E												
ESE												
SE												
SSE												
S												
SSW	.2	.1	.1					1.1				
SW	.4	.7	.2		1.1				2.3			
WSW	1.4	.2	.3					1.1				
W	.9	.4						4.4				
WNW	.5	.3	.1	68	1.1				2.3	2.3		34
NW	.8	.6	.2		2.2			2.2	43	4.0		
NNW	.4	.3						1.1				
Total	4.0	3.0	1.4		8.8	3.3	2.2		11.5	9.2		

TABLE 6.—Annual total (all directions combined) percentage frequencies of velocities of 22–27 meters per second, 28–36 meters per second, and over 36 meters per second, respectively; also, maximum velocity and corresponding directions—stations grouped according to location in northern, middle, and southern sections of country

Station	STATIONS NORTH OF LATITUDE 41°											
	6,000 meters				8,000 meters				10,000 meters			
	22-27	28-36	Over 36	Max. vel.	22-27	28-36	Over 36	Max. vel.	22-27	28-36	Over 36	Max. vel.
Burlington, Vt.	8.4	2.2	0.6	W-41	6.9	1.1	1.1	WNW-38	4.8	3.2	0	SW-35
Sault Ste. Marie, Mich.	9.9	3.2	.5	W-49	14.2	7.1	.7	SW-41	12.5	10.9	1.6	NNE-48
Lansing, Mich.	8.2	2.5	1.0	NW-81	11.6	2.9	.4	NW-37	13.4	5.0	.8	WNW-40
Madison, Wis.	9.6	2.8	1.1	WNW-49	15.0	5.6	1.4	NW-58	10.5	1.2	1.2	NW-38
Omaha, Nebr.	5.1	1.2	.3	W-47	5.1	1.7	.4	W-39	8.8	2.5	.3	W-38
Ellendale, N. Dak.	12.3	6.3	1.3	NNW-50	15.2	7.1	1.1	NW-62	15.6	6.9	1.4	W-40
Cheyenne, Wyo.	6.7	1.7	.1	NW-46	5.6	1.2	0	S-36	4.4	1.5	.7	WSW-37
Sheridan, Wyo.	9.0	3.4	.5	WSW-57	14.0	3.1	.9	W-40	10.5	6.3	1.5	W-41
Havre, Mont.	11.0	4.3	.3	SW-47	8.8	2.7	.5	SW-38	9.2	3.7	.6	W-41
Boise, Idaho	7.3	2.6	.5	WSW-44	9.6	3.7	.4	NNE-40	10.6	6.0	.4	WSW-38
Portland, Ore.	6.8	2.3	.3	NNE-48	9.4	2.5	.8	NE-39	10.2	4.9	0	N-35
Mean (percent)	8.3	2.8	.5		10.4	3.5	.7		10.5	5.0	.8	

STATIONS BETWEEN LATITUDES 35° AND 41° NORTH												
Station	22-27	28-36	Over 36	Max. vel.	22-27	28-36	Over 36	Max. vel.	22-27	28-36	Over 36	Max. vel.
Washington, D. C.	7.1	1.2	.3	WSW-40	5.0	1.0	0	WNW-34	9.8	2.3	0.6	WNW-41
Greensboro, N. C.	3.6	2.0	.7	WSW-49	6.1	1.5	.2	NNE-38	7.7	3.9	1.2	NNE-50
Royal Center, Ind.	8.4	2.7	.4	W-53	8.8	3.0	1.2	WNW-48	14.0	4.3	1.7	NNW-46
Evansville, Ind.	3.2	.6	.2	W-38	4.5	.5	0	WSW-28	1.3	0	0	NW-22
Memphis, Tenn.	2.5	.6	.1	WSW-38	2.0	.5	0	WSW-28	2.1	0	0	NNE-25
Broken Arrow, Okla.	6.5	4.3	1.1	NW-61	6.8	3.2	1.5	W-51	7.0	4.6	1.9	WNW-53
Amarillo, Tex.	4.8	2.0	.2	SW-40	5.8	2.1	.2	WSW-40	5.0	1.4	.5	W-37
Modena, Utah	6.0	2.8	.4	NW-58	11.4	3.9	.3	N-40	9.1	8.6	2.2	W-48
Redding, Calif.	8.4	3.3	.9	NW-48	9.9	5.0	2.1	NW-60	12.5	6.4	1.9	NW-58
San Francisco, Calif.	1.9	1.0	.2	NW-47	4.6	.4	.2	NNW-46	7.3	3.5	0	SW-34
Mean (percent)	5.8	2.6	.6		7.2	2.6	.8		8.4	4.2	1.3	

STATIONS BETWEEN LATITUDES 24° AND 35° NORTH												
Station	22-27	28-36	Over 36	Max. vel.	22-27	28-36	Over 36	Max. vel.	22-27	28-36	Over 36	Max. vel.
Due West, S. C.	6.6	3.5	1.3	NW-61	5.0	3.3	1.1	W-55	6.2	2.2	1.0	WNW-59
Jacksonville, Fla.	3.6	1.2	0	WNW-35	3.6	2.0	.3	WSW-47	7.2	2.2	.3	WSW-37
Key West, Fla.	1.3	.2	0	W-31	3.6	1.8	.3	WNW-43	8.4	2.0	.6	W-38
New Orleans, La.	4.3	1.6	.1	WNW-40	6.0	1.9	0	W-34	11.6	6.1	1.4	W-43
Groesbeck, Tex.	6.5	3.6	.5	WNW-45	7.0	3.5	1.0	W-60	7.2	4.0	1.0	WNW-54
Brownsville, Tex.	2.2	.6	.1	SW-38	5.2	1.9	0	WNW-32	6.7	2.2	1.1	W-54
El Paso, Tex.	7.4	2.5	.5	SW-39	6.3	4.6	.7	W-46	10.2	3.6	1.8	NW-60
Winslow, Ariz.	7.0	4.8	1.7	WNW-68	11.7	9.5	3.5	NW-47	14.5	7.9	5.3	WNW-49
Los Angeles, Calif.	4.9	.7	0	NW-32	3.6	.6	.3	WSW-49	6.4	2.9	0	NW-32
Mean (percent)	5.1	2.6	.7		5.5	3.0	.8		8.0	3.4	1.1	

This table shows that on the average the frequency of high velocities increases with latitude at all three levels and with altitude for all three groups of stations. With a very few exceptions, the highest velocity on record at each station occurred with a westerly wind. In table 7 the mean values for each group are combined to show frequency of winds of 22 meters per second or over, 28 meters per second or over, and over 36 meters per second, respectively.

TABLE 7.—Percentage frequency of winds of 22 meters per second or over, 28 meters per second or over, and over 36 meters per second, respectively.

Groups	6,000 meters			8,000 meters			10,000 meters		
	22	28	Over 36	22	28	Over 36	22	28	Over 36
	m. p. s. or over	m. p. s. or over	m. p. s.	m. p. s. or over	m. p. s. or over	m. p. s.	m. p. s. or over	m. p. s. or over	m. p. s.
Northern	11.6	3.3	0.5	14.6	4.2	0.7	16.3	5.8	0.8
Middle	0.0	3.2	.6	10.6	3.4	.8	13.9	5.5	1.3
Southern	8.4	3.3	.7	9.3	3.8	.8	12.5	4.5	1.1

As may be seen, the frequency of wind velocities of 22 meters per second or over ranges from 8.4 percent at 6 kilometers over the southern section of the country to 16.3 percent at 10 kilometers over the northern section. The frequency of velocities of 28 meters per second or over, ranges from 3.2 percent at 6 kilometers over the middle section to 5.8 percent at 10 kilometers over the northern section, and the frequency of velocities of more than 36 meters per second ranges from 0.5 percent at 6 kilometers over the northern section to 1.3 percent at 10 kilometers over the middle section.

EXTREME VELOCITIES

In order that the record of extreme (highest on record) velocities may be shown as completely as possible, these data are given in table 8 for all Weather Bureau stations in the United States, including both the active and discontinued stations, and for all available records through July 1936. These data are shown by seasons, but with the individual month also given in which each observation occurred.

It will be noted that there is considerable variation in the highest recorded velocities, even between adjoining stations, due to the fact that observations reaching these altitudes were made very irregularly at all stations, and rarely at the same time or even the same day at two or more adjoining stations. An analysis of the table shows that winds of 50 meters per second (112 miles per hour) or over have been recorded at least once during the past several years at 30 different stations whose locations are well distributed over the country. With one exception (at Groesbeck, Tex.), these records are confined to the first three levels of 6, 8, and 10 kilometers. Extreme velocities of 60 meters per second (134 miles per hour) or over were recorded at 9 different stations; also fairly well distributed over the country. These records are confined to the two lower levels of 6 and 8 kilometers. The highest velocity for all stations was 81 meters per second (181 miles per hour) from the NW., recorded at 6 kilometers at Lansing, Mich., on the morning of December 17, 1919. Although this was a single-theodolite observation, an examination of the original record gives no reason to doubt its accuracy. This is verified, to some extent also, by the unusually rapid movement of a surface high-pressure area of 30.5 inches, which was centered at St. Paul, Minn., on the morning of this observation, and 24 hours later was centered at Philadelphia, Pa., nearly 1,000 miles away.

TABLE 8.—Extreme velocities (meters per second), with directions and month of occurrence, for all Weather Bureau Pilot Balloon stations in the United States and for all records through July 1936, by seasons. One meter per second=2.24 miles per hour

WINTER

Station	Yrs. recd.	6,000 meters			8,000 meters			10,000 meters			12,000 meters			14,000 meters		
		Vel.	Dir.	Mo.	Vel.	Dir.	Mo.	Vel.	Dir.	Mo.	Vel.	Dir.	Mo.	Vel.	Dir.	Mo.
Akron, Ohio.....	2	(1)			(1)			(1)			(1)			(1)		
Abilene, Tex.....	1	34	NW	Feb.	33	W	Jan.	45	W	Feb.	22	W	Dec.	(1)		
Albany, N. Y.....	7	33	NW	Dec.	30	WNW	Dec.	21	NW	Jan.	(1)			(1)		
Albuquerque, N. Mex.	5	66	WSW	Jan.	33	W	Dec.	24	NNW	Jan.	9	ESE	Jan.	(1)		
Amarillo, Tex.....	4	40	SW	Dec.	40	WSW	Dec.	37	W	Dec.	13	SE	Jan.	(1)		
Atlanta, Ga.....	9	31	W	Feb.	41	W	Feb.	29	WSW	Jan.	31	W	Jan.	(1)		
Bellefonte, Pa.....	5	39	WNW	Feb.	21	NNE	Feb.	(1)			(1)			(1)		
Big Spring, Tex.....	4	41	NNW	Jan.	36	W	Dec.	50	WNW	Jan.	29	W	Feb.	26	WSW	Feb.
Billings, Mont.....	2	35	NW	Feb.	28	WNW	Dec.	22	N	Jan.	28	N	Jan.	32	NNW	Jan.
Bismarck, N. Dak.....	4	31	NW	Feb.	25	NW	Dec.	26	SE	Feb.	25	W	Jan.	(1)		
Boise, Idaho.....	10	39	N	Feb.	42	WNW	Jan.	29	NNE	Jan.	13	WNW	Dec.	(1)		
Boston, Mass.....	10	28	WSW	Dec.	8	NW	Feb.	22	NW	Feb.	(1)			(1)		
Broken Arrow, Okla.	12	50	W	Feb.	50	W	Jan.	40	W	Dec.	37	WNW	Feb.	36	WSW	Dec.
Brownsville, Tex.....	7	58	SW	Feb.	32	WNW	Feb.	54	W	Jan.	(1)			(1)		
Buffalo, N. Y.....	7	18	NW	Feb.	14	N	Dec.	(1)			(1)			(1)		
Burlington, Vt.....	17	41	W	Feb.	37	WNW	Feb.	19	NW	Feb.	21	NW	Feb.	(1)		
Charleston, S. C.....	4	48	W	Jan.	40	SW	Feb.	26	N	Dec.	(1)			(1)		
Cheyenne, Wyo.....	10	46	NW	Jan.	26	ENE	Dec.	16	NNW	Feb.	17	WSW	Feb.	(1)		
Chicago, Ill.....	10	36	NW	Jan.	(1)			(1)			(1)			(1)		
Cincinnati, Ohio.....	5	13	W	Dec.	(1)			(1)			(1)			(1)		
Cleveland, Ohio.....	10	33	NW	Jan.	25	SW	Feb.	4	SSW	Feb.	11	W	Feb.	(1)		
Columbus, Ohio.....	5	43	W	Jan.	38	NW	Feb.	23	N	Dec.	37	NNW	Dec.	(1)		
Dallas, Tex.....	6	44	W	Jan.	29	W	Feb.	38	WNW	Jan.	(1)			(1)		
Davenport, Iowa.....	10	29	WSW	Feb.	46	WSW	Jan.	50	NNW	Feb.	(1)			(1)		
Del Rio, Tex.....	5	28	W	Jan.	24	WSW	Feb.	16	E	Feb.	(1)			(1)		
Denver, Colo.....	17	39	W	Dec.	42	NNW	Dec.	52	W	Dec.	23	W	Dec.	30	W	Feb.
Detroit, Mich.....	10	35	W	Feb.	22	W	Dec.	20	W	Dec.	(1)			(1)		
Due West, S. C.....	11	61	NW	Jan.	55	W	Feb.	47	NW	Jan.	42	W	Feb.	(1)		
Elko, Nev.....	4	32	NW	Dec.	16	W	Feb.	11	ESE	Jan.	4	SSW	Jan.	(1)		
Ellendale, N. Dak.....	13	47	WNW	Feb.	37	W	Feb.	30	WNW	Dec.	21	WNW	Jan.	17	NW	Feb.
El Paso, Tex.....	4	39	W	Feb.	38	SW	Dec.	40	W	Feb.	44	NNE	Feb.	29	W	Dec.
Evansville, Ind.....	7	35	W	Feb.	25	WNW	Feb.	(1)			(1)			(1)		
Fargo, N. Dak.....	2	33	NW	Feb.	46	N	Dec.	21	WNW	Jan.	(1)			(1)		
Fresno, Calif.....	7	28	W	Jan.	21	N	Feb.	(1)			(1)			(1)		
Greensboro, N. C.....	8	44	WNW	Dec.	36	WNW	Feb.	50	NNE	Dec.	18	WSW	Feb.	(1)		
Groesbeck, Tex.....	13	45	WNW	Dec.	60	W	Feb.	54	WNW	Feb.	54	NW	Jan.	24	WNW	Dec.
Havre, Mont.....	9	32	WNW	Jan.	32	W	Feb.	25	NW	Feb.	20	ENE	Feb.	(1)		
Hollister, Calif.....	1	31	NNW	Jan.	(1)			(1)			(1)			(1)		
Houston, Tex.....	5	33	W	Dec.	32	WNW	Dec.	38	WSW	Dec.	30	W	Dec.	(1)		
Indianapolis, Ind.....	4	39	WSW	Dec.	24	WNW	Feb.	21	W	Jan.	25	W	Jan.	(1)		
Ithaca, N. Y.....	10	32	WNW	Feb.	29	NW	Jan.	15	WNW	Dec.	(1)			(1)		
Jackson, Miss.....	3	18	W	Feb.	14	NW	Jan.	(1)			(1)			(1)		
Jacksonville, Fla.....	10	33	W	Feb.	29	WNW	Feb.	24	WSW	Feb.	9	WNW	Jan.	(1)		
Kansas City, Mo.....	10	22	W	Feb.	15	SSW	Dec.	15	W	Feb.	10	W	Feb.	(1)		
Key West, Fla.....	16	30	WSW	Dec.	43	WNW	Feb.	38	W	Feb.	41	WNW	Feb.	34	W	Jan.
Kingman, Ariz.....	1	31	WNW	Dec.	30	WSW	Dec.	(1)			(1)			(1)		
Knoxville, Tenn.....	9	31	W	Dec.	20	W	Jan.	24	W	Dec.	(1)			(1)		
Kylertown, Pa.....	1	(1)			(1)			(1)			(1)			(1)		
Lansing, Mich.....	7	81	NW	Dec.	28	NW	Jan.	27	NW	Feb.	10	ENE	Dec.	(1)		
Las Vegas, Nev.....	1	50	WNW	Jan.	34	WNW	Feb.	41	WNW	Feb.	(1)			(1)		
Lebec, Calif.....	3	32	WNW	Feb.	(1)			(1)			(1)			(1)		
Leesburg, Ga.....	2	45	WNW	Dec.	37	WNW	Dec.	29	W	Feb.	(1)			(1)		
Los Angeles, Calif.....	10	32	NW	Dec.	28	NNW	Dec.	32	NW	Dec.	20	WNW	Dec.	6	WSW	Dec.
Madison, Wis.....	8	49	WNW	Jan.	34	WNW	Jan.	26	W	Feb.	(1)			(1)		
Medford, Ore.....	10	45	N	Feb.	31	NNW	Feb.	39	NE	Feb.	20	NNE	Feb.	(1)		
Memphis, Tenn.....	13	38	WSW	Dec.	28	WSW	Jan.	36	WSW	Jan.	18	WSW	Dec.	(1)		
Miami, Fla.....	6	35	WSW	Feb.	29	W	Dec.	32	WNW	Dec.	12	W	Jan.	(1)		
Missoula, Mont.....	1	27	NW	Jan.	14	NW	Dec.	8	NNW	Dec.	(1)			(1)		
Modena, Utah.....	9	58	NW	Dec.	40	N	Jan.	31	NNE	Jan.	22	NW	Jan.	33	W	Dec.
Murfreesboro, Tenn.....	3	31	WSW	Dec.	16	NW	Dec.	(1)			(1)			(1)		
Newark, N. J.....	10	22	W	Feb.	(1)			(1)			(1)			(1)		
New Orleans, La.....	10	32	W	Feb.	34	W	Feb.	36	W	Jan.	26	WNW	Dec.	16	WNW	Dec.
North Platte, Nebr.....	6	40	WNW	Jan.	30	SSW	Jan.	15	NNW	Dec.	(1)			(1)		
Northport, Wash.....	1	26	NW	Jan.	12	NW	Jan.	8	NNW	Jan.	(1)			(1)		
Oklahoma City, Okla.....	10	47	WNW	Jan.	40	WSW	Dec.	(1)			(1)			(1)		
Omaha, Nebr.....	16	49	WNW	Jan.	28	NNE	Dec.	28	W	Feb.	19	WNW	Jan.	20	WNW	Jan.
Pasco, Wash.....	4	17	NW	Feb.	16	NW	Feb.	(1)			(1)			(1)		
Pembina, N. Dak.....	3	26	NW	Jan.	51	NNW	Jan.	(1)			(1)			(1)		
Pendleton, Ore.....	1	23	N	Dec.	(1)			(1)			(1)			(1)		
Phoenix, Ariz.....	6	50	NW	Dec.	42	WSW	Dec.	52	SW	Dec.	13	WNW	Dec.	(1)		
Pittsburgh, Pa.....	3	27	WNW	Dec.	(1)			(1)			(1)			(1)		
Portland, Ore.....	8	48	NNE	Jan.	39	NE	Dec.	35	N	Dec.	36	W	Jan.	15	WSW	Feb.
Redding, Calif.....	7	48	NE	Dec.	48	NNW	Dec.	58	NW	Dec.	27	NNW	Jan.	19	NNW	Feb.
Reno, Nev.....	9	56	NW	Jan.	39	WSW	Feb.	43	NW	Feb.	(1)			(1)		
Richmond, Va.....	3	11	WNW	Feb.	(1)			(1)			(1)			(1)		
Rock Springs, Wyo.....	4	53	WSW	Jan.	58	N	Jan.	34	NW	Dec.	12	NW	Feb.	(1)		
Royal Center, Ind.....	13	40	NW	Dec.	48	WNW	Dec.	46	NNW	Jan.	21	WNW	Jan.	(1)		
St. Louis, Mo.....	10	39	W	Feb.	13	WSW	Feb.	15	WNW	Feb.	(1)			(1)		
St. Paul, Minn.....	10	36	WNW	Feb.	24	NW	Feb.	17	W	Feb.	(1)			(1)		
Salt Lake City, Utah.....	10	49	NW	Jan.	34	NE	Feb.	25	NE	Feb.	18	NNE	Feb.	(1)		
Sandberg, Calif.....	4	64	NNW	Dec.	28	NNW	Jan.	29	WSW	Dec.	(1)			(1)		
San Diego, Calif.....	5	35	SW	Jan.	30	NW	Jan.	40	SSW	Dec.	(1)			(1)		
San Francisco, Calif.....	15	33	ENE	Feb.	46	NNW	Feb.	30	NNW	Jan.	24	WNW	Dec.	21	WNW	Jan.
Sault Ste. Marie, Mich.....	10	31	NNW	Feb.	28	WNW	Feb.	20	W	Feb.	(1)			(1)		
Seattle, Wash.....	10	53	NW	Dec.	34	SW	Feb.	34	NW	Dec.	25	NE	Dec.	34	SW	Feb.
Sheridan, Wyo.....	7	55	NW	Jan.	32	NNE	Feb.	36	N	Feb.	29	NNW	Jan.	11	NW	Feb.
Spartanburg, S. C.....	4	20	W	Jan.	13	NNW	Dec.	13	NNW	Dec.	(1)			(1)		
Spokane, Wash.....	10	50	NW	Feb.	34	W	Feb.	27	NW	Jan.	22	NW	Feb.	(1)		
Tampa, Fla.....	5	29	WSW	Feb.	23	WNW	Jan.	32	WNW	Jan.	16	NNW	Jan.	(1)		
Tucson, Ariz.....	1	34	W	Feb.	39	WSW	Feb.	13	NW	Feb.	(1)			(1)		
Tulsa, Okla.....	2	44	W	Feb.	36	W	Feb.	(1)			(1)			(1)		
Vicksburg, Miss.....	1	41	W	Jan.	34	WSW	Jan.	(1)			(1)			(1)		
Washington, D. C.....	18	40	WSW	Jan.	34	WNW	Dec.	41	WNW	Dec.	(1)			(1)		
Wichita, Kans.....	6	37	WSW	Jan.	36	W	Feb.	33	NNE	Dec.	14	N	Feb.	(1)		
Winnemucca, Nev.....	1	22	W	Jan.	16	NNW	Feb.	(1)			(1)			(1)		
Winslow, Ariz.....	5	64	WNW	Feb.	47	NW	Jan.	49	NNW	Jan.	42	N	Jan.	38	NNE	Dec.
Yakima, Wash.....	1	22	N	Jan.	8	NNE	Jan.	5	N	Feb.	(1)			(1)		

1 No data available for these levels.

TABLE 8.—Extreme velocities (meters per second), with directions and month of occurrence, for all Weather Bureau Pilot Balloon stations in the United States and for all records through July 1936, by seasons. One meter per second=2.24 miles per hour—Continued

Station	Yrs. red.	SPRING														
		6,000 meters			8,000 meters			10,000 meters			12,000 meters			14,000 meters		
		Vel.	Dir.	Mo.	Vel.	Dir.	Mo.	Vel.	Dir.	Mo.	Vel.	Dir.	Mo.	Vel.	Dir.	Mo.
Akron, Ohio	2	(1)			(1)			(1)			(1)			(1)		
Ablene, Tex.	1	20	WSW.	May	35	SW.	Apr.	21	W.	Mar.	30	NW.	May	(1)		
Albany, N. Y.	7	44	WSW.	Apr.	30	NW.	May	53	WSW.	May	18	SW.	May	(1)		
Albuquerque, N. Mex.	5	44	WSW.	Apr.	38	WNW.	Mar.	29	WNW.	Mar.	9	NE.	May	(1)		
Amarillo, Tex.	4	37	WSW.	Mar.	25	WNW.	Mar.	22	WNW.	Mar.	21	SW.	Mar.	20	SSE.	Mar.
Atlanta, Ga.	9	41	WNW.	Mar.	50	WNW.	Mar.	42	W.	Mar.	33	WSW.	Apr.	11	NW.	May
Bellefonte, Pa.	5	23	WSW.	Apr.	35	SW.	Mar.	32	NE.	May	6	NE.	May	(1)		
Big Spring, Tex.	4	37	N.	Mar.	27	WSW.	Mar.	20	NNW.	Apr.	26	W.	Mar.	(1)		
Billings, Mont.	2	40	NNW.	Mar.	26	NW.	May	21	W.	May	27	W.	May	11	WNW.	May
Bismarck, N. Dak.	4	34	W.	Mar.	31	NW.	Apr.	20	N.	May	15	W.	May	9	N.	Mar.
Boise, Idaho	10	37	NW.	Apr.	37	NE.	May	29	NNW.	May	32	S.	Apr.	29	SSE.	Mar.
Boston, Mass.	10	33	W.	May	32	WSW.	May	29	NW.	Mar.	12	NNW.	May	(1)		
Broken Arrow, Okla.	12	58	SW.	Apr.	61	W.	Mar.	53	WNW.	Apr.	34	WNW.	May	19	W.	May
Brownsville, Tex.	7	32	WSW.	Apr.	30	W.	May	29	NW.	May	80	NW.	May	23	SW.	May
Burlington, Vt.	7	40	SW.	Apr.	32	SW.	Mar.	19	NNW.	May	8	W.	Apr.	(1)		
Charleston, S. C.	17	41	WNW.	May	38	WNW.	Mar.	17	WNW.	Mar.	19	WSW.	May	16	W.	May
Cheyenne, Wyo.	4	26	NW.	Mar.	37	WNW.	Apr.	33	W.	May	27	WNW.	May	23	NNE.	May
Chicago, Ill.	10	42	NW.	Mar.	29	W.	Apr.	20	NW.	Mar.	43	W.	Mar.	25	ESE.	May
Cincinnati, Ohio	10	31	WNW.	Apr.	43	NW.	Apr.	25	NW.	May	(1)			(1)		
Cleveland, Ohio	5	33	WNW.	Apr.	11	WNW.	May	22	NW.	May	11	SSE.	Mar.	(1)		
Columbus, Ohio	10	38	WNW.	May	28	W.	May	28	WNW.	May	42	WNW.	May	(1)		
Dallas, Ohio	5	37	W.	Mar.	26	NW.	May	29	WNW.	May	20	NW.	Apr.	28	WNW.	Apr.
Davenport, Iowa	6	38	WSW.	Apr.	32	W.	May	31	W.	May	20	W.	May	(1)		
Del Rio, Tex.	10	45	WNW.	Mar.	36	WSW.	May	32	N.	May	15	WSW.	May	22	W.	May
Denver, Tex.	5	25	WSW.	Mar.	18	W.	May	17	N.	Apr.	(1)			(1)		
Denver, Colo.	17	32	NW.	Mar.	48	WSW.	Mar.	30	WNW.	Mar.	(1)			(1)		
Detroit, Mich.	10	46	NNW.	Apr.	49	NW.	Mar.	32	NNW.	May	18	SW.	Mar.	17	N.	May
Due West, S. C.	11	49	WNW.	Mar.	48	WSW.	Mar.	39	WSW.	Mar.	30	W.	May	19	SW.	May
Elko, Nev.	4	30	NNW.	Mar.	21	ENE.	Apr.	10	NNW.	Apr.	(1)			(1)		
Ellendale, N. Dak.	13	38	NW.	Apr.	37	W.	Mar.	30	WSW.	Apr.	36	NNW.	May	27	NE.	May
El Paso, Tex.	4	36	WNW.	Apr.	38	WSW.	May	30	WNW.	Apr.	40	WNW.	Apr.	16	NNW.	May
Evansville, Ill.	7	32	WNW.	May	24	NNW.	Apr.	22	NW.	Apr.	28	WNW.	Apr.	17	WNW.	Apr.
Fargo, N. Dak.	2	30	NW.	Mar.	24	WNW.	May	13	NW.	May	10	WSW.	May	(1)		
Fresno, Calif.	7	34	WNW.	Apr.	30	WNW.	May	(1)			(1)			(1)		
Greensboro, N. C.	8	49	WSW.	Mar.	38	NNE.	May	35	WNW.	Apr.	35	W.	May	28	W.	Apr.
Groesbeck, Tex.	13	41	WNW.	Mar.	51	W.	Mar.	44	WSW.	Mar.	32	W.	May	20	WNW.	May
Havre, Mont.	9	39	NW.	Mar.	37	W.	May	41	W.	May	24	WSW.	May	6	W.	Mar.
Hollister, Calif.	1	(2)			(1)			(1)			(1)			(1)		
Houston, Tex.	5	28	SW.	Apr.	28	W.	Mar.	15	WNW.	Apr.	19	WNW.	May	(1)		
Indianapolis, Ind.	4	32	WNW.	Apr.	40	W.	Apr.	32	W.	Apr.	18	NNW.	May	15	ESE.	Apr.
Ithaca, N. Y.	10	30	SW.	Mar.	32	NW.	Mar.	15	NE.	Mar.	9	SW.	May	(1)		
Jackson, Miss.	3	28	NW.	Mar.	14	NW.	May	26	NW.	Apr.	(1)			(1)		
Jacksonville, Fla.	10	35	WNW.	Mar.	47	WSW.	Mar.	31	W.	Apr.	36	WNW.	May	22	NNE.	May
Kansas City, Mo.	10	35	WSW.	Apr.	22	W.	May	14	E.	May	19	N.	May	(1)		
Kay West, Fla.	16	31	W.	Mar.	42	W.	Mar.	31	NNW.	May	36	W.	Apr.	28	WNW.	May
Kingman, Ariz.	1	32	NW.	Apr.	28	N.	Apr.	(1)			(1)			(1)		
Knoxville, Tenn.	9	37	WNW.	Mar.	27	W.	Mar.	27	WNW.	Mar.	(1)			(1)		
Kylertown, Pa.	1	18	W.	May	(1)			(1)			(1)			(1)		
Lansing, Mich.	7	50	WNW.	May	37	NW.	May	28	WSW.	Mar.	29	N.	May	19	WSW.	May
Las Vegas, Nev.	1	33	WNW.	Apr.	34	WNW.	Mar.	28	WNW.	May	10	NNW.	May	10	NW.	May
Lebec, Calif.	1	28	NW.	Mar.	23	NNW.	Apr.	22	WNW.	Apr.	22	WSW.	Apr.	29	WNW.	Apr.
Leesburg, Ga.	2	32	W.	Mar.	32	W.	Mar.	18	NNW.	Mar.	(1)			(1)		
Los Angeles, Calif.	10	35	W.	Mar.	26	NNW.	Mar.	30	WSW.	May	18	WNW.	Mar.	15	WSW.	Mar.
Madison, Wis.	8	38	WNW.	Mar.	46	NW.	May	38	NW.	May	38	W.	Apr.	20	NW.	May
Medford, Oreg.	10	45	N.	Apr.	50	N.	Mar.	41	N.	May	27	W.	Apr.	24	W.	May
Memphis, Tenn.	13	27	WSW.	Apr.	20	WNW.	Apr.	20	WNW.	Apr.	15	W.	Apr.	22	NE.	May
Miami, Fla.	6	31	WNW.	Mar.	22	W.	May	28	W.	May	27	W.	May	(1)		
Missoula, Mont.	1	24	WSW.	Mar.	17	WNW.	Apr.	17	W.	Apr.	(1)			(1)		
Modena, Utah	9	43	NW.	May	30	NW.	Mar.	37	WNW.	May	35	NNW.	Apr.	29	S.	Mar.
Murfreesboro, Tenn.	3	26	W.	Mar.	17	WNW.	May	32	NNW.	Apr.	6	NNE.	May	(1)		
Newark, N. J.	10	33	SW.	Mar.	21	NNW.	Apr.	13	NW.	May	4	NW.	May	(1)		
New Orleans, La.	10	40	WNW.	Apr.	33	WNW.	Apr.	43	W.	Apr.	31	W.	Apr.	43	WNW.	May
North Platte, Nebr.	6	39	NNW.	Mar.	37	SW.	May	18	SW.	May	9	W.	Apr.	(1)		
Northport, Wash.	1	28	NW.	Mar.	13	NNW.	Mar.	4	S.	May	(1)			(1)		
Oklahoma City, Okla.	10	39	WNW.	Mar.	21	NW.	May	12	NW.	May	17	WNW.	Apr.	10	N.	Apr.
Omaha, Nebr.	16	31	NNW.	Mar.	38	W.	May	33	NW.	May	(1)			(1)		
Pasco, Wash.	4	20	NW.	Apr.	15	NNE.	Mar.	12	NE.	Apr.	(1)			(1)		
Pembina, N. Dak.	3	36	NW.	Mar.	36	W.	Apr.	32	WNW.	Mar.	9	WSW.	Mar.	(1)		
Pendleton, Oreg.	1	34	NW.	Mar.	19	WNW.	Mar.	19	NE.	Mar.	10	W.	Apr.	(1)		
Phoenix, Ariz.	6	30	WNW.	Apr.	34	WNW.	Apr.	22	NW.	Apr.	16	WNW.	Apr.	(1)		
Pittsburgh, Pa.	3	25	NW.	May	13	WNW.	Apr.	13	WSW.	Apr.	7	S.	Apr.	(1)		
Portland, Oreg.	8	31	NNW.	Mar.	38	W.	May	33	WNW.	Apr.	28	WNW.	Apr.	18	SW.	Mar.
Redding, Calif.	7	48	NNW.	May	60	NW.	May	39	N.	May	30	NE.	Apr.	15	NW.	Apr.
Reno, Nev.	9	47	WNW.	Mar.	37	WNW.	Apr.	27	WNW.	Mar.	(1)			(1)		
Richmond, Va.	3	26	W.	May	8	WNW.	Apr.	11	NNE.	May	(1)			(1)		
Rock Springs, Wyo.	4	49	NW.	Mar.	65	N.	Mar.	43	SW.	Mar.	34	W.	Mar.	16	NW.	Apr.
Royal Center, Ind.	13	39	SW.	Mar.	42	SW.	Mar.	44	WNW.	Mar.	36	WNW.	May	28	NW.	May
St. Louis, Mo.	10	24	WNW.	Apr.	14	W.	May	(1)			(1)			(1)		
St. Paul, Minn.	10	30	NW.	Mar.	27	W.	Mar.	25	W.	May	15	WSW.	May	(1)		
Salt Lake City, Utah	10	48	W.	Apr.	28	N.	Apr.	31	NW.	Apr.	33	WSW.	May	35	SW.	Mar.
Sandberg, Calif.	4	38	SSW.	May	25	WSW.	Mar.	29	NW.	Apr.	20	W.	May	(1)		
San Diego, Calif.	5	28	WNW.	Apr.	30	WSW.	Mar.	16	WNW.	May	(1)			(1)		
San Francisco, Calif.	15	29	WNW.	Mar.	22	SE.	Apr.	22	W.	May	16	W.	May	11	W.	Mar.
Sault Ste. Marie, Mich.	10	49	W.	Apr.	38	NW.	Apr.	35	WNW.	Mar.	45	W.	May	8	W.	May
Seattle, Wash.	10	36	NNW.	Mar.	37	NNE.	May	20	N.	Mar.	16	WNW.	Apr.	(1)		
Sheridan, Wyo.	7	50	WNW.	Mar.	38	N.	Apr.	37	N.	Mar.	34	W.	May	28	SSE.	May
Spartanburg, S. C.	4	35	WSW.	Apr.	30	WNW.	Apr.	20	SSW.	May	18	NE.	May	13	NNW.	May
Spokane, Wash.	10	36	NNW.	Apr.	30	WNW.	Mar.	27	WNW.	May	20	WNW.	Apr.	12	WSW.	Mar.
Tampa, Fla.	5	28	W.	Mar.	36	W.	Mar.	29	NW.	Mar.	31	WNW.	Apr.	25	NW.	May
Tucson, Ariz.	1	56	SW.	May	49	SW.	May	30	WSW.	Mar.	(1)			(1)		
Tulsa, Okla.	2	43	WSW.	May	34	W.	May	27	NW.	Mar.	10	W.	Apr.	(1)		

TABLE 8.—Extreme velocities (meters per second), with directions and month of occurrence, for all Weather Bureau Pilot Balloon stations in the United States and for all records through July 1936, by seasons. One meter per second=2.24 miles per hour—Continued

SUMMER

Station	Yrs. recd.	6,000 meters			8,000 meters			10,000 meters			12,000 meters			14,000 meters		
		Vel.	Dir.	Mo.	Vel.	Dir.	Mo.	Vel.	Dir.	Mo.	Vel.	Dir.	Mo.	Vel.	Dir.	Mo.
Akron, Ohio	2	21	SW.	July	29	NNW.	June	21	NNE.	June	11	WNW.	June	(1)		
Abilene, Tex.	1	18	W.	June	21	NNE.	June	20	SE.	Aug.	14	W.	June	(1)	NE.	Aug.
Albany, N. Y.	7	36	WSW.	Aug.	31	W.	Aug.	31	W.	Aug.	23	NNW.	Aug.	(1)		
Albuquerque, N. Mex.	5	31	W.	June	18	NW.	June	14	NNE.	Aug.	21	W.	Aug.	(1)	S.	Aug.
Amarillo, Tex.	4	26	W.	June	31	WNW.	June	25	W.	July	30	NE.	June	(1)	NNW.	Aug.
Atlanta, Ga.	9	23	NNW.	June	24	W.	June	22	E.	July	24	NW.	July	(1)	W.	July
Bellefonte, Pa.	5	30	NW.	July	31	WSW.	Aug.	36	WSW.	July	24	WSW.	Aug.	(1)	NW.	July
Big Spring, Tex.	4	23	NW.	June	17	WNW.	June	19	W.	June	24	NE.	Aug.	(1)	E.	Aug.
Billings, Mont.	2	34	W.	June	39	W.	June	32	WNW.	Aug.	22	W.	July	(1)	WSW.	July
Bismarck, N. Dak.	4	31	WNW.	June	31	W.	July	28	WNW.	July	13	NW.	July	(1)		
Boise, Idaho	10	44	WSW.	June	36	WSW.	Aug.	34	SSW.	Aug.	24	W.	Aug.	(1)	WSW.	Aug.
Boston, Mass.	10	36	WSW.	Aug.	31	WSW.	Aug.	39	NNE.	Aug.	13	WNW.	July	(1)		
Broken Arrow, Okla.	12	29	NW.	June	28	NW.	June	32	NW.	July	35	WNW.	July	(1)	NNW.	July
Brownsville, Tex.	7	21	N.	June	22	W.	June	26	W.	June	33	WSW.	June	(1)	E.	Aug.
Buffalo, N. Y.	7	30	NNW.	June	17	WNW.	Aug.	20	WNW.	Aug.	22	NW.	July	(1)		
Burlington, Vt.	17	33	NW.	June	30	NNW.	June	27	NNW.	June	32	W.	July	(1)		
Charleston, S. C.	4	35	WSW.	June	24	N.	Aug.	23	WNW.	July	22	NW.	June	(1)	NNE.	June
Cheyenne, Wyo.	10	34	WNW.	June	36	S.	June	37	WSW.	June	25	WNW.	Aug.	(1)	SSW.	June
Chicago, Ill.	10	34	NW.	June	26	W.	June	23	NNW.	June	6	WNW.	July	(1)	NW.	July
Cincinnati, Ohio	5	18	WNW.	July	22	NNE.	Aug.	(1)			(1)			(1)		
Cleveland, Ohio	10	40	WNW.	June	29	SSW.	June	33	SW.	Aug.	23	NW.	Aug.	(1)	NNW.	Aug.
Columbus, Ohio	5	31	WNW.	Aug.	35	N.	June	44	NNW.	June	25	WSW.	June	(1)		
Dallas, Tex.	6	24	WNW.	June	23	NE.	July	30	NW.	Aug.	21	ENE.	Aug.	(1)	NE.	Aug.
Davenport, Iowa	10	34	S.	June	28	N.	July	34	N.	Aug.	31	NW.	June	(1)	W.	July
Del Rio, Tex.	5	24	NNW.	June	22	NW.	June	17	E.	July	14	ESE.	July	(1)	S.	July
Denver, Colo.	17	36	SSW.	June	36	W.	July	26	W.	July	29	SSW.	June	(1)	N.	July
Detroit, Mich.	10	36	W.	July	45	SW.	June	46	W.	July	28	W.	July	(1)	NNW.	July
Due West, S. C.	11	30	NNW.	June	29	SW.	Aug.	27	W.	Aug.	30	WSW.	June	(1)	NW.	June
Elko, Nev.	4	31	NW.	Aug.	21	NNE.	June	8	WSW.	July	(1)			(1)		
Ellendale, N. Dak.	13	33	WSW.	July	40	W.	Aug.	40	W.	Aug.	26	NW.	Aug.	(1)	WNW.	Aug.
El Paso, Tex.	4	28	SW.	June	23	WSW.	June	23	W.	June	21	WSW.	June	(1)		
Evansville, Ind.	7	25	NNW.	June	26	WNW.	June	21	W.	June	16	N.	Aug.	(1)	W.	Aug.
Fargo, N. Dak.	2	23	W.	July	27	NW.	June	8	SW.	July	(1)			(1)		
Fresno, Calif.	7	25	SW.	July	25	W.	July	18	WSW.	July	(1)			(1)		
Greensboro, N. C.	8	33	NNW.	July	46	SW.	June	34	NNW.	July	30	NW.	July	(1)	NNW.	June
Groesbeck, Tex.	13	23	NW.	June	25	W.	June	36	NW.	June	35	WSW.	June	(1)	WNW.	July
Havre, Mont.	9	47	SW.	July	31	W.	June	35	SW.	Aug.	32	NW.	July	(1)	NW.	Aug.
Hollister, Calif.	1	21	SSW.	July	20	SSW.	July	18	N.	Aug.	(1)			(1)		
Houston, Tex.	5	28	NNE.	June	43	ENE.	June	24	SE.	Aug.	27	WNW.	June	(1)	NW.	June
Indianapolis, Ind.	4	26	WSW.	June	47	WNW.	June	34	WNW.	Aug.	30	NNW.	July	(1)	NNW.	Aug.
Ithaca, N. Y.	10	41	WNW.	June	24	SW.	July	26	SW.	July	12	S.	July	(1)		
Jackson, Miss.	3	14	NNW.	June	10	NNW.	June	14	NNW.	June	20	NNW.	June	(1)		
Jacksonville, Fla.	10	22	WNW.	June	28	W.	Aug.	30	W.	June	30	ENE.	Aug.	(1)	E.	Aug.
Kansas City, Mo.	10	30	N.	June	27	NNW.	June	24	N.	Aug.	30	NW.	June	(1)	NNW.	Aug.
Key West, Fla.	16	18	E.	Aug.	26	W.	June	38	SW.	June	20	NNW.	July	(1)	W.	Aug.
Kingman, Ariz.	1	25	WSW.	July	11	WSW.	July	18	SW.	Aug.	18	SW.	Aug.	(1)		
Knoxville, Tenn.	9	24	N.	June	28	W.	July	31	W.	June	27	NW.	June	(1)	WNW.	June
Kylertown, Pa.	1	24	WNW.	July	19	N.	July	27	N.	July	(1)			(1)		
Lansing, Mich.	7	27	NW.	July	29	NNW.	Aug.	31	W.	July	26	NW.	June	(1)		
Las Vegas, Nev.	1	25	WSW.	June	26	WNW.	June	22	SW.	Aug.	24	NW.	June	(1)	NW.	June
Lebec, Calif.	3	21	SW.	June	11	SW.	June	(1)			(1)			(1)		
Leesburg, Ga.	2	19	W.	June	17	NNW.	June	16	W.	July	28	NE.	July	(1)		
Los Angeles, Calif.	10	23	SW.	June	30	SW.	June	24	WSW.	June	38	SSW.	Aug.	(1)	W.	July
Madison, Wis.	8	32	W.	June	29	N.	Aug.	28	NW.	July	13	N.	Aug.	(1)	NW.	June
Medford, Oreg.	10	34	WSW.	July	43	NNW.	Aug.	40	W.	July	36	W.	July	(1)	SW.	Aug.
Memphis, Tenn.	13	33	W.	July	20	NNE.	June	25	NE.	June	18	N.	July	(1)	W.	June
Miami, Fla.	6	18	SW.	Aug.	17	NNW.	July	21	ESE.	Aug.	25	ESE.	Aug.	(1)	ENE.	July
Missoula, Mont.	1	30	SW.	June	18	W.	June	21	S.	July	(1)			(1)		
Modena, Utah	9	31	SW.	June	30	SW.	June	36	W.	Aug.	32	W.	Aug.	(1)	N.	Aug.
Murfreesboro, Tenn.	3	23	NNW.	June	31	SW.	Aug.	20	W.	June	30	WSW.	July	(1)	WSW.	July
Newark, N. J.	10	30	WSW.	July	25	WNW.	June	29	WNW.	Aug.	28	W.	Aug.	(1)		
New Orleans, La.	10	18	WNW.	Aug.	20	WSW.	June	31	W.	June	23	NNW.	June	(1)		
North Platte, Nebr.	6	31	WNW.	July	26	NW.	Aug.	29	NW.	Aug.	30	W.	June	(1)	WSW.	June
Northport, Wash.	1	32	WSW.	July	25	W.	July	(1)			(1)			(1)		
Oklahoma City, Okla.	10	29	NW.	June	26	WNW.	June	16	WSW.	June	12	SSW.	June	(1)	NNW.	June
Omaha, Nebr.	16	28	NW.	June	31	WNW.	June	33	NNW.	June	25	NW.	July	(1)	N.	July
Pasco, Wash.	4	17	NNW.	June	22	NNE.	June	(1)			(1)			(1)		
Pembina, N. Dak.	3	30	NW.	July	(1)			(1)			(1)			(1)		
Pendleton, Oreg.	1	32	SSW.	July	15	WNW.	Aug.	(1)			(1)			(1)		
Phoenix, Ariz.	6	28	SW.	June	22	SW.	July	17	WNW.	June	13	N.	June	(1)	SSE.	Aug.
Pittsburgh, Pa.	3	25	WNW.	Aug.	13	NNW.	July	14	NW.	Aug.	(1)			(1)		
Portland, Oreg.	8	41	SSW.	June	40	SW.	June	31	WSW.	July	39	SSW.	July	(1)	WNW.	Aug.
Redding, Calif.	7	37	NW.	June	37	N.	July	40	NE.	June	37	WSW.	July	(1)	NW.	Aug.
Reno, Nev.	9	40	SSW.	July	40	SW.	July	40	WSW.	July	23	W.	July	(1)	SSW.	July
Richmond, Va.	3	29	SSW.	July	20	W.	Aug.	14	SW.	June	10	NE.	July	(1)		
Rock Springs, Wyo.	4	46	NW.	June	38	SSW.	June	36	NW.	June	36	SW.	June	(1)	SW.	June
Royal Center, Ind.	13	30	NW.	July	31	NW.	June	34	NW.	Aug.	36	NNW.	June	(1)	NNE.	June
St. Louis, Mo.	10	21	WNW.	June	28	W.	June	20	W.	June	13	ESE.	July	(1)		
St. Paul, Minn.	10	30	WSW.	July	27	W.	Aug.	29	NW.	June	7	WNW.	July	(1)	N.	July
Salt Lake City, Utah	10	37	WNW.	June	27	WNW.	Aug.	27	WSW.	July	30	WSW.	Aug.	(1)	SW.	June
Sandberg, Calif.	4	25	SW.	June	25	W.	June	25	SW.	Aug.	16	NW.	Aug.	(1)		
San Diego, Calif.	5	24	SSW.	June	25	WSW.	June	19	SSW.	Aug.	13	SSW.	Aug.	(1)	NNW.	Aug.
San Francisco, Calif.	15	25	N.	June	40	NNW.	July	30	WSW.	Aug.	31	SW.	Aug.	(1)	WSW.	July
Sault Ste. Marie, Mich.	10	42	WNW.	June	41	SW.	July	48	NNE.	Aug.	42	NNW.	July	(1)	NW.	July
Seattle, Wash.	10	49	SSW.	Aug.	36	SW.	June	44	W.	July	31	SW.	July	(1)	WSW.	July
Sheridan, Wyo.	7	47	W.	June	40	W.	June	41	W.	Aug.	29	NE.	Aug.	(1)	NE.	July
Spartanburg, S. C.	4	18	WSW.	July	27	N.	July	18	ENE.	Aug.	12	N.	July	(1)	N.	July
Spokane, Wash.	10	33	W.	July	36	W.	July	22	WNW.	Aug.	13	ENE.	Aug.	(1)	WNW.	Aug.
Tampa, Fla.	5	25	WNW.	June	30	WNW.	June	24	NE.	Aug.	22	ENE.	Aug.	(1)	ENE.	Aug.
Tucson, Ariz.	1	15	WSW.	June	10	N.	June	14	WSW.	June	(1)			(1)		
Tulsa, Okla.	2	25	N.	Aug.	26	ENE.	June	24	NNE.	June	32	NW.	June	(1)	N.	June
Vicksburg, Miss.	1	17	NNW.	June	24	N.	June	23	N.	June	14	W.	June	(1)		
Washington, D. C.	18	31	WNW.	June	29	WNW.	Aug.	32	WSW.	June	37	N.	Aug.	(1)	NNE.	Aug.
Wichita, Kans.	6	25	NW.	June	26	NW.	June	22	WSW.	Aug.	30	WSW.	Aug.	(1)	NNW.	July
Winnemucca, Nev.	1	28	SSW.	June	27	WSW.	June	17	W.	July	(1)			(1)		
Winslow, Ariz.	5	38	WSW.	June	36	SSW.	June	27	SW.	June	29	W.	June	(1)	S.	July
Yakima, Wash.	1	26	WSW.	June	18	SW.	July	18	NE.	June	(1)			(1)		

1 No data available for these levels.

TABLE 8.—Extreme velocities (meters per second), with directions and month of occurrence, for all Weather Bureau Pilot Balloon stations in the United States and for all records through July 1936, by seasons. One meter per second=2.24 miles per hour—Continued

AUTUMN

Station	Yrs. red.	6,000 meters			8,000 meters			10,000 meters			12,000 meters			14,000 meters		
		Vel.	Dir.	Mo.	Vel.	Dir.	Mo.	Vel.	Dir.	Mo.	Vel.	Dir.	Mo.	Vel.	Dir.	Mo.
Akron, Ohio	2	(1)			(1)			(1)			(1)			(1)		
Akron, Ohio	1	24	W.	Oct.	28	W.	Oct.	37	W.	Sept.	38	WSW.	Sept.	19	WNW.	Sept.
Akron, Ohio	1	42	WNW.	Oct.	48	WNW.	Oct.	25	NNW.	Sept.	40	S.	Nov.	(1)		
Abilene, Tex.	7	48	NW.	Nov.	37	WNW.	Nov.	43	WSW.	Nov.	21	WNW.	Nov.	(1)		
Albany, N. Y.	5	37	WSW.	Nov.	34	W.	Nov.	32	WNW.	Nov.	24	NW.	Nov.	13	WNW.	Sept.
Amarillo, Tex.	4	37	WSW.	Nov.	26	NW.	Nov.	31	W.	Oct.	28	WSW.	Nov.	16	NW.	Oct.
Atlanta, Ga.	9	32	NE.	Nov.	23	WSW.	Sept.	24	N.	Sept.	28	N.	Sept.	(1)		
Belefonte, Pa.	5	28	NW.	Nov.	24	WSW.	Oct.	34	WSW.	Oct.	27	W.	Sept.	24	W.	Sept.
Big Spring, Tex.	4	32	WSW.	Nov.	27	NE.	Oct.	3	SSE.	Oct.	19	NE.	Oct.	(1)		
Billings, Mont.	2	33	NW.	Oct.	40	NNW.	Oct.	26	NE.	Oct.	22	SW.	Nov.	8	NNW.	Oct.
Bismarck, N. Dak.	4	33	NW.	Oct.	49	NNE.	Oct.	38	WSW.	Sept.	38	NW.	Oct.	23	WNW.	Oct.
Boise, Idaho	10	41	N.	Oct.	24	W.	Sept.	29	WNW.	Sept.	28	W.	Sept.	(1)		
Boston, Mass.	10	50	WNW.	Oct.	24	W.	Oct.	49	WSW.	Nov.	46	WNW.	Oct.	34	NW.	Oct.
Broken Arrow, Okla.	12	47	WNW.	Oct.	50	W.	Oct.	23	W.	Oct.	25	W.	Oct.	19	SW.	Oct.
Brownsville, Tex.	7	23	WSW.	Nov.	27	N.	Sept.	23	W.	Nov.	26	W.	Oct.	(1)		
Buffalo, N. Y.	7	28	W.	Oct.	6	ESE.	Sept.	(1)			(1)			(1)		
Burlington, Vt.	17	40	SW.	Oct.	30	SW.	Oct.	35	SW.	Sept.	35	N.	Sept.	32	NW.	Sept.
Charleston, S. C.	4	38	WSW.	Nov.	30	WNW.	Oct.	42	SW.	Oct.	36	W.	Sept.	18	N.	Sept.
Cheyenne, Wyo.	10	36	NE.	Nov.	31	W.	Nov.	31	NW.	Nov.	37	WSW.	Sept.	9	WNW.	Oct.
Chicago, Ill.	10	26	SW.	Nov.	30	W.	Sept.	43	WNW.	Sept.	20	WNW.	Oct.	(1)		
Cincinnati, Ohio	10	14	WNW.	Oct.	7	NNW.	Sept.	12	NNE.	Sept.	14	N.	Sept.	18	NNW.	Sept.
Cleveland, Ohio	5	26	W.	Oct.	28	SW.	Sept.	21	N.	Sept.	16	NW.	Sept.	14	WSW.	Sept.
Columbus, Ohio	10	26	N.	Nov.	25	N.	Oct.	30	NNE.	Sept.	(1)			(1)		
Dallas, Tex.	5	28	NW.	Nov.	47	N.	Nov.	31	WSW.	Oct.	30	NNE.	Nov.	16	NNW.	Sept.
Davenport, Iowa	6	38	NW.	Nov.	28	WNW.	Sept.	27	NNE.	Oct.	17	N.	Sept.	(1)		
Del Rio, Tex.	10	31	NNW.	Oct.	28	WNW.	Sept.	27	NNE.	Oct.	17	N.	Sept.	(1)		
Del Rio, Tex.	5	21	WSW.	Nov.	29	WSW.	Oct.	28	ENE.	Sept.	12	NW.	Sept.	11	SSW.	Sept.
Denver, Colo.	17	44	W.	Oct.	33	NNW.	Oct.	35	W.	Sept.	26	N.	Oct.	21	NW.	Sept.
Detroit, Mich.	10	32	NNW.	Oct.	26	NNW.	Sept.	34	NNW.	Oct.	22	SW.	Sept.	(1)		
Due West, S. C.	11	48	NW.	Nov.	44	W.	Nov.	50	NNW.	Nov.	39	W.	Nov.	24	W.	Oct.
Elko, Nev.	4	31	S.	Sept.	18	NW.	Oct.	(1)			(1)			(1)		
Ellendale, N. Dak.	13	50	NNW.	Nov.	62	NW.	Oct.	35	W.	Oct.	31	WNW.	Oct.	19	WNW.	Nov.
El Paso, Tex.	4	39	SW.	Nov.	46	W.	Nov.	50	NW.	Nov.	33	WNW.	Oct.	(1)		
Evansville, Ind.	7	27	WNW.	Oct.	28	WSW.	Nov.	18	NW.	Sept.	30	NW.	Sept.	46	WSW.	Sept.
Fargo, N. Dak.	2	33	WNW.	Oct.	20	NW.	Sept.	(1)			(1)			(1)		
Fresno, Calif.	7	31	NNE.	Nov.	32	WSW.	Nov.	(1)			(1)			(1)		
Greensboro, N. C.	8	41	W.	Nov.	33	NNW.	Sept.	41	SW.	Nov.	35	W.	Oct.	17	NW.	Sept.
Groesbeck, Tex.	13	35	WNW.	Nov.	37	W.	Oct.	45	W.	Nov.	40	W.	Oct.	34	WSW.	Oct.
Havre, Mont.	9	36	NW.	Sept.	38	SW.	Sept.	35	N.	Oct.	24	NE.	Oct.	11	WNW.	Sept.
Hollister, Calif.	1	24	N.	Oct.	17	WSW.	Sept.	(1)			(1)			(1)		
Houston, Tex.	5	34	W.	Nov.	30	W.	Nov.	35	W.	Nov.	20	WNW.	Sept.	(1)		
Indianapolis, Ind.	4	36	NW.	Nov.	20	W.	Nov.	41	WSW.	Sept.	44	WNW.	Sept.	(1)		
Ithaca, N. Y.	10	32	W.	Sept.	34	WNW.	Sept.	10	W.	Sept.	4	NW.	Sept.	(1)		
Jackson, Miss.	3	16	WNW.	Nov.	13	WNW.	Sept.	37	WSW.	Oct.	6	NNE.	Oct.	26	SW.	Oct.
Jacksonville, Fla.	10	32	NW.	Oct.	35	W.	Oct.	17	W.	Sept.	29	WSW.	Sept.	2	SE.	Sept.
Kansas City, Mo.	10	26	W.	Sept.	27	W.	Oct.	27	W.	Nov.	29	W.	Oct.	21	ESE.	Sept.
Key West, Fla.	16	24	W.	Nov.	34	WNW.	Nov.	27	W.	Nov.	29	W.	Oct.	(1)		
Kingman, Ariz.	1	39	NNW.	Nov.	31	W.	Nov.	(1)			(1)			(1)		
Knoxville, Tenn.	9	32	NNW.	Sept.	35	NW.	Nov.	25	WNW.	Oct.	28	NNE.	Oct.	16	NE.	Oct.
Kylertown, Pa.	1	20	W.	Oct.	18	NNW.	Oct.	(1)			(1)			(1)		
Lansing, Mich.	7	39	WNW.	Sept.	34	NW.	Nov.	40	WNW.	Sept.	25	NW.	Sept.	27	WNW.	Oct.
Las Vegas, Nev.	1	50	SSW.	Sept.	42	W.	Oct.	44	WSW.	Oct.	(1)			(1)		
Lebec, Calif.	3	41	NNE.	Nov.	17	NNW.	Oct.	6	SSW.	Oct.	(1)			(1)		
Leesburg, Ga.	2	28	WNW.	Nov.	28	WNW.	Nov.	42	WNW.	Nov.	27	W.	Sept.	21	W.	Sept.
Los Angeles, Calif.	10	31	W.	Sept.	49	WSW.	Sept.	28	SW.	Sept.	22	WSW.	Sept.	24	NNE.	Nov.
Madison, Wis.	8	47	NW.	Nov.	58	NW.	Nov.	25	W.	Sept.	16	ENE.	Sept.	14	SSE.	Sept.
Medford, Oreg.	10	44	NNE.	Oct.	29	NE.	Sept.	35	E.	Sept.	24	W.	Oct.	5	SW.	Sept.
Memphis, Tenn.	13	27	WNW.	Oct.	26	NNW.	Nov.	22	NE.	Sept.	31	W.	Oct.	14	WNW.	Oct.
Miami, Fla.	6	33	W.	Nov.	23	W.	Nov.	28	WNW.	Nov.	15	W.	Sept.	(1)		
Modena, Mont.	1	20	NNE.	Nov.	23	SSW.	Nov.	20	WNW.	Nov.	(1)			(1)		
Murfreesboro, Tenn.	9	40	NNW.	Nov.	36	NE.	Nov.	48	W.	Oct.	38	WNW.	Nov.	42	ESE.	Oct.
Newark, N. J.	3	30	W.	Oct.	25	WSW.	Sept.	23	NW.	Sept.	7	ESE.	Oct.	7	E.	Oct.
New Orleans, La.	10	32	W.	Nov.	27	WNW.	Nov.	37	WSW.	Oct.	40	WSW.	Oct.	34	WSW.	Oct.
North Platte, Neb.	6	37	NNW.	Nov.	30	WNW.	Nov.	33	E.	Oct.	22	WSW.	Oct.	28	SE.	Oct.
Northport, Wash.	1	22	ENE.	Sept.	16	ENE.	Sept.	9	NW.	Oct.	(1)			(1)		
Oklahoma City, Okla.	10	30	NNW.	Nov.	33	WNW.	Sept.	12	NNE.	Oct.	16	SW.	Oct.	26	NNW.	Oct.
Omaha, Neb.	16	39	WNW.	Oct.	38	WSW.	Nov.	38	W.	Sept.	28	SW.	Sept.	23	N.	Oct.
Pasco, Wash.	4	26	W.	Nov.	16	NW.	Nov.	12	NW.	Nov.	(1)			(1)		
Pembina, N. Dak.	3	35	WNW.	Oct.	24	NW.	Sept.	(1)			(1)			(1)		
Phoenix, Ariz.	1	28	NNE.	Oct.	(1)			(1)			(1)			(1)		
Pittsburgh, Pa.	6	37	NW.	Nov.	29	WSW.	Oct.	28	W.	Oct.	(1)			(1)		
Portland, Oreg.	8	34	WNW.	Nov.	21	WNW.	Sept.	12	SW.	Sept.	16	SW.	Nov.	24	N.	Nov.
Redding, Calif.	7	33	WNW.	Nov.	32	W.	Oct.	27	NW.	Oct.	16	SW.	Nov.	27	NNW.	Sept.
Reno, Nev.	8	48	NW.	Oct.	43	NW.	Nov.	37	NW.	Nov.	33	NNW.	Nov.	(1)		
Richmond, Va.	9	48	NNE.	Nov.	45	NW.	Nov.	26	SSE.	Nov.	22	WSW.	Nov.	(1)		
Rock Springs, Wyo.	3	23	W.	Oct.	13	NNW.	Oct.	(1)			(1)			(1)		
Royal Center, Ind.	4	44	SSW.	Oct.	50	NW.	Nov.	25	NW.	Nov.	31	NW.	Nov.	30	WNW.	Nov.
St. Louis, Mo.	13	53	W.	Nov.	48	W.	Oct.	39	NNW.	Sept.	40	WNW.	Sept.	20	NW.	Sept.
St. Paul, Minn.	10	25	NW.	Oct.	17	NNW.	Oct.	23	WNW.	Oct.	14	NNE.	Oct.	(1)		
Salt Lake City, Utah	10	26	W.	Sept.	30	WNW.	Sept.	23	WNW.	Sept.	28	WSW.	Nov.	(1)		
San Diego, Calif.	4	41	SSW.	Sept.	32	WSW.	Nov.	36	WSW.	Sept.	36	NE.	Oct.	16	W.	Sept.
San Francisco, Calif.	10	39	W.	Sept.	33	WSW.	Oct.	38	WSW.	Nov.	(1)			(1)		
Sault Ste. Marie, Mich.	5	28	WSW.	Sept.	42	WSW.	Oct.	50	WSW.	Oct.	31	WNW.	Oct.	23	SSE.	Oct.
Seattle, Wash.	10	47	NNW.	Nov.	29	W.	Oct.	34	SW.	Nov.	31	WNW.	Oct.	28	NW.	Nov.
Sheridan, Wyo.	10	30	NNW.	Sept.	30	WNW.	Oct.	28	NNW.	Sept.	23	NW.	Sept.	45	NNW.	Sept.
Spartanburg, S. C.	7	46	NW.	Nov.	24	W.	Oct.	28	NNW.	Sept.	13	NW.	Sept.	6	WNW.	Oct.
Spokane, Wash.	4	57	WSW.	Oct.	38	W.	Sept.	38	N.	Nov.	24	NNE.	Nov.	10	NNW.	Oct.
Tampa, Fla.	5	22	WNW.	Nov.	25	NW.	Nov.	28	WNW.	Oct.	31	N.	Sept.	12	NNW.	Oct.
Tucson, Ariz.	10	48	W.	Sept.	47	NW.	Nov.	26	NNE.	Sept.	16	NW.	Sept.	(1)		
Tulsa, Okla.	5	22	WSW.	Oct.	26	W.	Nov.	22	SW.	Sept.	24	WNW.	Nov.	9	ENE.	Sept.
Vicksburg, Miss.	1	(1)			(1)			(1)			(1)			(1)		
Washington, D. C.	1	29	NW.	Oct.	16	WSW.	Nov.	17	N.	Nov.	16	NW.	Nov.	15	NNW.	Nov.
Wichita, Kans.	18	25	WNW.	Nov.	25	WNW.	Nov.	25	WNW.	Nov.	18	WNW.	Nov.	(1)		
Winnebago, Nev.	6	37	W.	Nov.	36	WSW.	Nov.	36	W.	Sept.	33	WNW.	Nov.	16	NNW.	Sept.
Winslow, Ariz.	11	36	WNW.	Oct.	44	W.	Oct.	40	NE.	Sept.	26	WSW.	Sept.	22	E.	Sept.
Yakima, Wash.	5	(1)			(1)			(1)			(1)			(1)		
Yakima, Wash.	1	68	WNW.	Nov.	43	NW.	Nov.	34	W.	Nov.	45	N.	Nov.	38	W.	Nov.
Yakima, Wash.	1	23	NW.	Nov.	15	W.	Oct.	9	WNW.	Oct.	7	N.	Oct.	(1)		

1 No data available for these levels.