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U. S. Weather Bureau.

Catalog of radarscope photography concurrent with Tiros...

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UNITED STATES DEPARTMENT OF COMMERCE
U.S. WEATHER BUREAU

CATALOG OF RADARSCOPE PHOTOGRAPHY CONCURRENT WITH TIROS I SATELLITE OBSERVATIONS

Robert L. Pyle and Louis Novotny

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Washington, D. C.
July 1961

National Oceanic and Atmospheric Administration
TIROS Satellites and Satellite Meteorology

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CATALOG OF RADARSCOPE PHOTOGRAPHY
CONCURRENT WITH TIROS I SATELLITE OBSERVATIONS

This catalog contains condensed documentation of radarscope photographs obtained by various military and civilian land, sea, and air stations during the operational lifetime of TIROS I. Many of these stations were participants in a special program initiated as an aid in the interpretation of satellite cloud observations, and conducted by the Stanford Research Institute, under contract with the Air Force Geophysics Research Directorate.

The stations are grouped by agency and listed together with information on the type of radar used and the type of pictures taken. Each station has been assigned a number by which it is identified on the map in Fig. 1 and in Tables 1 and 2. The tables show the correlation of radarscope photography with satellite cloud observations over or within range of each station. An "X" indicates that all TIROS I cloud observations within radar range on the indicated day were covered by concurrent radarscope photographs, and an "O" indicates that some but not all of the observations were covered. The TIROS I observations used for this correlation are the sequences containing useable frames listed and mapped in "TIROS I Television Cloud Photography" now in press as No. 5.31 in the U. S. Weather Bureau series Key to Meteorological Records Documentation.

The following references may be consulted for more information about the radar programs and availability of photographic data.

ADC, and AWS stations, Miscellaneous stations nos. 64 and 66, Airborne and ship stations, and Weather Reconnaissance flights:

Dr. Myron G. H. Ligda
Division of Engineering Research
Stanford Research Institute
Menlo Park, California

Army Signal Corps stations, and Miscellaneous stations nos. 65 and 67:

Commanding Officer
USARDL
Attn: SIGRA/SL-SMA
Fort Monmouth, New Jersey

Weather Bureau stations:

National Weather Records Center
U. S. Weather Bureau
Arcade Building
Asheville, North Carolina

RADAR STATIONS

AIR DEFENSE COMMAND STATIONS; Nos. 1-25

No.	Station	Radar	No.	Station	Radar
1.	Limestone, Maine	CPS-9	13.	Burns, Oreg.	MPS-7
2.	Benton, Pa.	CPS-6B	14.	Klamath AFS, Calif.	FPS-20
3.	Selfridge AFB, Mich.	CPS-6B	15.	Mill Valley, Calif.	GPS-3
4.	Sault Sainte Marie, Mich.	FPS-20	16.	Santa Rosa Is., Calif.	
			17.	Mt. Lemmon, Ariz.	FPS-20
5.	Waverly, Iowa	FPS-10	18.	Moriarty, N. Mex.	FPS-20
6.	Finland, Minn.	FPS-20	19.	Amarillo, Tex.	FPS-20
7.	Finley, N. Dak.	FPS-20	20.	Pyote, Tex.	FPS-3
8.	Fortuna, N. Dak.	FPS-20	21.	Lackland, Tex.	FPS-20
9.	Ellsworth, S. Dak.	FPS-20	22.	Texarkana, Ark.	FPS-20
10.	Cutbank, Mont.	FPS-20	23.	Houma, La.	FPS-20
11.	Neah Bay, Wash.	GPS-3	24.	Lake City, Tenn.	FPS-10
12.	Mt. Hebo, Oreg.	MPS-11	25.	Hunter AFB, Ga.	FPS-20

Type of pictures: All Stations used 35mm film, 2 pictures each 15 minutes of operation.

Note: The film is initially classified as of this writing.

AIR WEATHER SERVICE STATIONS; Nos. 26-37

No.	Station	Radar	No.	Station	Radar
26.	Apalachicola, Fla.	CPS-9	32.	Eniwetok	CPS-9
27.	Schilling, Kans.	CPS-9	33.	Guam	CPS-9
28.	Lowry, Colo.	CPS-9	34.	Kadena, Okinawa	CPS-9
29.	Bermuda	CPS-9	35.	Hahn, Germany	CPS-9
30.	Ramey, Puerto Rico	CPS-9	36.	Brize Norton, England	CPS-9
31.	Albrook, Canal Zone	CPS-9	37.	Keflavik, Iceland	CPS-9

Type of pictures: 1 Polaroid print each 15 minutes of operation.

ARMY SIGNAL CORPS STATIONS; Nos. 38-41

No.	Station	Radar
38.	Evans Signal Laboratory, Belmar, N. J.	CPS-9
39.	Norfolk NAS, Va.	CPS-9
40.	Pope AFB, Ft. Bragg, N. C.	CPS-9
41.	Warner Robbins AFB, Macom, Ga.	CPS-9

Type of pictures: Station 38 used 70mm film; stations 39 and 40 used 35 mm film and Polaroid prints; station 41 used 35 mm film.

Note: Photographs are of PPI scope, single frame time exposures for the period (5-10 minutes) of overhead satellite passage. Polaroid prints are available for each minute of duration while the satellite was overhead.

RADAR STATIONS

U. S. WEATHER BUREAU STATIONS; Nos. 42-63

No.	Station	Radar	No.	Station	Radar
42.	Nantucket, Mass.	SP	53.	Wichita, Kans.	WSR-3
43.	Washington, D.C.	WSR-57	54.	Tulsa, Okla.	WSR-1
44.	Cape Hatteras, N. C.	SP1M	55.	Oklahoma City, Okla.	WSR-57
45.	Charleston, S. C.	WSR-3	56.	Amarillo, Tex.	WSR-1
46.	Miami, Fla.	WSR-57	57.	Wichita Falls, Tex.	WSR-1
47.	Tampa, Fla.	WSR-3	58.	Abilene, Tex.	WSR-1
48.	Huntsville, Ala.	WSR-3	59.	Ft. Worth, Tex.	WSR-1
49.	Columbia, Mo.	WSR-3	60.	Waco, Tex.	WSR-1
50.	Springfield, Mo.	WSR-1	61.	Shreveport, La.	WSR-1
51.	Goodland, Kans.	WSR-1	62.	Swan Island	WSR-1
52.	Topeka, Kans.	WSR-3	63.	San Juan, Puerto Rico	SP

Type of pictures: Stations 43, 46, 48, 49, 51, and 55 used 16mm film; all others used 35mm film. Several stations used Polaroid camera.

Note: Some of the film is classified "unusable", generally because date and time cannot be read off the film. This film has been omitted from usage within the catalog but is available for research if desired.

MISCELLANEOUS STATIONS; Nos. 64-67

No.	Station	Radar
64.	McGill University, Toronto, Canada	CPS-9
65.	Pennsylvania State University, University Park, Pa.	M-33C
66.	Illinois State Water Survey, Urbana, Ill.	CPS-9
67.	Oregon State College, Marys Peak, Oreg.	CPS-9

Type of pictures: Stations 64 and 66 used 35mm film. Station 65 used 16mm film, 21/2 frames per minute of operation with each frame a 6-second exposure. Station 67 took 16mm photos of the PPI with one frame exposed every 30 seconds; some 35mm film of RHI data and 4 X 5 sheet film photos by Graflex camera were also taken.

AIRBORNE STATIONS; Nos. 68-71

No.	Station	Latitude	Longitude	Track	Radar
68.	Station 3	43.5°N	134.0°W	360°-180°	APS-20
69.	Station 5	40.0°N	135.5°W	340°-160°	APS-20
70.	Station 7	35.5°N	131.5°W	340°-160°	APS-20
71.	Station 9	32.0°N	127.5°W	320°-140°	APS-20

Type of pictures: 35mm film, 1 picture each 2 minutes of operation.

RADAR STATIONS

SHIP STATIONS; Nos. 72-74

No. Station	Latitude	Longitude	Radar
72. SP	43°15'N	130°00'W	SPS-8
73. SR	35°30'N	131°50'W	SPS-8
74. SS	32°20'N	124°25'W	SPS-8

Type of pictures: 35mm film, 2 pictures each 15 minutes of operation.

U. S. AIR FORCE AWS RECONNAISSANCE FLIGHTS (not included in tables or map)

Flight	General Area
Stork Juliett	Over water Alaska to California
Stork Special	Northern Gulf of Alaska
Lark Special	Gulf of Alaska to California
Lark X-Ray Mod.	California to Hawaiian Islands
Loon Kilo	South of Hawaiian Islands
Loon Mike	Southwest of Hawaiian Islands
Gull Sierra	Atlantic Ocean east of Bermuda
Buzzard India	Between Japan and Philippine Islands
Buzzard Hotel	Japan to southeast of Kamchatka
Buzzard Special	Sea of Japan and Yellow Sea
Buzzard Tango	Vicinity of Japan
Vulture Uniform	South between Guam and Eniwetok

Type of pictures: 35mm film, 1 picture each 2 minutes of operation.
Note: Characteristics of the radar are classified. The film is also initially classified as of this writing. Photos were taken during the first 20 days in April.

STA	APRIL 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
1		X	X	X	X	X	X	X	X	X										
2	X	X	X	X	X	X	X	X	X	X	X	X	X	X						
3		0		0			X	X	X	X	X	X	X	X						
4	X	X	X	X	X	X	X	X	X	X	X	X	X	X						
5	X	X	X	X	X	X	X	X	X	X	X	X	X	X						
6	X	X	X	X	X	X	X	X	X	X	X	X		X						
7	X	0	X	X	X	X	X	X	X	X	X	X		X						
8	X	X	X		X	0	X	X	X	X	X	X								
9	X	X	X	X	X	X	X	X	X	X	X	X	X	X						
10	X	X	X	X	0	0	X		X	X	X									
11	X	X	X	X	X	X	X	X	X	X	X	X								
12	X	X	X	0	X	0	X	X	X	0	X	X								
13																				
14	(0	X	X	X	X	X	X	X	X	X	X	X)	out of focus							
15	X	X	X	X	X	X	X	X	X	X	0	X								
16	X	X	X	0	0	X	0	X	X	X	X	X								
17								0	X	X	0	X	X	X	X					
18												0								
19		X	X	X	X	X	X	X	X	X	X	X	X	X	X					
20	0	X	X	X	0	X	X	X	X	0	X		X	X	X					
21	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
22	X	X	X	X	0	X	X	X	X	X	X	X	X	X						
23	X	X	X	X	X	X	X	X	X	X	X	(X	X	X	X)	out of focus				
24				(X	X	X	X	X	X	X	X	X	X	X)	out of focus					
25	X	X	0	X	X	X	X	X	X	X	X	X	X	X	X					
26	0	X	X	X	0				X					X						
27					0	X	X	X	X	X	X	X	X	X	X					
28					X	X	X	X	X	X	X	X	X	X						
29					0	X	X	X	X	X	X	X	X	X	X					
30					X	X	X	X	X	X	X	X	X	X			X			
31									X	X		X	X	X	X	X		X	X	
32													X							
33																				
34						X		X		X	X	X		X	X	X				
35						X	X	X	X	0	X									
36				0	X	X	X	X	X	0	X									
37					X	X														

STA	APRIL 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
38					0	0	0	0	0	0										
39								0												
40																				
41					0	0	0	0	0	0										
42	0	0		X	X	0		X	X											
43		X	X	X	X	X	X			0	0	X								
44								0	X	X	X	X								
45		0	X	X																
46		X	X		X	X	X	X												
47		0																		
48																				
49	X										0									
50																				
51																				
52																				
53																				
54																				
55																				
56																			X	
57												0								
58																				
59		X												0						
60																				
61	0																			
62																				
63																				
64	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
65																				
66	0	0		0				X	0		0	0	0	X						
67		0	0	0			0	0	0											
68																				
69																				
70																				
71																				
72	X	X	X	X	X	X	X		X	X	X	X								
73	X	X	X	X	X	X	X	X	X	X	X	X								
74	X	X	X	X	X	X	X	X	X	X	X	X								

Table 1. Correlation of radarscope photography with TIROS I cloud observations during April, 1960.

| STA | MAY | | |

```
STA                          MAY                                                  JUNE
    5 6 7 8 9101112131415161718192021222324252627282930 31  1 2 3 4 5 6 7 8 910111213
38            0 0   0             0   0   0 0 0   0   0       0 0 0 0 0 0
39              0   0   0 0 0
40            0     0             0           0   0           0 0   0
41
42    0   X X X X X X X X X X X     X X X X           X X     0 X X   X
43        X   X   X X X X 0 X     X X   0   0
44  X X X X X X   X X X X X X X X X X X X X X X X X X X X X X   X X X X X   X X X
45            X X         0         0           0     0             X X X
46      X X X   X   X   X       X X X X     X X X
47                                            X X X         X X X X X X X 0
48    X                                       0                     X
49    X                   X
50                                          0
51                                                                0         X       X
52    X                   X       X       X X     X                         X
53                      X                       0 0
54                                                                                X
55          0                 0 0       X   0   0 0   X       X   X X X   0 X     X X
56                                          0   0     0           0   X   0 0
57                            X 0               0     X           X     X         X
58                                                                      X
59                            X                 0     X           X 0 0 X X       X
60  0                         0           0         0         0         X
61                            X   X                                 0   0
62                                            0               X             X
63                                          0 X             X           0
64
65                          X     0 0           0 0 0 0         0   X
66
67                0 X           0         0 0 0 0
68                    0 X   X X X 0 X 0 X X X X X X   X           X   X X X
69                      0   0   X X X X X X X X X 0 0             X   X X     X
70                  0     X X X 0 0 X X X X X X X   X             0 0 X 0 0   X
71                  0   0 0 X X X X X X 0 X X X X   X X       X   0   X   0
72
73
74
```

Table 2. (continued)

CHARACTERISTICS OF VARIOUS RADAR EQUIPMENT

Type	Wave-Length	Beam Width	Type of Sweep	Maximum Range	Presentation
APS-20	10 cm				
CPS-6B FPS-10	10 cm	1°azi. 24° vert.	Automatic rotation in azimuth	133 n. mi. 266 n. mi.	PPI
CPS-9	3.2 cm	1°	Automatic and manual in horizontal and vertical, either direction. Sector scan in both planes.	350 n. mi.	PPI, off-center PPI, RHI
FPS-3 MPS-7	23 cm	1.3° azi. lower 0-3° upper 3-13°	Automatic, horizonal	400 n. mi.	PPI
FPS-20	23 cm	1.3°azi. 22°vert.	Automatic in azimuth	250 n. mi.	PPI
M-33C	10 cm	2°		60 n. mi.	
MPS-11 FPS-8 *GPS-3	22 cm	30°vert. 2.5°horiz.	Automatic in vertical and horizontal	225 n. mi.	PPI
SP SP1M	10 cm	3°	Manual and automatic in horizontal, manual in vertical	300 n. mi.	PPI
SPS-8	22 cm	30°vert. 2-1/2°horiz.		90 n. mi.	
WSR-1	10 cm	4°	Automatic, 12 rpm., manual control of antenna tilt	180 n. mi.	PPI
WSR-3	10 cm	4°	Automatic, variable speed to 12 rpm, reversible, automatic and manual control of antenna tilt	180 n. mi.	PPI, RHI
WSR-57	10 cm	2°	Automatic and manual in horizontal and vertical, either direction	250 n. mi.	PPI, off-center PPI, RHI

*GPS-3 is a modified FPS-8

Information on this page has been extracted in part from Weather Bureau memorandum "List of Sites from which Radar Meteorological Data are Obtainable" dated March 22, 1961 and from Weather Bureau Circular Letter 6-60 "Radar Weather Observations from Cooperative Agencies" dated July 19, 1960.

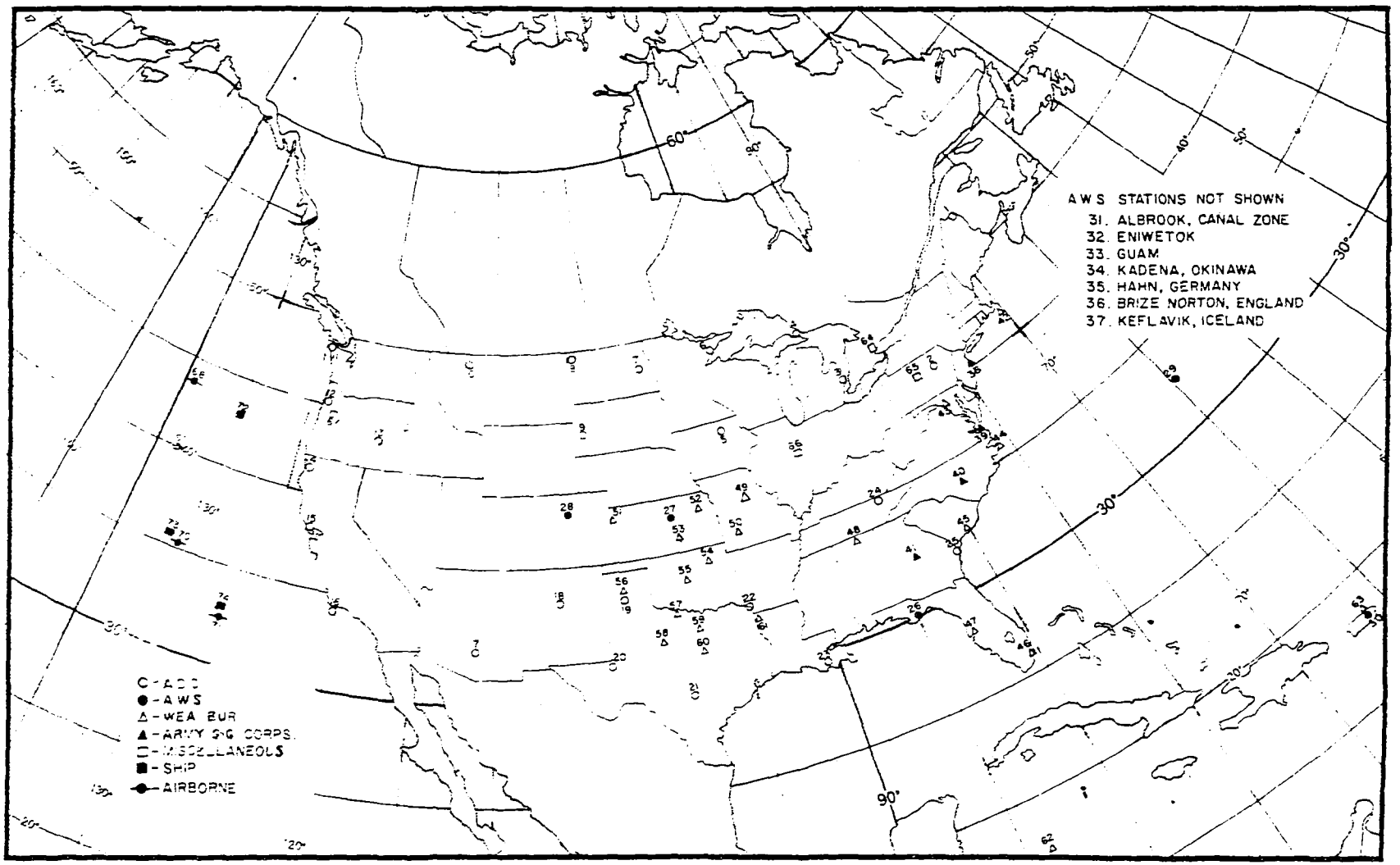

Figure 1. Location of stations