

meager data, but, at least for this period, indicated a maximum rain squall frequency for the northeast trade-wind zone between 20° and 15°, and beyond 5° S. a distinct increase in frequency toward the higher latitudes. It is to be noted that the observations in the latter group were made during the Southern Hemisphere winter.

The normal trade-wind curve of temperature, while extraordinarily steady, nevertheless is made up of a multitude of tiny changes; and corresponding to these the trace for relative humidity seesaws constantly through a range of largely 2 to 5 per cent (occasionally reaching 8 to 10), these oscillations being superposed upon the very small diurnal swing.

The curves for temperature and relative humidity in the rain squalls are unmistakably different from these normal trade-wind curves, and they strongly resemble those made over a heated land surface. They seem to show clearly that isolated bodies of cold air exist in the otherwise uniformly turbulent trade-wind stream, the instability which they help to produce being altogether more marked at the surface than the normal instability which produces the trade-wind cumuli.

Two general types of temperature change occur with the rain squalls:

1. A fall lasting 2 to 4 hours, usually irregularly. It is sometimes interrupted by a slight rise, after which the approach to the minimum is more rapid than before. Recovery of normal temperature may be either slow or rapid.

2. A type requiring at the most three-quarters of an hour for the completion of the changes during the passage of the ship through the body of cold air, sometimes scarcely 20 minutes.

There was one very special case (June 29, in latitude about 23° N.) differing from the above types. First occurred a slight cooling incident to a strong northerly squall with light to moderately heavy rain, and then came a sharp rise of temperature to above normal upon the veering of the wind into the ESE. The author suggests that this rise was due to the thrusting northward of warm air from lower latitudes in some manner connected with the passage of the cold air. Adequate discussion of this case was impossible, however; observations on wind direction were taken only at 4-hour intervals.

With regard to occurrence of the rain squalls in the southeast trades, the *Deutschland* registrations show clearly that the cold-air masses reached to 6° S. They have been observed with southeast wind on the South American coast northeast of Pernambuco.

The author regards these cold-air bodies as remnants of larger air masses thrust forward from high latitudes to and in part within the trade-wind boundaries, their breaking up giving opportunity for the rain squalls. He points out that this is, in a sense, nothing new, for it is well known that in winter, polar-air streams now and then reach almost to the Equator. The registrations discussed are, however, of special interest because they are the first automatic records from the Atlantic showing cold-air thrusts into the trade-wind zones.—*B. M. V.*

#### AN UNDERDEVELOPED TORNADO

By G. SHIPMAN

[Weather Bureau Office, Fort Smith, Ark., May 24, 1926]

An underdeveloped tornado closely followed by a straight blow occurred at Fort Smith, Ark., during the late afternoon of April 23, 1926. It developed at the front of an advancing HIGH on the wind-shift line accompanied by a sharp drop in temperature. The sky was clear until 4:30 p. m. when it changed to partly cloudy,

becoming cloudy at 5:30 p. m. A few alto-stratus clouds from the south were observed until 4:30 p. m., changing then to lower clouds with a dense bank to the north. At 5:30 the clouds became denser, with a small turbulent mass of mammato-cumulus moving from the south. The lower clouds moved from south to north, while the higher ones, when observed, moved from west to east along the path of the storm. Lightning, starting at 5:30 p. m., was vivid during the entire storm, the flashes, mostly perpendicular, passing from higher clouds through scud to the earth. The tornado cloud appeared at Fort Smith at 6:15 p. m., earlier to the west, and later to the east. It was observed by several persons, as a dense bank of greenish clouds with a narrow rope-like pendant. The pendant cloud rose and fell, seldom touched the earth, moved slowly, taking about three minutes to pass Fort Smith, dissolved to a mass of scud occasionally and reformed again at intervals of some miles. Light precipitation and light hail accompanied the storm. Moderate southerly winds prevailed during the day increasing after 6:00 p. m., attaining an extreme velocity of 61 miles at 6:26 p. m. and a maximum velocity for five minutes of 49 miles from the northwest at the same time. The wind shifted often during the storm and remained northwest to west afterwards. The pressure curve showed weak tornado features with a short, sharp drop before the storm and a rise of 0.30 inch in three hours following. Two persons in ordinary buildings in the path of the storm described the passage of the cloud over them as violently shaking the buildings without causing serious damage. The damage resulted from a straight blow that followed the storm by about 10 minutes. A five-month infant was killed at Branch, Ark., and about \$10,000 damage was done at Fort Smith, with one person slightly injured. The storm's path was very narrow and extended from Salisaw, Okla., to Branch, Ark., about 52 miles. The débris and damage in the path showed straight blow effects as did instrumental records and direct observations. Had this storm occurred at night without observation of the tornado cloud probably no tornado would have been reported. Only persons near the tornado cloud heard any attendant noises. 551.467 (048) (98)

#### ARCTIC ICE IN 1925

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The Danish Meteorological Institute has published its annual report on the state of the ice in the Arctic seas.

As usual, the data are most numerous from the Barents Sea, Spitsbergen, the west coasts of Greenland and Alaska, but in 1925 a good deal of information was available from the east coast of Siberia practically no data came to hand. The most notable feature of the year was the unusually small amount of ice observed in practically all the Arctic seas that were visited. During the summer, the Barents Sea was free from ice and the Kara Sea was remarkably open. Spitsbergen waters were very clear, and during August there was open water round practically the whole of the group. Franz Josef Land, as usual, was more or less inaccessible but there was open water on the north of Novaya Zemlya in August. On the east coast of Greenland the ice belt was narrow, and there appears to have been less drift from the north than usual. Bering Strait was open in June, but the north coast of Alaska not until late in July. Commander C. I. H. Sperrschneider, the editor of the report, comments on the facts that for several years, particularly in 1925, little old ice was found in the east Greenland or east Spitsbergen currents, and that most of the ice was of one winter's formation.