

NOTE

Sporadic E Movements on 21 June 1949

An interesting instance of sporadic *E* reflections occurred on 21 June 1949 over North America. These reflections, reported by radio amateurs operating in the 50 mc/s band during the hours of 0000–0400 GMT, are portrayed in figures 1–5. The various radio amateurs report whenever a radio contact is made by means of sporadic *E*. Such contacts are carefully screened to insure that propagation by means of the ground wave or the *F*₂ ionospheric layer is not involved. The midpoints of the great circle paths are then plotted as a dot

in the case of single hop transmission. With a double hop path, an "x" indicates the midpoint of each half of the great circle path. Each map represents the integrated number of contacts received during the one hour period centering on the hour indicated.

The number of reporting amateurs during the entire period was about 300. It is seen that a rather extensive area of North America was blanketed by *Es* during the period shown. The greatest area covered was about 10^6 km². No reports were re-

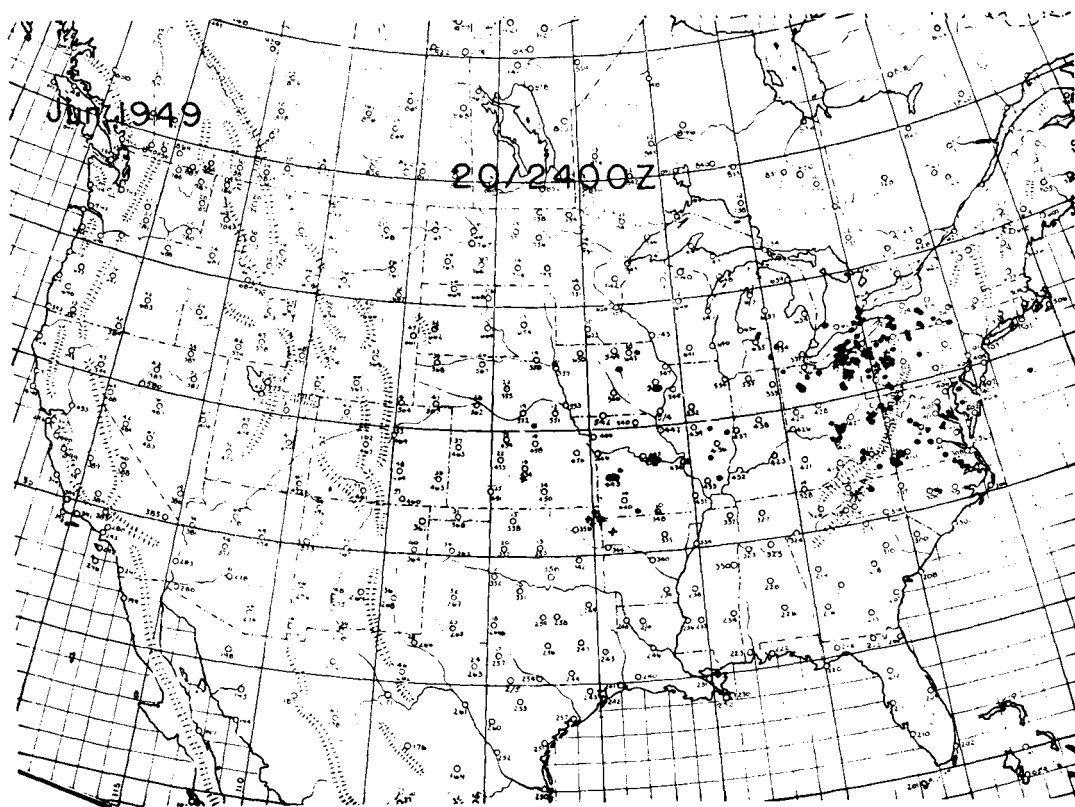
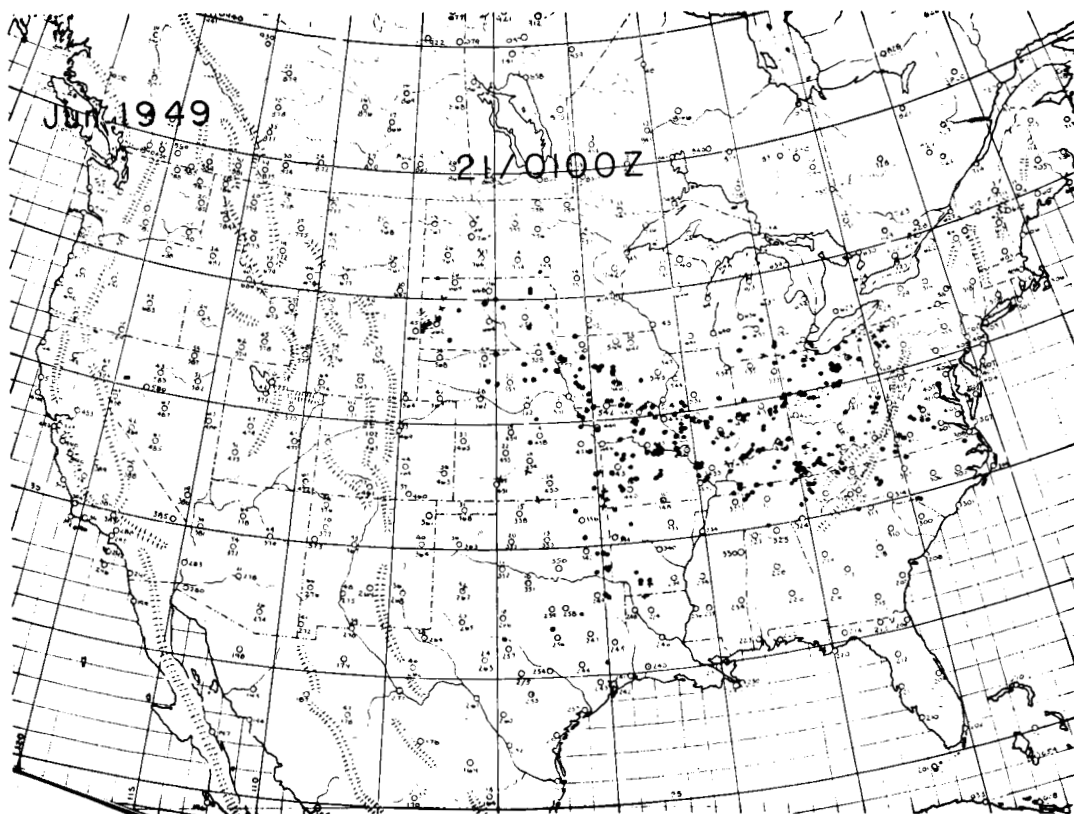
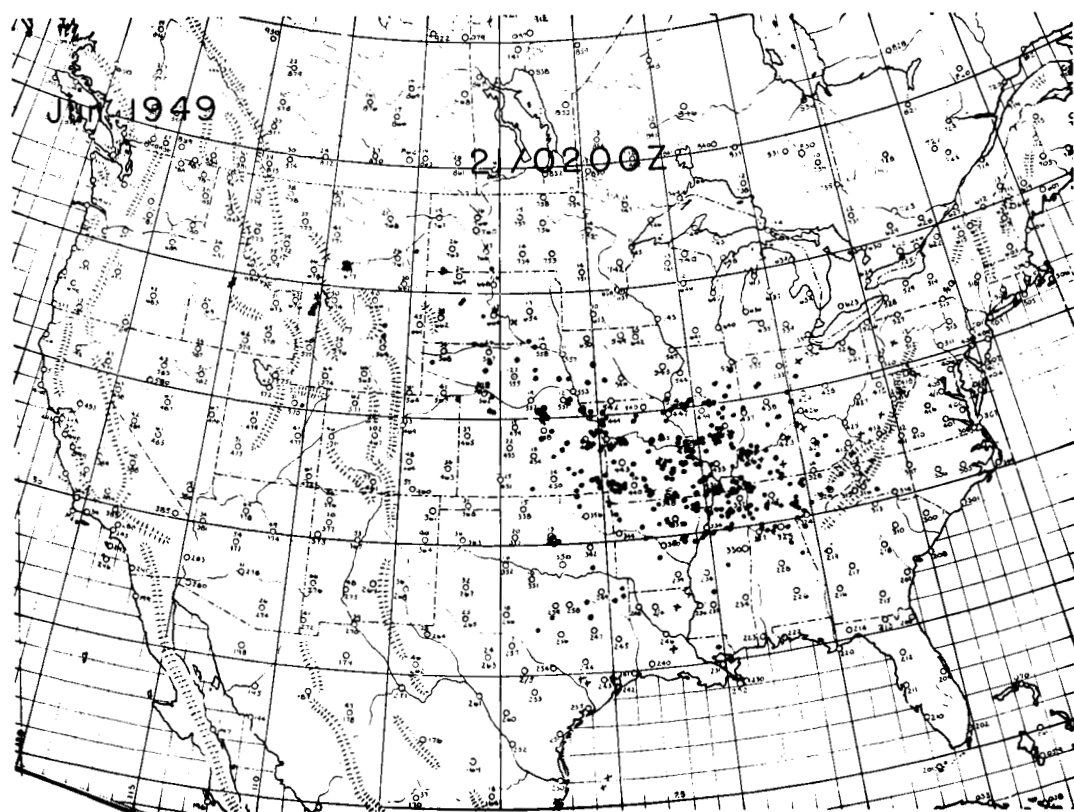


Fig. 1. Hourly summary of sporadic *E* reported by oblique incidence during the hour centered on 0000 GMT.

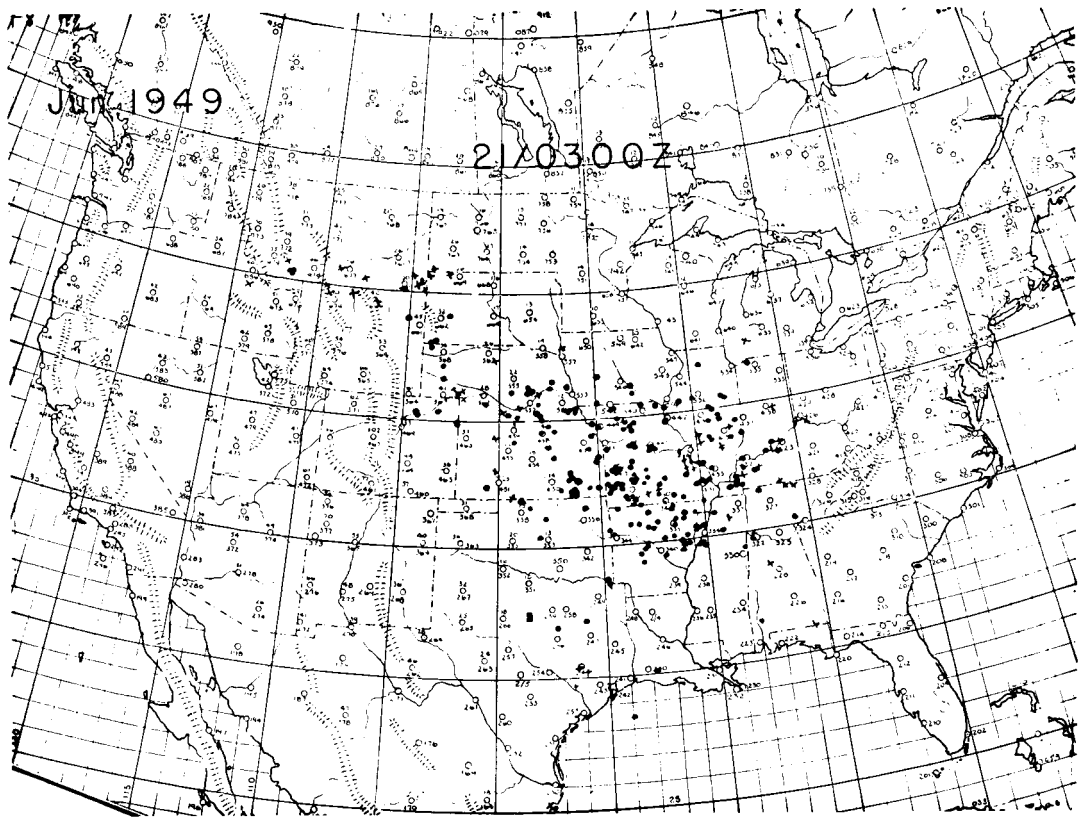


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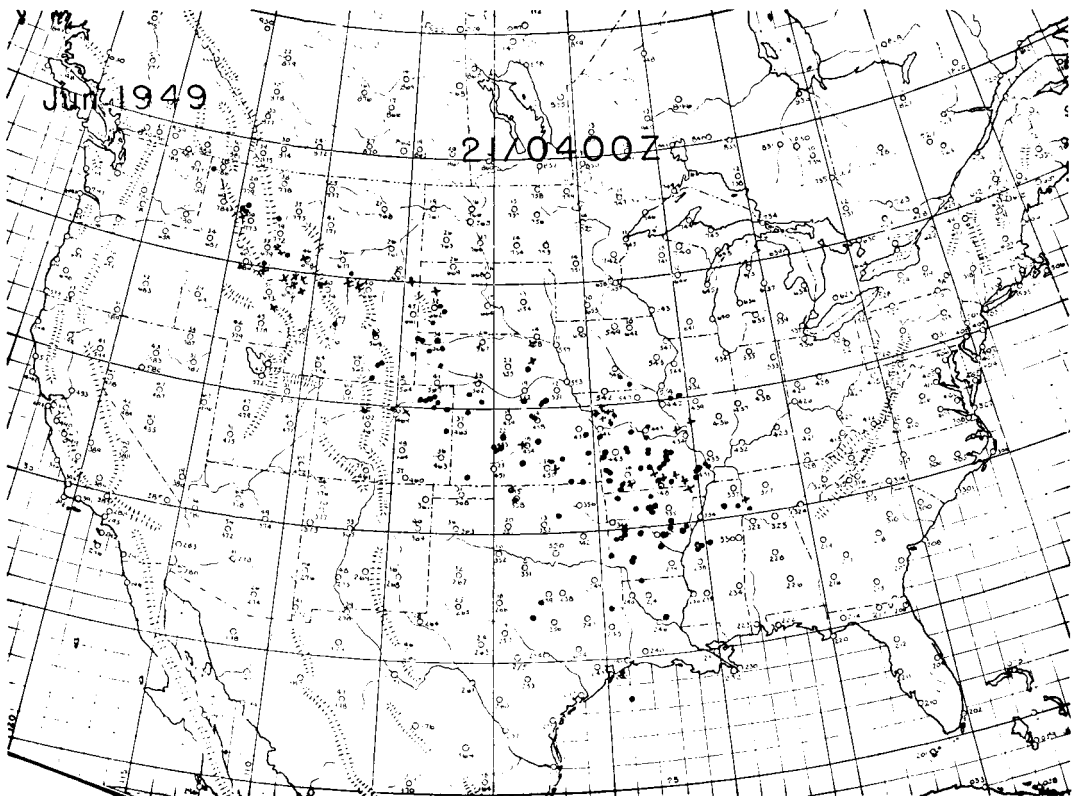


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Fig. 2 and 3. Hourly summary of sporadic E reported during the hour, centered on 0001 and 0002 GMT.



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Fig. 4 and 5. Hourly summary of sporadic E reported during the hour centered on 0003 and 0004 GMT.

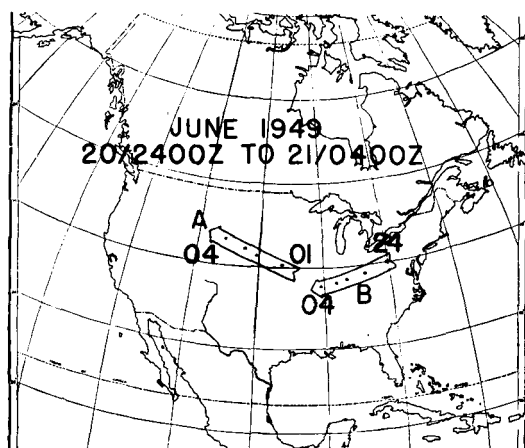


Fig. 6. Summary map showing movement of sporadic E during the period 0000—0004 GMT 21 June 1949.

ceived during the hours immediately prior to or after the time given.

From the maps some type of drift motion at the altitude of *Es* (near 110 km) is evident. Whether such a drift is peculiar to this phenomenon (i.e., solely an electron drift) or whether the reflection areas move about as part of a general atmospheric circulation pattern is not known with certainty. On the assumption that the general drift shown is an actual wind velocity, some indication of the average velocity of movement may be found.

Two centers of *Es* are evident, both appearing at 2400 GMT, 20 June 1949. The first group, B, centered over about southwestern Pennsylvania, moves from the ENE at an average speed of 240 km/hr. Group A, first observed near central Missouri at 2400 GMT, drifts from the SE at an average speed of 250 km/hr. In both cases, the apparent velocity was greatest during the first hour (about

350 km/hr) after which it decreased somewhat as dissipation and general disappearance of the "cloud" occurred. The average speed may be biased by the net number of radio observers operating at any particular time; however, in the above instance a sufficient number of amateurs were on the air both before and after the observational period to have reported *Es* had its effects been detectable at 50 mc/s.

It should also be noted that the term "average velocity", which is determined from the movement of the center of mass of the plotted points, hardly describes the somewhat rapid thrust of the cloud A to the NW during the first 3—4 hours of observation. The average velocity would be expected to be somewhat constant during the motion of the *Es* reflection area inasmuch as it is difficult to conceive of sudden movements or vortices in the atmospheric fluid at altitudes of 110 km.

It is, of course, possible that an apparent motion only is displayed and that in reality the *Es* volume is dissipated at one side and produced at another, much like a banner cloud on the lee side of a mountaintop. The mechanism for such an effect, however, is not immediately understood. A third hypothesis also exists: that the *Es* is formed by some sudden onslaught of particles from space, that these ionize the atmosphere in the vicinity of 110 km and that the ionized particles then move until dissipated. However, the maintenance of such an initially ionized volume for several hours under the known recombination rates of the *E* ionospheric regions is hard to explain.

Appreciation is expressed to the radio amateurs in the United States for their wholehearted cooperation in supplying the observations, to Mr O. P. Ferrell in screening the data, and to Mr F. Crowley for plotting.

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