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DIGITAL RADAR DATA – APPLICATION TO AUTOMATIC PREDICTION OF STORM TRANSLATION AND SEVERE STORM DEPICTION

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Mr. Barclay of the Physical Research Branch of the Bureau of Meteorology who has recently returned after a year's attachment to the National Severe Storms Laboratory (NSSL) at Oklahoma, USA, spoke on aspects of the Federal Aviation Administration's automatic weather prediction project. He had participated in developmental work and research on radar weather display carried out on behalf of the Federal Aviation Administration.

Mr. Barclay outlined the aims of the project in which an effective operational analysis and application of digital radar data to severe storm motion requires continuous computer matching of the echoes. The matching of cell centroids from one observation to the next, based on their intensity and other parameters, was being attempted for individual cells and in real time. This makes it possible to project the paths of cell centroids. However, a difficulty would arise from the marked diurnal variation of thunderstorm and tornado incidence as this variation creates a serious data load problem. Thus, for example, with a resolution of one nautical mile some two million digits of radar information have to be processed during one afternoon of severe storm activity in the operational area.

The speaker then discussed the merits and demerits of rigorously adopting a threshold value of radar reflectivity for the recognition of severe storms, especially of hail. Experience in the USA has shown that the size of the area enclosing an iso-echo line $Z = 10^3 mm^6/m^3$ is not strongly correlated with storm severity. A better correlation is obtained using a threshold value $Z > 10^4$ or $10^5 mm^6/m^3$.

A related problem is the objective prediction of strong shear and maximum wind gust associated with squall-lines which often precede the thunderstorm echoes. It has been tackled by Fourier analysis of Dines anemograph data from a 30-station meso-network, a relevant parameter being the ratio of "wave length" and the distance between recording stations. The objective analyses of both wind speed and direction for one case studied, showed the presence of a band of strong shear about 4 miles in width. Squall lines can be particularly hazardous, as shown by the example of one squall line accompanied by a tornado which, at least initially, lacked a recognisable association with intense echoes from thunderstorms.

Mr. Barclay then reviewed aspects of turbulence as a hazard to civil aviation.

The depiction of likely areas of severe convective turbulence in the immediate vicinity of storms is facilitated by its fairly high correlation with the storm's maximum reflectivity (Z_{max}). The criterion for the occurrence of severe convective turbulence as adopted by the Bureau of Meteorology, viz. $Z \geq 10^5 mm^6/m^3$,