

ROYAL METEOROLOGICAL SOCIETY: AUSTRALIAN BRANCH MEETING

9 August 1979

Rotating Thunderstorms and Tornadoes

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In this interesting and well presented talk Dr Smith (Monash University) first outlined the synoptic conditions for the formation of intense 'super-cell' thunderstorms common in central USA and compared these with Australian conditions. He then explained the widely accepted model of internal structure of these storms developed by Browning and Ludlam, and emphasised the question central to understanding how tornadoes form, namely the way in which parts of systems acquire a zone of strong and usually cyclonic vorticity.

A numerical model of intense cumulus convection in a windshear by Klemp and Wilhenson was then described in which the tendency was noted for the storm to bifurcate into separate updraft centres where the vorticity was a maximum, offering the explanation that the vorticity derived from the convective looping and straining of horizontal vorticity in the windshear.

An account was given of recent progress by the American National Severe Storms Laboratory (NSSL) in the radar sounding of tornado-producing storms. Tornado locations can be identified by a 'signature' of reversal in Doppler measured velocity components in the direction of the radar beam. Refinements, including the use of coupled stereoscopic scanning, have shown that the zone of high vorticity extends the full depth of the stormcloud with a maximum at undercloud level, is approximately vertical, and is usually located (in the northern hemisphere) on the southeastern flank of the main storm cell.

After showing an amusing example of the extent to which the popular press can misinterpret a scientific explanation of the tornado phenomenon, Dr Smith went on to outline the results of a numerical model by himself and Leslie, which reproduces many of the vortex formation characteristics observed in storms by the convective straining and angular momentum convergence of an axially heated axisymmetric system, and therefore offers a plausible mechanism for the means by which vorticity can be concentrated within the updraft region of intensive storms.

The talk concluded with a movie film produced by NSSL showing dramatically examples of the early stages and subsequent development of tornadic storms, and giving rules for their identification.

A.McE.

