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Conference on European Tornadoes and Severe Storms

Satellite observations of storm tops

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Satellite observations are a useful tool in storm nowcasting and forecasting. Though several cloud top features as seen from satellite are believed to reflect aspects of storm intensity, the atmospheric processes leading to their formation & maintenance are not yet fully understood. This presentation reviews results from a joint U.S.-Czech project during 1994-1997 to study storm top features and plans for future research.

Among the best known features are the thermal IR band "cold-U" shapes, coupled with "embedded warm wake" regions. Though several hypotheses have been proposed to explain this structure, its significance for severe storm (supercell) detection remain to be demonstrated on a regular basis. The climatology of occurrence needs to include a significantly higher number of cases than examined in previous studies. Though not as frequent as over the United States, European storms also do exhibit this type of features. Two cases of storms from Europe, exhibiting the cold-U will be presented.

Much less is known about the origin and importance of other satellite-observed cloud top features or structures. The first of these is the 3.7/3.9 micron reflectivity, which seems to be linked to storm cloud top microphysics. Several forms of the increased cloud top reflectivity in this band are known. While some appear to be linked to mesocyclone activity of the storm, others seem to have no apparent relation to the radar-determined structure at all. The second of the more recently revealed structures are the so-called "plumes". These occasionally appear at the tops of storm anvils, or more frequently above them. They can be revealed in the visible and near IR bands (3.7/3.9 micron), yet they are almost impossible to detect in the thermal IR bands (11-12 microns). Most of these plumes seem to be connected with supercell storms, however this link needs to be validated on much broader number of cases than available until now. Plumes have been documented for European as well as for U.S. storms.