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Environmental Research Laboratories Programs and Plans



FY 1989 Programs and FY 1990 Plans



U.S. Department of Commerce
National Oceanic and Atmospheric Administration
Environmental Research Laboratories

Environmental Research Laboratories

The mission of the Environmental Research Laboratories (ERL) is to conduct an integrated program of fundamental research, related technology development, and services to improve understanding and prediction of the geophysical environment comprising the oceans and inland waters, the lower and upper atmosphere, the space environment, and the Earth.

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MESOSCALE RESEARCH DIVISION

Accomplishments FY 89

Mesoscale Convective Systems Research

Research projects within the NSSL Mesoscale Research Division (MRD) continued to focus primarily on the analysis and interpretation of observational data of mesoscale convective systems (MCSs), thunderstorms, and related phenomena. Principal accomplishments in FY 89 were the following:

- Completed the documentation of the precipitation and kinematic structure of a non-squall line MCS. The MCS occurred on 4 June 1985 near the Preliminary Regional Experiment for STORM [Stormscale Operational and Research Meteorology] (PRE-STORM) Kansas dual-Doppler radars. Air-motion analyses reveal different vertical motion profiles in the convective bands of the MCS, and retrieved patterns of perturbation pressure, and buoyancy from the Doppler wind fields reveal that the momentum flux by the convection was much more three-dimensional (3-D), and down-gradient, than for squall lines.
- Completed study focusing on the environment associated with cyclonic vortices that resulted from MCSs. The locations and tracks of 24 mesoscale convectively-generated vortices (MCVs) over the central United States from 1981 to 1988 was determined from satellite imagery, and environmental data were composited relative to the center of each vortex. Results of the composite analyses indicate that the typical MCV synoptic setting is very weak flow—the predominant feature at 500 mb was a longwave ridge with weak winds and wind shear, with both the winds and shear decreasing with time as the MCV develops. These results suggest that both the scale and duration of latent heating and the character of the background synoptic setting are critical factors controlling the development of MCVs.
- Completed momentum flux study using data collected during the Cooperative Convective Precipitation Experiment (CCOPE) squall line of 17 July 1981. The study examined how horizontal momentum was transported in the convective region, how the momentum is generated by the pressure forces, and how the environment of the squall line is affected by the generation and redistribution of momentum.
- Completed a study of convective vertical motions obtained by direct penetration of convective cells by the P-3 aircraft during the 1988 Taiwan Area Mesoscale Experiment project. Vertical motions were weak compared to mid-latitude convective storms. Water loading of the updraft played a substantial role in reducing buoyancy.

Climatology of Southwest Monsoon Mesoscale Convective Systems

A preliminary study of the characteristics of Mexican MCSs has been completed. Examination of Geostationary Operational Environmental Satellite imagery during the warm season revealed several MCSs similar in satellite characteristics to central United States MCSs. Documentation over northern Mexico

