DEPARTMENT SUMMARY

The Department of Meteorology has a broad but focused research program to address scientific questions important to tactical support of both operational commanders and individual forces at sea with regard to high impact weather. For high impact weather, the Navy is turning increasingly to Rapid Environmental Assessment (REA) for tactical support, recently described by our curriculum sponsor, Oceanographer of the Navy (OP-096). Of essence in REA is the detailed and timely Meteorology and Oceanography (METOC) characterization of a limited objective area. REA will call for sequential application of old and new techniques as operation start time (H-hour) nears. This will require enlarging the emphasis from large-scale, predictive, numerical models to include "nowcasting" quick-reaction survey, direct exploitation of remote and in situ observations, innovative processing techniques for satellite data and through-the-sensor environmental measurements.

The Department's currently supported and planned research is designed to meet evolving Navy requirements and also to meet two basic motivations for METOC support: to ensure the safety of the Fleet and the shore establishments in the face of adverse weather and ocean conditions and to provide warfighters a decisive tactical edge by providing environmental parameters for weapons system performance predictions. The following are areas of present and future research support:

a) Development of a unified view of the mesoscale, synoptic-scale, and large-scale environment components of atmospheric circulations that impact Naval operations, including tropical and extratropical cyclones, coastal circulations, and upper-tropospheric circulations;
b) Development and motion of extra-tropical and tropical cyclones;
c) Analysis and modeling dirunal, synoptic, intraseasonal, and interannual variations of tropical and monsoon weather systems;
d) Formulation of methods focusing remote sensing to estimate overwater coastal region radar/radio refraction conditions and aerosol/visibility conditions;
e) Formulation/evaluation of physical models for near-surface turbulence and gradients affecting near-horizon optical propagation;
f) Selection evaluation of commercial equipment to use in integrated shipboard systems that would describe electromagnetic/electro-optical (EM/EO) conditions;
g) Innovative observation and data analysis techniques and modeling method for boundary layer studies that lead to improved representation of boundary layer turbulence and clouds in global and regional models;
h) Development of frontal models for application over the oceans and the land, including topography;
i) Development of real-time mesoscale observing, data management, and mesoscale data assimilation techniques applicable to the coastal environment;
h) Development of local modeling and mesoscale forecasting techniques to improve coastal atmospheric prediction; and
i) Description of air-sea-ice interactions in polar regions through in situ measurements.

RESEARCH FACILITIES

The Department of Meteorology has facilities for both measurement (in situ and remote sensing) of atmospheric phenomena and for numerical modeling/analyses development. In situ measurement devices are in the Marine Atmospheric Measurements Laboratory (MAML) and within a suite designed to be installed on ships of opportunity. MAML has meteorological ground stations, 405 and 915 MHz Doppler-radar wind profilers, a radiosonde system, and a SODAR, at either the NPS or at a Presidio of Monterey (POM) Annex location. Ground stations with airflow sensors and real-time transmission capabilities are located at the Point Sur Lighthouse. A shipboard system consisting of rawinsonde and sensors for airflow properties has been developed with necessary acquisition and calculation support systems. Buoy systems have been developed for measuring air-sea fluxes and surface thermal and wave properties. The modeling/analysis facilities are contained within the Interactive Digital Environmental Analysis (IDEA) Laboratory with 16 workstations and the Remote Sensing Laboratory with four workstations. Both laboratories provide modern computer technology, including computations and display software, and real-time databases. Recently, the Department of Meteorology obtained a SGI multi-processor Computer Server. This allows both research and real-time mesoscale modeling of atmospheric dynamic processes, particularly for coastal regions.