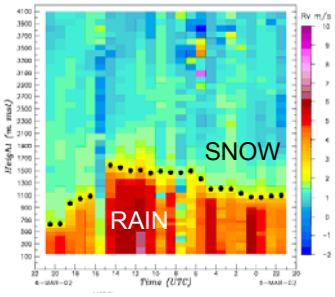
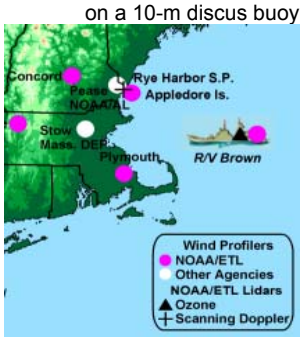
Environmental Technology Laboratory

Developing and applying remote-sensing methods to observe and understand our atmosphere and oceans

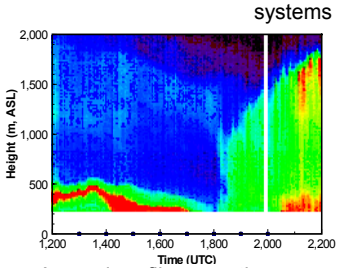


The melting snow is indicated by black dots in this time section of vertical velocity from a radar wind profile.

First test of a radar wind profiler on a 10-m discus buoy



The New England Air Quality Study observing network with the NOAA Ship *Ron Brown* offshore with its ozone and aerosol systems



Aerosol profiles over the ocean measured with the ETL lidar from the *Ron Brown* off of New England. Note the change from onshore (left) to offshore flow (right) through the day.

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What does the Environmental Technology Laboratory do for the nation?

In medical science, there are many technologies for looking inside the human body. Most of us have visited the doctor for X-rays to diagnose a sprained ankle or broken arm. An expectant mother has the opportunity to see her unborn child at several stages of development through the use of ultrasonic imaging. These "remote sensing" methods provide doctors with a means for looking inside the human body in a noninvasive manner.

Similarly, NOAA's Environmental Technology Laboratory (ETL) has developed remote sensing instrumentation that now allows its meteorologists and oceanographers to peer inside the earth's atmosphere to diagnose its behavior and study its interaction with land, water, and ice surfaces. ETL's engineering and scientific expertise help NOAA as it seeks to better monitor, observe, understand and describe the atmosphere so as to provide improved forecasts of its future state.

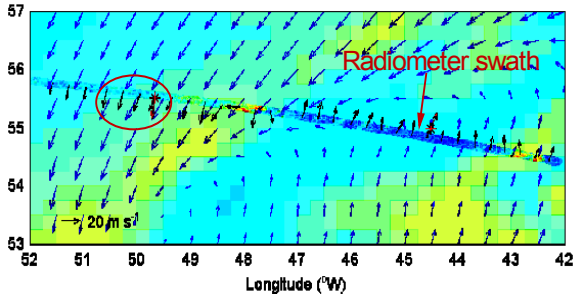
Recent Accomplishments:

- With the goal of accelerating the transfer of scientific and technological advances into operations, ETL has embraced and implemented an observational testbed concept. An initial effort has built off ETL's past, west coast winter storms program in developing a hydrometeorological testbed to improve forecasts of precipitation and runoff in mountainous coastal watersheds. New technology demonstrated in the winter of 2002-2003 included implementation of an automatic snow level detection algorithm for wind profilers and testing of a high-resolution gap-filling weather radar. Previously, during 2001, we carried out the first tests of a buoy-mounted wind profiler to improve offshore observations of approaching weather systems. ***Payoffs: Short-term forecasts in coastal areas still lag those over the continental U.S. because of limited offshore observations and the blocking of conventional weather radar beams by mountains. ETL's focus on testing new observing capabilities in regional testbeds and diagnosing coastal weather phenomena will translate into improvements in NOAA's observing system and forecasts.***

- In partnership with NOAA's Health of the Atmosphere program and with the implementation of a regional observing network over New England in the summer of 2002, ETL deployed, for the first time, an ozone and aerosol lidar on the NOAA Ship Ron Brown, in combination with its sea-going radar wind profiler, to study over-the-ocean transport of air pollution. ***Payoffs: Transport of air pollution over the coastal ocean will be one of the major challenges for future air quality forecast models. ETL's unique remote sensing and analysis capability will help evaluate numerical model performance and improve the science contained within the model.***

- Quantifying the exchange of heat, momentum, moisture, and trace gases between the atmosphere and ocean has been a major challenge for weather and climate models. ETL in collaboration with university and international research communities has continued to develop and update the NOAA/COARE (Coupled Ocean Atmosphere Response Experiment) bulk flux algorithm that has attained the status of a global standard for weather, climate, and research applications. In addition, ETL has now extended its applicability to estimating CO_2 fluxes over the ocean. ***Payoffs: Improving the parameterizations of surface exchange in climate models will reduce one element of uncertainty in future climate predictions.***

- ETL is the first to have demonstrated two-dimensional mapping of the near-surface ocean wind field using passive polarimetric radiometry from an aircraft. ***Payoffs: The ETL effort directly supports the NPOESS Integrated Program Office in development of radiometric instruments that are scheduled for use on board the first NPOESS satellite in 2009.***



Wind vectors from polarimetric radiometer swath observed from the air compared with operational model winds in the North Atlantic

What's next for ETL?

Major emphases for ETL over the next five years include:

- Further development of the observing and modeling testbed concept as a means of accelerating the transfer of science and technology to the operational side of NOAA. The initial foci are on hydrometeorology and air quality.
- Increasing our ability to observe and model the planetary boundary layer, as the interface between the atmosphere and the Earth, continues to be a major challenge scientifically and a focus of the National Weather Service Science and Technology Infusion Plan. Our regional observational programs will emphasize testing and improving of numerical model physics, particularly in areas of cloud-radiation-surface feedbacks, situationally sensitive areas such as coastal and ocean interfaces, urban areas, and over the Arctic.
- Increasing our activities in linking weather and climate time scales. For time scales from a few weeks to a month or more, numerical weather prediction has marginal skill while climate prediction models are designed for much longer time scale. Thus, the weather-climate connection time scale is one that requires new observational and diagnostic methods as well as a focused research effort. This is an area where ETL's observational and analysis capabilities complement the climate diagnostic effort of its primary partner in this effort, namely the NOAA Research Climate Diagnostic Center.

Research Partnerships:

ETL's major external research partner is the Cooperative Institute for Research in the Environmental Sciences (CIRES) at the University of Colorado where we co-lead the Regional Processes and Advanced Observing and Modeling Research Themes. Internally we are developing stronger internal relationships with other OAR Laboratories and NOAA Line Offices. We also maintain long-term relationships with other federal agencies, universities, state agencies, and international collaborators.

Budget and Staff

The FY 2003 enacted budget for the ETL budget lines totaled $7.5M, and its request for FY 2004 totaled $8.1M. ETL has 56 federal employees, 23 contractors, and 31 Joint Institute employees.

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