

ENVIRONMENTAL TECHNOLOGY LABORATORY

Boulder, Colorado

Mission

The Environmental Technology Laboratory (ETL) supports the strategic goals of NOAA and OAR through regionally specific research efforts in weather, climate, and air quality that exploit the Laboratory's unique expertise in remote sensing of the geophysical environment.

Brief History

The Wave Propagation Laboratory (now ETL), like a number of the original Boulder Laboratories, grew out of the research of the Central Radio Propagation Laboratory in the late 1960s. The laboratory, formed in 1967 under the leadership of Dr. C. Gordon Little, focused on developing remote sensing methods (optical, radio, and acoustical) as a new means to study the geophysical environment. In the 1970s and early 1980s, ETL began focusing on a number of practical problems including applying its acoustical and optical remote sensing methods to the study of regional air quality. The transfer of the boundary layer research group from the Air Force Cambridge Labs to ETL in the mid-1970s accelerated these efforts. In addition, ETL began developing and demonstrating the value of operational networks of radar wind profilers for weather forecasting. In the course of these activities, the Prototype Regional Observing and Forecasting System (PROFS) and the Wind Profiler Demonstration Network were spun off from the laboratory and later formed the nucleus for the Forecast Systems Laboratory in 1988. Most recently, in response to a number of external reviews, the laboratory has narrowed its focus to developing and refining remote sensing technology for regional weather and climate applications while maintaining its unique blend of physicists, engineers, and meteorologists necessary to promote science and technology transfer. Currently, two of ETL's four Divisions focus on technological innovations in the areas of optical and microwave propagation, including airborne remote sensing, while the other two focus on 1) applications to surface, cloud, and radiative processes, and 2) applications to problems in regional weather and climate.

Financial Data (In thousands of dollars)

Fiscal Year	Permanent Funding	Other NOAA	Non- NOAA	Pass Through	TOTAL
FY 2001	4944	4083	10065	462	19554
FY 2002	2922	4592	8695	0	16209
FY 2003	5230	4266	8364	0	17860

Note: Non-NOAA funds are used to both prefund Joint Institute staff into the following year and also represent new funds as well as funds that are carried over from the previous fiscal year. The actual annual operating expense for ETL for FY03 was \$14,100.

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Personnel Data

FY	FEDERAL EMPLOYEES	JOINT INSTITUTE	Contractors	TOTAL
FY 2000	69	57	27	163*
FY 2001	73	51	29	158*
FY 2002	59	26 FT 5PT	14FT 7PT*	111*
FY 2003	56	24 FT 7PT	14FT 9PT*	110**

* Students appear as part-time contractors (FY02- 3 students FY 03 6 students)

** FY 00 Guest Workers/Post Docs= 10 for a staff total of 163

** FY 01 Guest Workers/Post Docs= 5 for a staff total of 158

** FY 02 Guest Workers/Post Docs= 7 for a staff total of 118

** FY 03 Guest Workers/Post Docs= 11 for a staff total of 121

Average Age Federal/Scientific/Engineering and Technical Staff 48

Average Age of JI/Scientific/Engineering and Technical Staff 46

Federal Staff	PhD	41% MS	13%
JI Staff	PhD	59% MS	16%
Federal Scientific Staff	PhD	73% MS	27%
JI Scientific Staff	PhD	70% MS	26%

Environmental Technology Laboratory (ETL)

PARTNERSHIPS

PARTNERSHIPS	IDENTIFY (and explain)
<p><u>JOINT INSTITUTES</u></p> <p>ETL's work with joint institutes is focused on fundamental process studies that have the potential to advance NOAA's strategic priorities.</p> <p>CIRES - Cooperative Institute for Research in the Environmental Sciences - University of Colorado</p> <p>CIRA - Cooperative Institute for Research in the Atmosphere - Colorado State University</p> <p>CU-INSTAAR - University of Colorado Institute for Arctic and Alpine Research</p> <p>CIFAR - Cooperative Institute for Arctic Research - University of Alaska</p>	<p>CIRES</p> <ul style="list-style-type: none"> • flux measurements • satellite calibration/validation • airborne radiometric field studies • measurements and modeling • turbulence • planetary boundary layer processes • Arctic processes • societal impact research <p>CIRA</p> <ul style="list-style-type: none"> • cloud chemistry <p>CU-INSTAAR</p> <ul style="list-style-type: none"> • Antarctic processes <p>CIFAR</p> <ul style="list-style-type: none"> • Steller's sea lion research

OTHER NOAA LABS

ETL partners with other NOAA labs to address NOAA priorities through OAR, NOAA, multi-agency, and international programs.

HOA - Health of the Atmosphere

ITCT - Intercontinental Transport and Transformation Chemical and

BAO - Boulder Atmospheric Observatory

TARS - Tethered Aerostat Radar System

IHOP- International H₂O Program

MAP - Mesoscale Alpine Project

AL

- HOA
- air quality
- air chemistry and aerosols
- ITCT

AOML

- CO₂ flux measurement

ARL

- airborne radiometric soil moisture mapping

CDC

- Climate/Weather Connection

CMDL

- BAO - solar and thermal radiation monitoring
- Arctic climate - aerosol and radiation monitoring
- Arctic change - decadal analysis
- aerosol monitoring
- CO₂ remote profiling

FSL

- TARS Profilers
- air quality
- satellite winds
- cooperative agency profilers
- IHOP

GFDL

- cloud modeling

NSSL

- MAP
- IHOP

- PMEL flux monitoring
- Arctic climate - aerosol and radiation measurements
- Arctic change - decadal analysis
- aerosol monitoring

OTHER OAR PROGRAMS

ETL participates in a variety of OAR programs designed to advance NOAA's strategic priorities.

- CLIVAR - Climate Variability and Predictability
- SEARCH - Study of Environmental Arctic Change
- EPIC-Eastern Pacific Investigation of Climate
- NAME-North American Monsoon Experiment
- IHOP - International H₂O Program
- QPF - Quantitative Precipitation Forecasting
- PSR - Polarization Scanning Radiometer
- THORPEX - The Observing System Research and Predictability Experiment

OGP

- flux - ocean observing and CLIVAR
- Arctic climate (SEARCH)
- cloud observations (EPIC, NAME)
- satellites retrievals- Climate Change and Detection
- air chemistry modeling

USWRP

- IHOP
- cool season QPF
- airborne PSR field studies
- THORPEX

HOA

- air quality

Sea Grant

- radiometric airborne salinity mapping

Steller's Sea Lion Study

- lidar-based airborne fish stock assessment

OTHER NOAA RELATIONSHIPS

ETL partners with a number of non-OAR NOAA elements to more firmly link research activities to operational needs.

NCEP - National Centers for Environmental Prediction

EMC - Environmental Modeling Center

NOHRSC - National Operational Hydrologic Remote Sensing Center

NWP - Numerical Weather Prediction

STIP - Science and Technology Infusion Plan

ORA - Office of Reserach and Applications

NCDC - National Climatic Data Center

JCSDA - Join Center for Satellite Data Assimilation

AMSU - Advanced Microwave Sounding Unit

IPO - Integrated Program Office

Ghostnets - lost or abandoned fishing nets

NPOESS - National Polar-orbiting Environmental Satellite System

CALJET/PACJET - California/Pacific Land-falling Jets Experiment

NWS

- radiative transfer modeling (NCEP)
- satellite algorithm/product development (NCEP)
- sea surface flux - ocean model assimilation (NCEP/EMC)
- geosynchronous microwave sounder development
- cold land process experiment (NOHRSC)
- coastal waveheight mapping
- satellite winds (NCEP)
- high resolution temperature forecasting program
- NWP model evaluation (NCEP)
- STIP planning committees
- sodar deployment at San Francisco airport

NESDIS

- satellite algorithm/product development (ORA, NCDC)
- radiative transfer modeling (JCSDA)
- geosynchronous microwave sounder development
- AMSU interference studies (IPO)
- fish lidar - Ghostnets
- satellite winds (NPOESS)
- NPOESS risk reduction and cal/val (IPO)

NMFS

- fish lidar - Ghostnets
- fish lidar - Pacific northwest sardine surveys
- Airborne Oceanographic Package
- fish lidar - Steller's Sea Lion Study

NOS

- airborne salinity and coastal color mapping

Climate and Global Change Program

- aerosol and cloud observations

NMAO

- RV Ron Brown radar system maintenance
- Airborne Oceanographic Package
- CALJET/PACJET flight operations

OTHER FEDERAL AGENCIES

ETL seeks to advance NOAA's strategic priorities by selectively partnering with other federal agencies having mutual interests.

AMSR-E - Advanced Microwave Scanning Radiometer for earth observing

Ghostnet - lost or abandoned fishing net

GPM - Global Precipitation Monitoring

ARM - Atmospheric Radiation Measurement Program

USFS - US Forest Service

FAA - Federal Aviation Administration

TARS - Tethered Aerostat Radar System

ONR - Office of Naval Research

ARO - Army Research Office

SHEBA - Surface Heat Budget of the Arctic

NASA

- satellite algorithm/product development
- airborne soil moisture mapping
- AMSR-E cal/val
- fish lidar - Ghostnets
- ground-based profiling for climate applications
- satellite wind measurements
- CO₂ profiling
- GPM ground validation

DOE

- ground-based profiling for climate applications (ARM)
- air pollution studies

USDA

- airborne soil moisture mapping
- AMSR-E cal/val
- improve wildfire fighting (USFS)

TVA

- air pollution studies

NSF

- Arctic cloud research

DOT

- ground based icing detection system (FAA)
- jet aircraft impact on air quality (FAA)

U.S. Coast Guard

- Farallon Island wind profiler
- SHEBA Ice Breaker

DOD

- air-sea interaction research
- TARS wind profiler development (Air Force)
- ocean acoustic propagation for climate monitoring (Navy/ONR)
- satellite algorithm/product develop (Navy)
- sodar development (Army)
- boundary layer research (Army/ARO)

STATE AGENCIES

ETL partners with state agencies to advance NOAA's priorities through close interaction with end users.

BAO - Boulder Atmospheric Observatory tower

TCEQ - Texas Commission on Environmental Quality

NESCAUM - Northeast States for Coordinated Air Use Management

CalTrans - California Department of Transportation

Colorado Dept. of Health

- BAO boundary layer monitoring for air quality

TCEQ

- air quality studies

California Air Resources Board

- boundary-layer processes and model evaluation for air quality

NESCAUM

- New England air quality research

California water managers

- fresh water resource management

CalTrans

- winter weather for highway maintenance

LOCAL AGENCIES

ETL interacts with local agencies primarily through outreach activities.

Town of Erie, Colorado civic outreach

University of Colorado student research activities

University of Colorado - High School Honors Institute (ETL mentors)

Boulder Valley high school student summer intern program

Boulder Valley School District primary and secondary educational outreach

Fish lidar - herring and salmon survey techniques (Prince William Sound Science Center)

<p>UNIVERSITY</p> <p>ETL partners with a number of universities to gain access to world class researchers with complementary areas of expertise. The resulting synergy can greatly accelerate research discoveries and the eventual transfer of new knowledge into NOAA operations. Collaborations include studies centered around novel sensor development, air quality applications, climate dynamics, air-sea interaction, cloud microphysics, marine ecosystems, etc.</p> <p>NCAR - National Center of Atmospheric Research</p>	<p>NCAR</p> <p>University of Colorado</p> <p>Colorado State University</p> <p>Wood Hole Oceanographic Institute</p> <p>University of Arizona</p> <p>Georgia Institute of Technology</p> <p>University of Miami</p> <p>University of California, Los Angeles</p> <p>University of Washington</p> <p>University of Wisconsin</p> <p>University of Texas, College Station</p> <p>Massachusetts Institute of Technology</p> <p>University of Alaska</p> <p>California Institute of Technology</p> <p>University of California, Santa Cruz</p> <p>Carnegie-Mellon University</p> <p>Pennsylvania State University</p> <p>University of Massachusetts</p> <p>Oregon State University</p> <p>University of Utah</p> <p>Texas A&M</p> <p>University of Alabama, Huntsville</p> <p>University of New Hampshire</p> <p>State University of New York</p> <p>Naval Postgraduate School</p>
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INTERNATIONAL

Climate and weather are world-wide concerns. International collaborations allow ETL to remain connected and contribute to the larger scientific community. These connections enhance ETL's reputation and ability to leverage knowledge gained, not only for NOAA's benefit, but for the benefit of mankind as a whole.

CSIRO - Commonwealth Scientific and Industrial Research Organization

SST - sea surface temperature

EUMETSAT - European Organization for the Exploitation of Meteorological Satellites

CNRS - Centre National de la Recherche Scientifique

CSIRO, Australia

- flux measurement technology and parameterizations

Environment Canada, University of Toronto

- Arctic climate

World Climate Research Organization

- flux advisory working group

Global Ocean Data Assimilation Experiment

- high-resolution SST product

Vaisala, Finland

- CRADA for wind profiler development

EUMETSAT

- geosynch. microwave sounder studies

Tel Aviv and Hebrew University, Israel

- aerosol-cloud interaction studies

Communications Research Laboratory, Japan

- space-based winds

University of Stockholm

- Arctic boundary layer processes

University of Leeds, United Kingdom

- cloud modeling

Norway

- fish lidar - mackerel surveys

CNRS, France/Univ. of Innsbruck, Austria

- Mesoscale Alpine Project

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