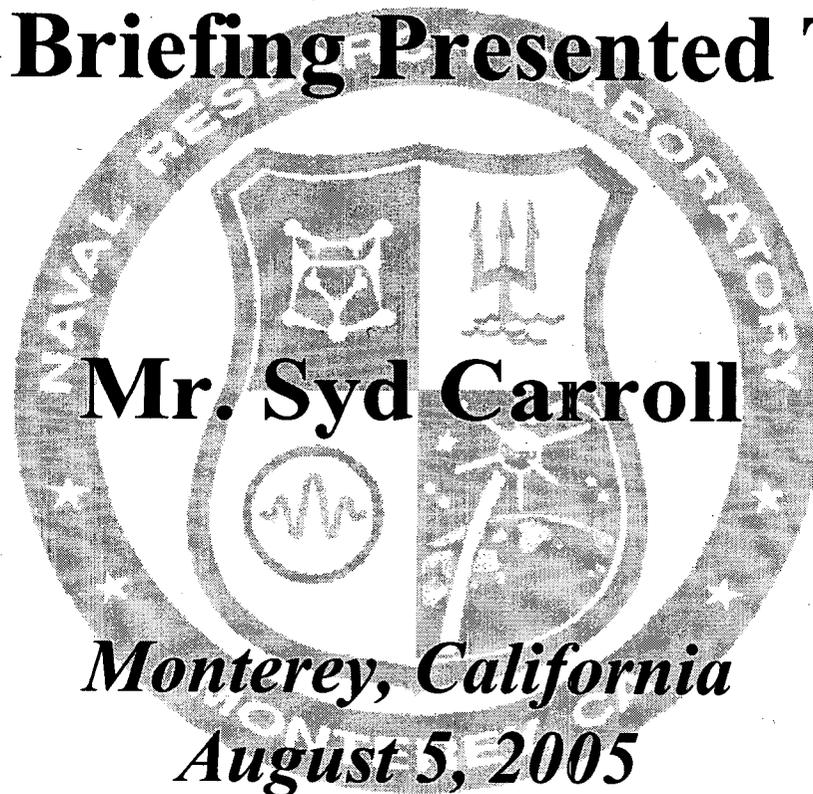




# NAVAL RESEARCH LABORATORY MARINE METEOROLOGY DIVISION



## A Briefing Presented To



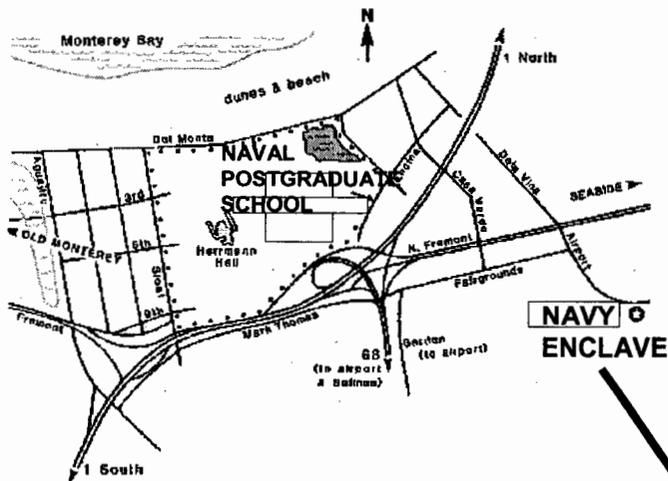
**Mr. Syd Carroll**

*Monterey, California*

*August 5, 2005*

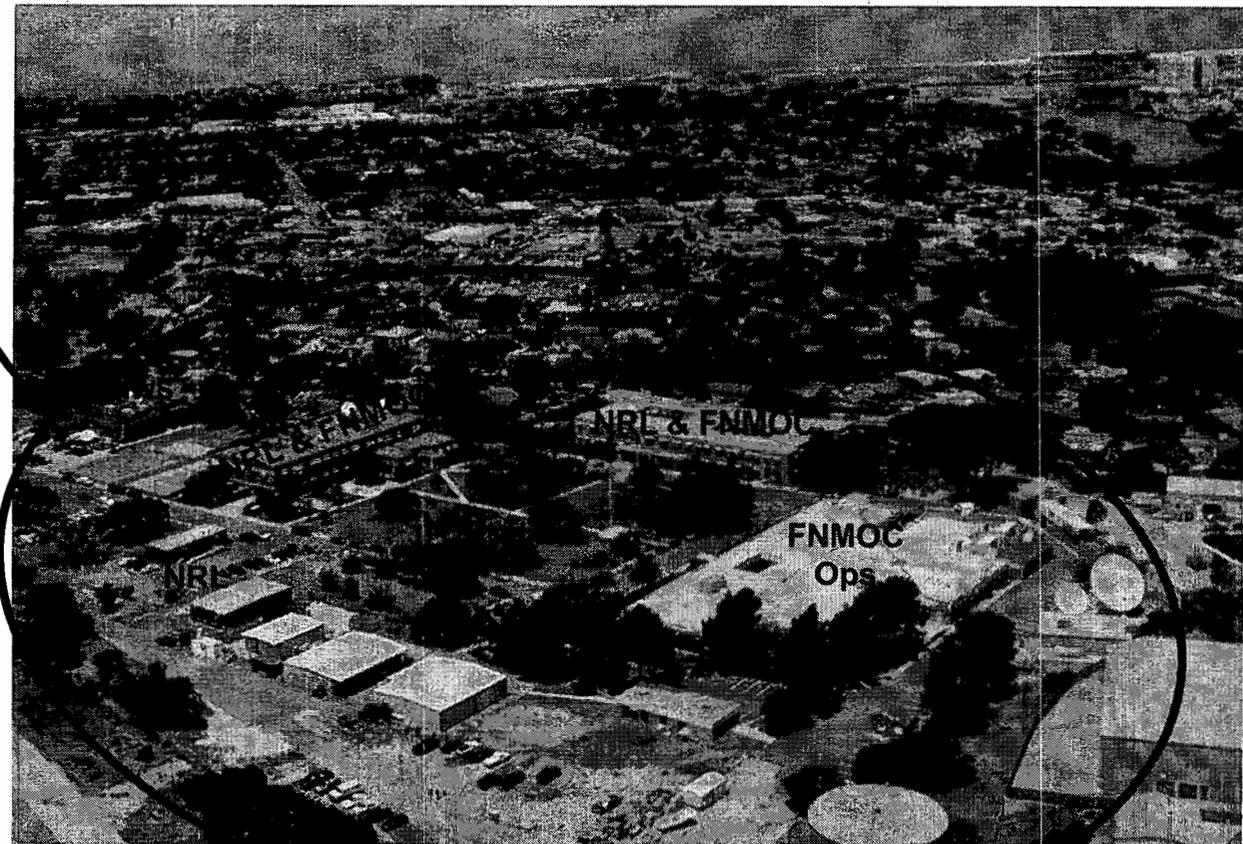


# NAVAL RESEARCH LABORATORY MARINE METEOROLOGY DIVISION



## Navy Enclave Facility

This facility is shared by NRL, FNMOC, and the National Weather Service, and is located ~ 2 miles from NPS campus.



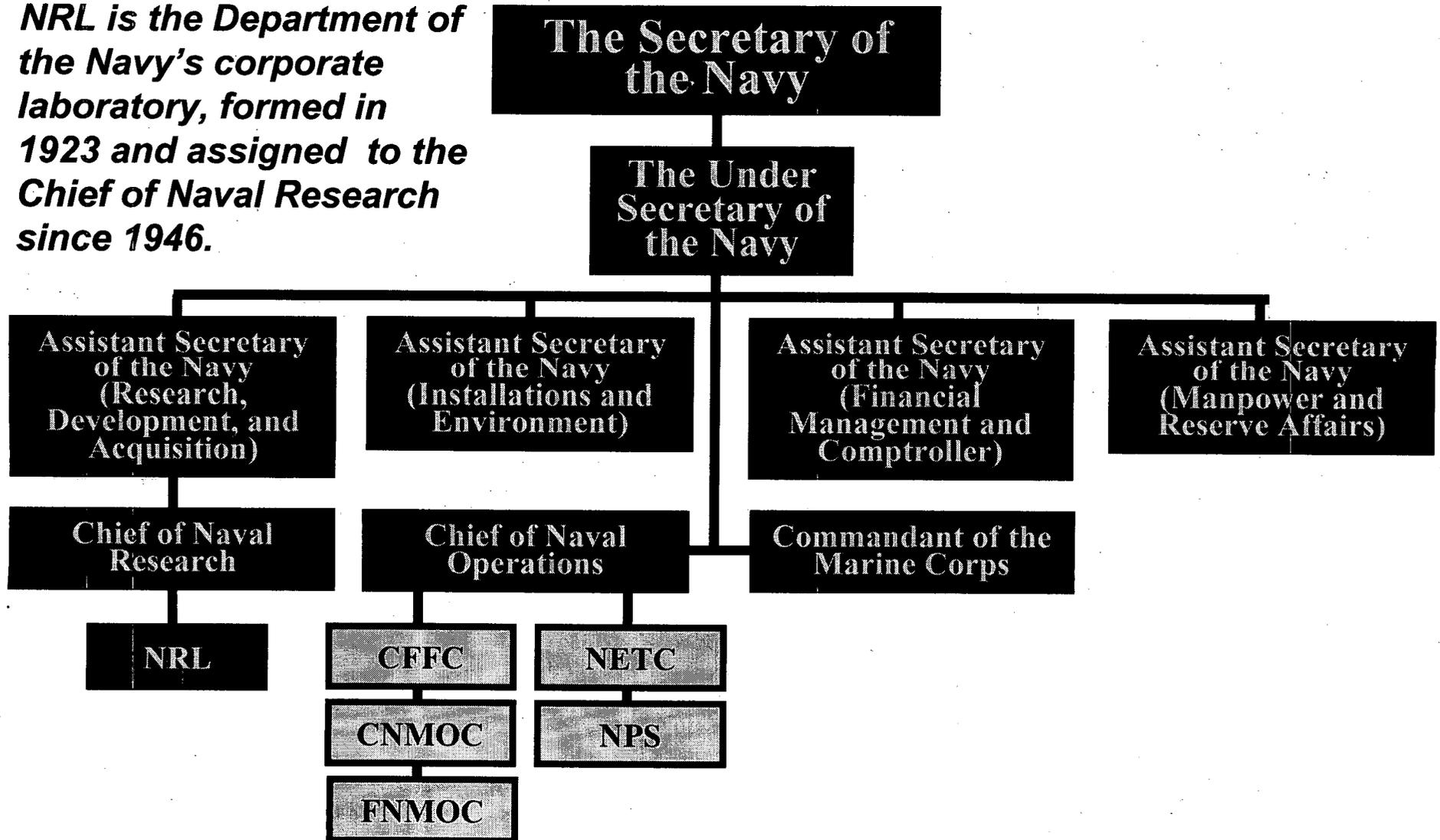
We receive all facility support from Navy Region SouthWest. We are self-sufficient operationally and administratively, and are not dependent upon NPS to accomplish our mission or provide base support.



# Naval Research Laboratory



*NRL is the Department of the Navy's corporate laboratory, formed in 1923 and assigned to the Chief of Naval Research since 1946.*



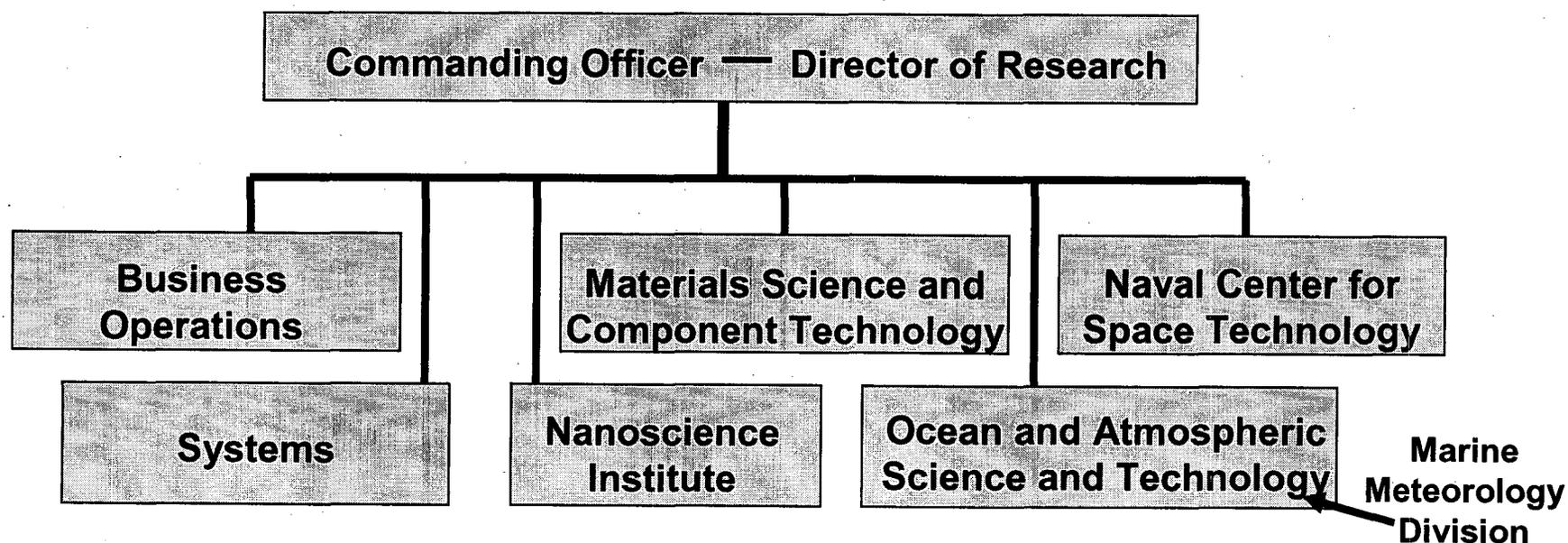


# Naval Research Laboratory Structure

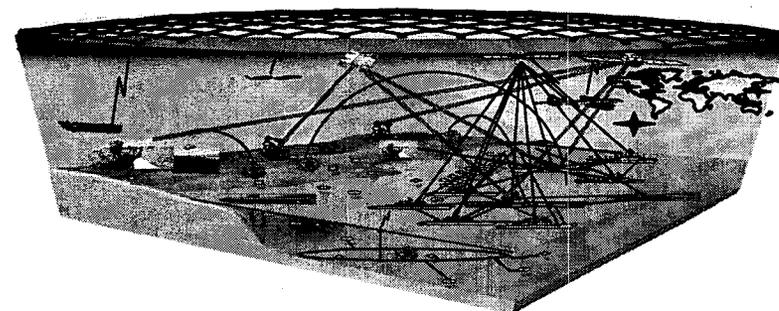
Organization



NRL employs approximately 2500 civilian scientists and has a long history of producing cutting-edge science and technological inventions and products to support DOD requirements.



The Ocean and Atmospheric S&T Directorate performs scientific and technological R&D from the bottom of the sea floor to the top of the atmosphere into space, to populate the 4D battlespace with analyzed and forecasted environmental data in support of the DOD mission.



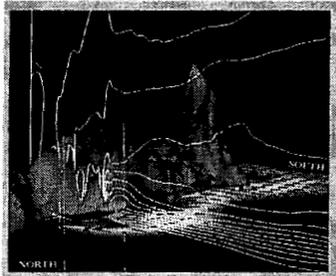
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# NAVAL RESEARCH LABORATORY MARINE METEOROLOGY DIVISION

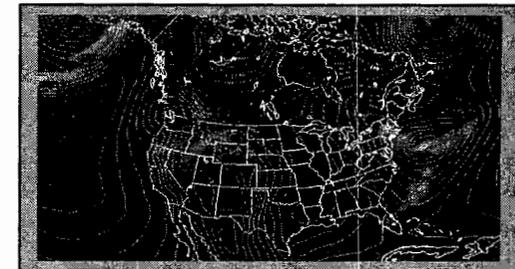


## *Our Division's Mission*

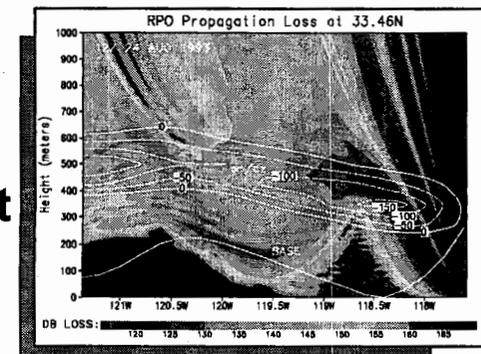


To understand and simulate the behavior of the atmosphere on local, regional, and global scales, including its interaction with the ocean, land and cryosphere...

To apply that knowledge to the development and implementation of objective analysis and prediction systems and automated weather interpretation systems for Navy/DoD users ...



To study the effect of atmospheric conditions on Navy weapons systems and provide meteorological data support for input to tactical decision aids...



...Meeting identified and *anticipated* Navy & DOD needs.

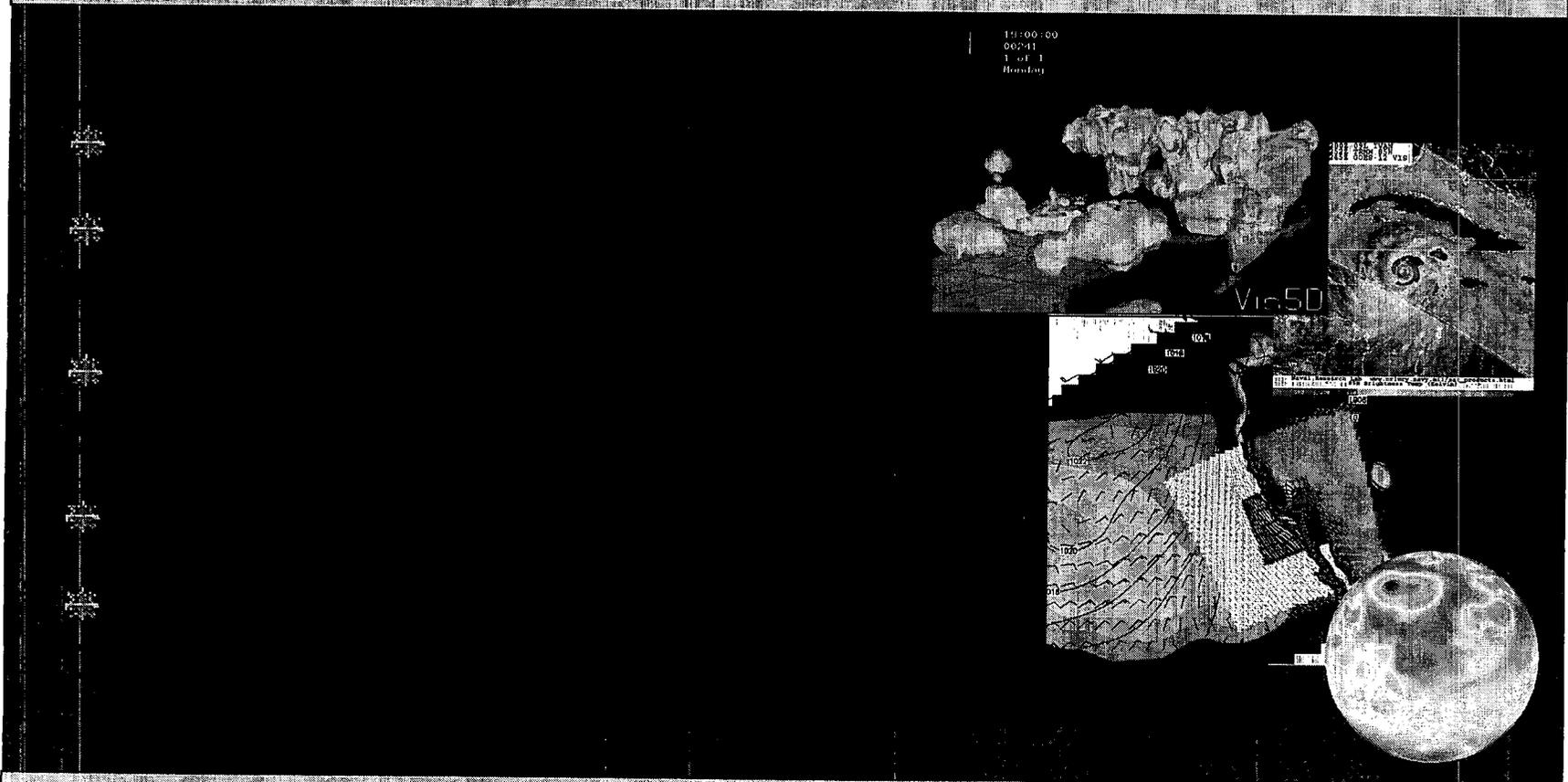
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# Naval Research Laboratory Marine Meteorology Division



## Developing Quality Products to Meet DOD Needs



DOD's Only Laboratory S&T Program in Atmospheric Sciences

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# NRL Develops the Systems FNMOOC Generates and Distributes Products



## NRL Aerosol Analysis and Prediction System

Navy Operational Global  
Atmospheric Prediction System

### NOGAPS & NAAPS

- \*Global Coverage
- \*Meso- to Synoptic Scale
- \*1-5d Guidance/ 10d Ensemble
- \*Weather, Ice, SST, Aerosols

### COAMPS®

- \*Nested Regional Coverage
- \*Nonhydrostatic Scale
- 72h Guidance
- \*Weather, Ocean, and Aerosols

### COAMPS-OS®

- \*Nested Local Coverage
- \*Tactical Scales
- 24h Guidance, on-demand
- \*On-Scene, local data assimilation

### NOWCAST

- \*Rapid Environmental Assessment
- \*Warfighter Time & Space Scales
- \*0-6h Guidance, Rapid Update
- \*Real-time, Automatic, Data Fusion

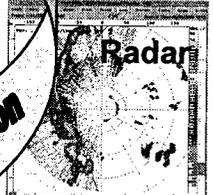
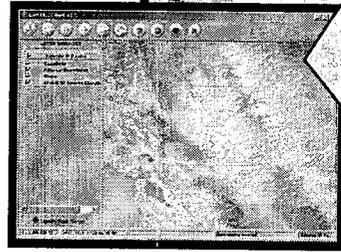
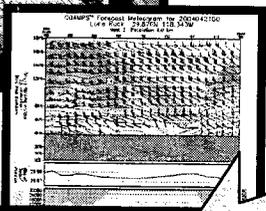
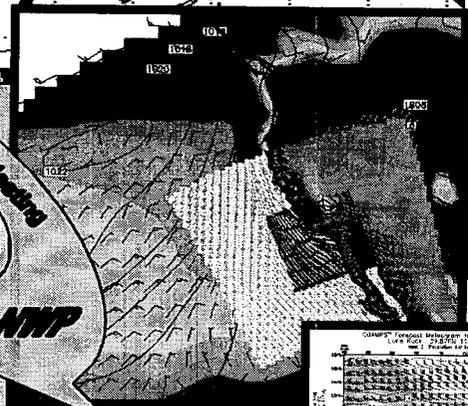
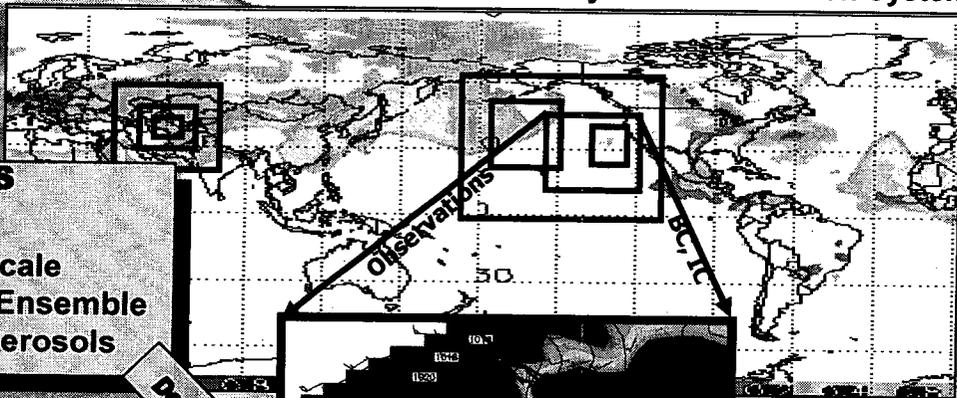
Down-Scale Nesting

NWP

Through-the-Sensor Obs

Data Fusion

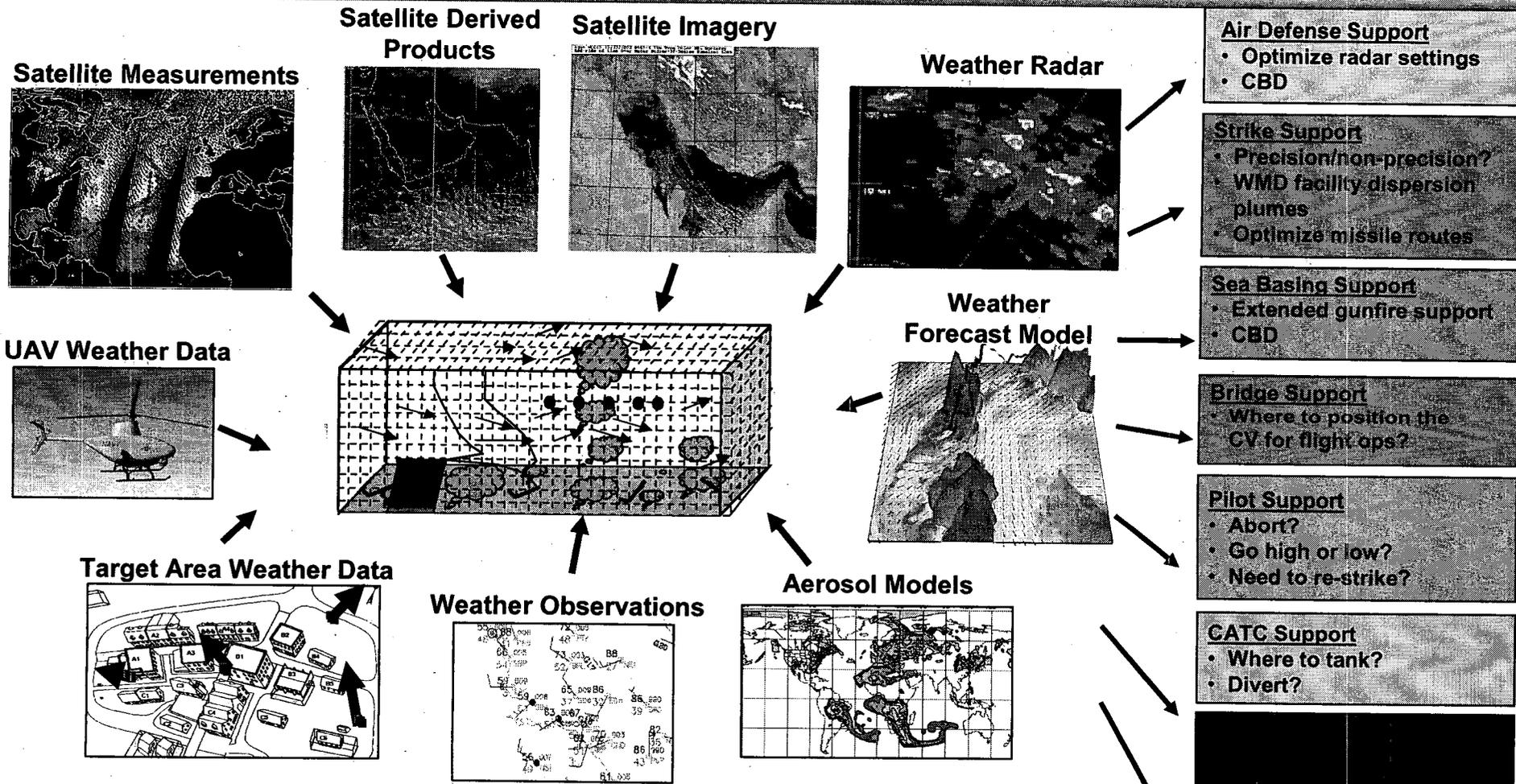
Coupled Ocean/ Atmosphere  
Mesoscale Prediction System





# Marine Meteorology Division

## Supporting the Warfighter



Given a few observations, model products are the only source of information that provide a realistic 4-dimensional representation of the atmospheric state consistent with known dynamical and physical relationships

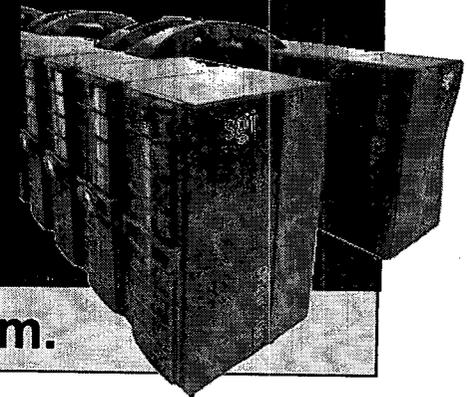


# Naval Research Laboratory

## Marine Meteorology Division



**Collocated with FNMOC for Effective Transition**



**NRL and FNMOC are a tightly linked team.**

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# Marine Meteorology Division

## Supporting NAVY Customers

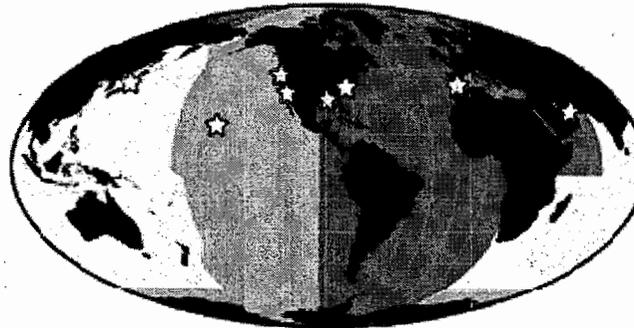


### Fleet Numerical

### Regional METOC Centers

### Ships

**On-scene  
Demonstrations**



**Fleet Battle  
Experiments**

- Global, Mesoscale, and Local Scale Weather Models
- Coupled Models (Air, Ocean, Wave, Aerosol)
- Data Assimilation, Data QC and Monitoring Tools
- Nowcasting System
- Remotely Sensed Data Products
- Automated Tropical Cyclone Forecast System
- Port Studies, Forecast Guides, Hurricane Havens Handbooks
- TAWS (Target Acquisition Weapons System)
- AREPS (Advanced Refractive Effects Prediction System)

**FNMOCC is the primary customer for mature NRL S&T, taking over responsibility for 24/7 execution and delivery of products that have met V&V requirements.**



# Marine Meteorology Division

## Supporting Joint Customers



### ***Non-Navy DOD customers for NRL S&T:***

#### **Air Force**

53<sup>rd</sup> AF Recon Squadron  
Operational Weather Squadrons  
Joint Typhoon Warning Center  
Ramstein, Shaw, Prince Sultan,  
Wright Patterson AF Bases  
Air Force Weather Agency  
AFTAC  
Air Force Research Laboratory  
Air Force Academy  
Combat Climatology Center  
Technical Applications Center

#### **Army**

Aviation Regiment  
Cold Regions Research &  
Engineering Lab  
Coastal Hydraulics Lab  
Topographic Engineering  
Center  
Army Research Laboratory  
18<sup>th</sup> Airborne in Iraq

#### **Coast Guard**

Various CG Cutters, Stations  
CG Marine Safety Office  
Command and Operations  
School

#### **Marine Corps**

Marine Aviation Weapons &  
Tactics Squadron-1

#### **DOD**

STRATCOM

OSD

Defense Threat Reduction  
Agency

Defense Modeling and  
Simulation Office

#### **DOD-related**

CIA

Dept. of Homeland Security

DOE National Laboratories

National Geospatial-  
Intelligence Agency

***Non-DOD customers for NRL S&T:*** NOAA, NASA, FAA, United Nations, Peace Corps,  
Maritime and Aviation Industries, Tropical Cyclone Forecasters around the globe



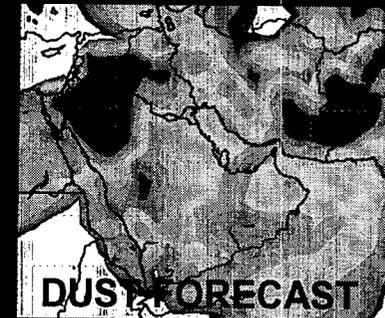
# Naval Research Laboratory

## Marine Meteorology Division



### Quickly Responding to Rapidly Changing DOD Needs

■  
■  
■  
■  
■



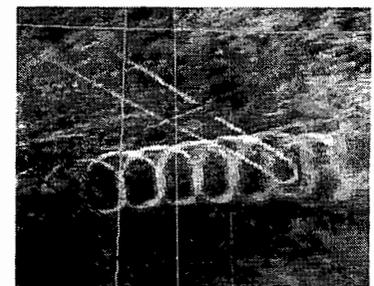
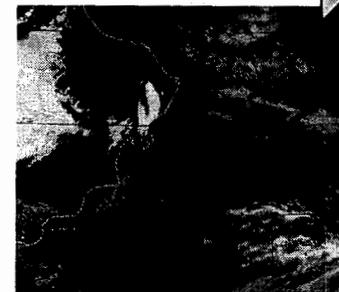
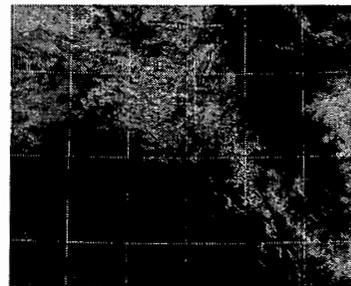
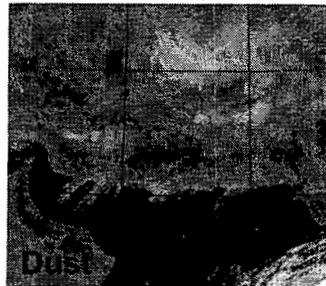
**R&D Products Provided Critical Support During OEF, OIF**



# Satellite Applications Supporting the War Effort

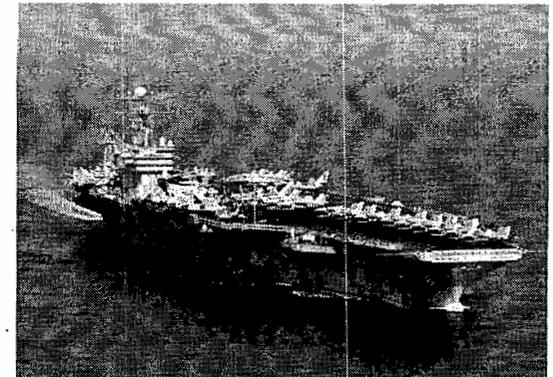


Since Winter 2001, NRL Monterey has delivered a growing suite of novel, value-added, satellite-based meteorological applications supporting OA divisions in the Middle East during OEF and OIF.



*"Navy ships are taking over all operations in support of ground troops and bomb runs. All ships are receiving aircraft from others as well. We are currently using the (NRL Satellite Focus Web Page) products to determine the Abe's track to safely support the mission."*

**-USS ABRAHAM LINCOLN, Operation Iraqi Freedom**





# Modeling Applications Supporting the War Effort



## Forecasts of Aerosol Optical Depth (Visibility)

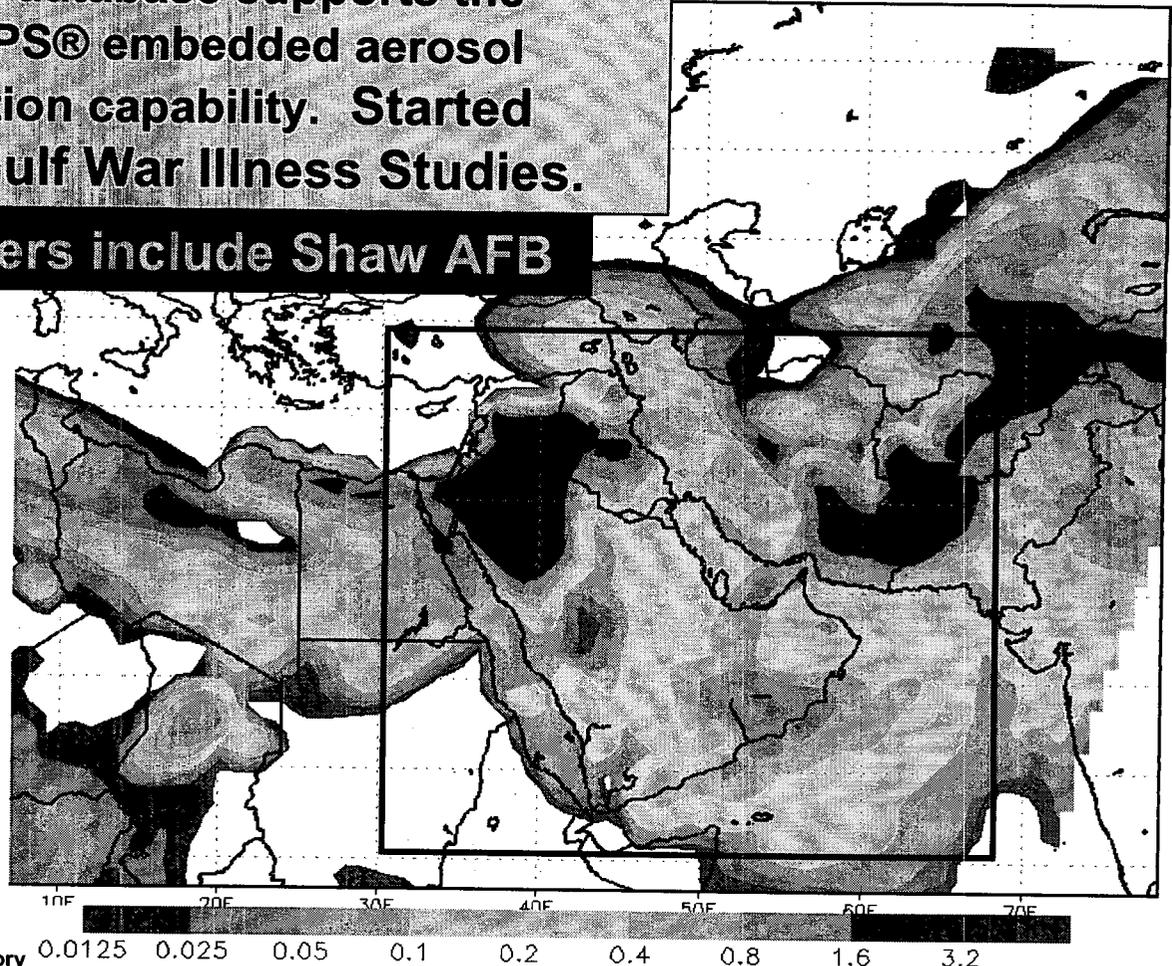
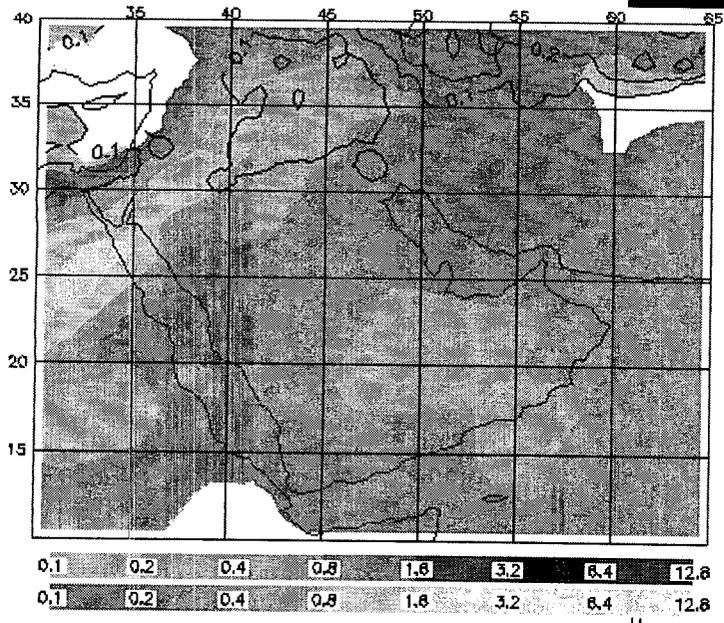
“World First”  
**GLOBAL  
NAAPS**

## Navy-unique Capability

NRL unique high-resolution dust source database supports the COAMPS® embedded aerosol prediction capability. Started with Gulf War Illness Studies.

## Regional COAMPS®

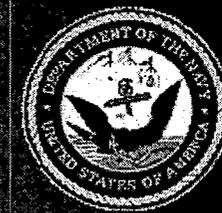
Users include Shaw AFB



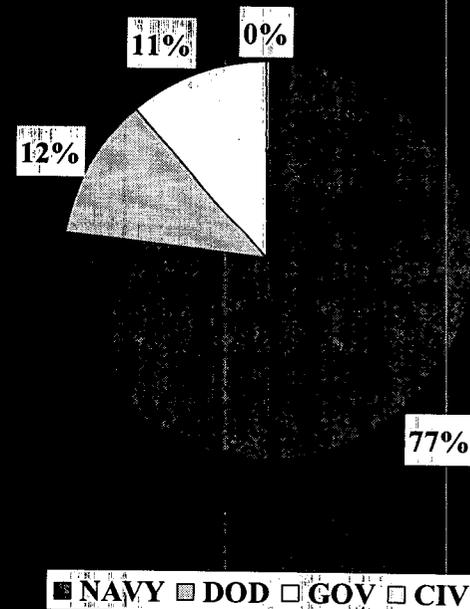


# Naval Research Laboratory

## Marine Meteorology Division



### Serving DOD and National Interests



**NRL MRY is a World-Class R&D Performer, Externally Reviewed**



# Marine Meteorology Division

## Products with Broad DOD Relevance



### High-Altitude Global Atmospheric Modeling

Strategic Missile Defense (SMD) against Weapons of Mass Destruction  
Atmospheric Corrections for ICBM  
High-Altitude UAV Support  
DoD Satellite Operations  
High-Altitude Reconnaissance Flights

### Very High-Resolution Coupled Modeling (air,ocean,land,aerosol)

Urban Warfare  
Chem-Bio Defense  
Strike Warfare  
Special Forces Support

### Multi-Sensor Satellite Data Fusion

Visual Reconnaissance  
Mission Planning and Target Selection  
Protection of Assets



# Marine Meteorology Division

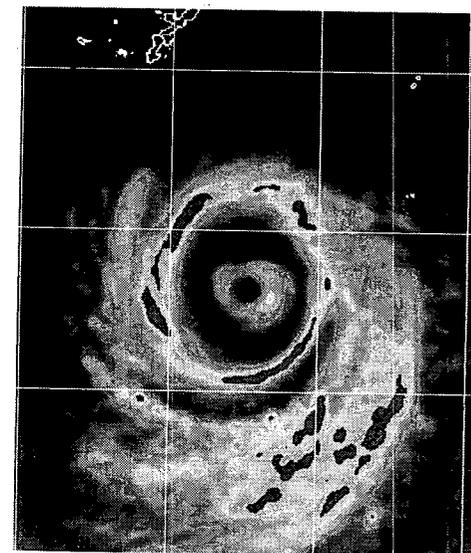
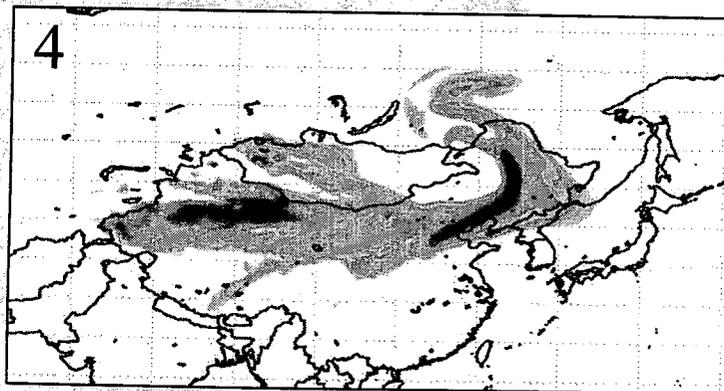
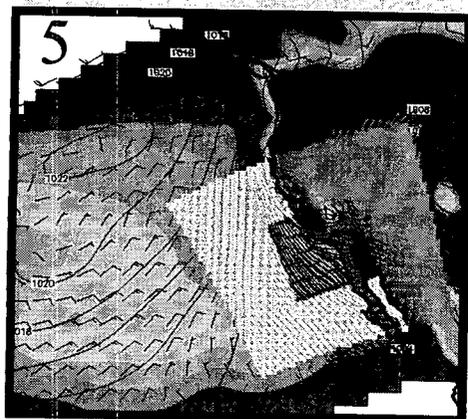
## Products with Broad National Relevance



Customers around the country and even around the globe are dependent upon R&D products developed at NRL, which NRL produces and distributes via public web sites 24/7.

*R&D demo products*

1. Tropical Cyclone Web Page
2. NEXSAT CONUS Web Page
3. Global Satellite Product Web Page
4. Aerosol Web Page
5. COAMPS-OS® Demonstration Areas



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# Naval Research Laboratory

## Marine Meteorology Division



### From Basic Research to Operational Transition

6.1

6.2

Ops

6.3/6.4

✦  
✦  
✦  
✦

**NRL Meteorology Program is Unique—No “Valley of Death”.**



# Naval Research Laboratory

## Marine Meteorology Division



### Our Greatest Asset

■ Ph.D. ■ M.S. ■ B.S.

**Intelligent and Dedicated People are the Key to Success**

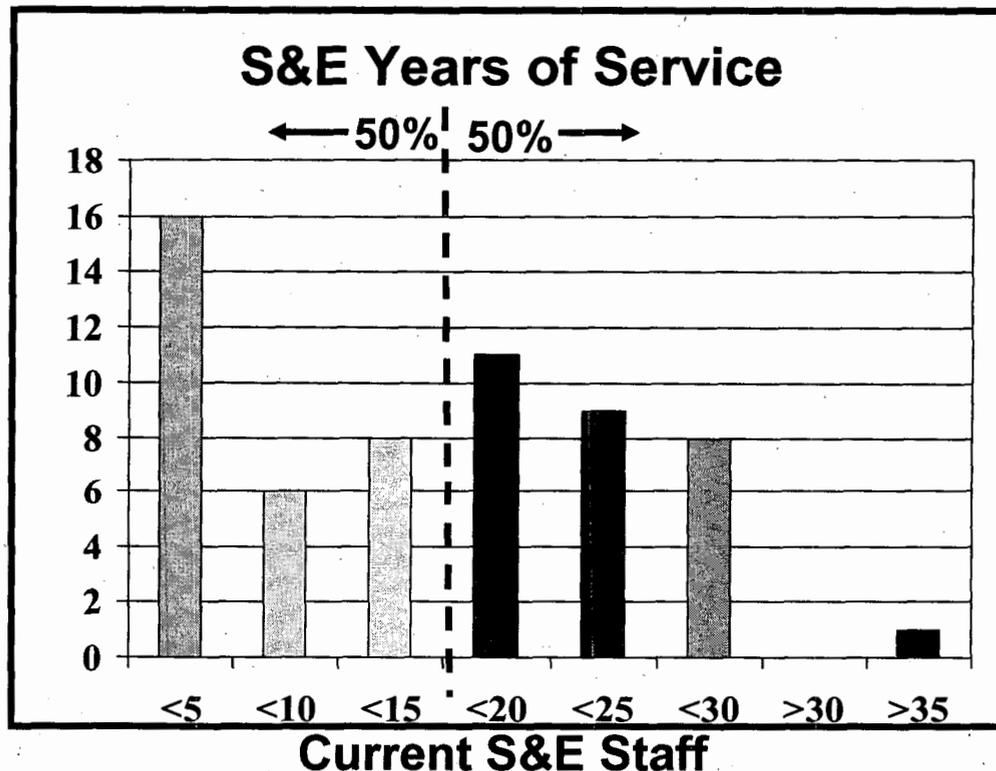


# MARINE METEOROLOGY DIVISION

## Recruiting and Sustaining S&E Staff



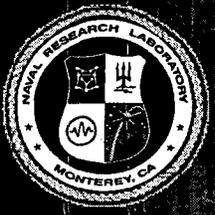
1. **Successful Recruiting:** One-quarter of the staff has been hired in the last 5 years.
2. **Long Recruiting Time:** Can take 1-2 years to find a candidate with the specialized skills needed.
3. **Small Applicant Pool:** Only ~150 PhDs in Atmos. Sci. graduate each year, and at least 40% are non-citizens.
4. **Low Turnover Rate:** Of the 36 permanent scientists hired since Sept 1992, only 3 have left NRL MRY for employment elsewhere.



*High cost of living in MRY is offset by quality of life and positive work environment where scientists can perform interesting, challenging, and meaningful work with a critical mass of colleagues.*

Jun 05

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# MARINE METEOROLOGY DIVISION BRAC 2005 History



**NRL Monterey was involved in several BRAC Scenarios.**

1. Technical JCSG Analyses of DOD Laboratories.
2. Department of the Navy studies of NPS and other Navy in MRY.

**NRL Monterey was not on DOD's closure or realignment list.**

1. Moving NRL MRY is very expensive (~\$39M + MILCON + COBRA).
2. There is no long-term cost savings—payback period was "never".
3. A move would be operationally disruptive.
4. Relocation has high risk of destroying intellectual capital.
5. NRL MRY currently provides joint service support.

**Navy BRAC Office supports an "enclave" for NRL/FNMOC.**

1. Currently occupied property is geographically separate from NPS.
2. No tenant relationship with NPS – base support from NRSW.
3. Preserves critical NRL/FNMOC team relationship.



# MARINE METEOROLOGY DIVISION SUMMARY



- ✦ **NRL MRY is Unique.**
  - ✦ *DOD's only S&T Program in Atmospheric Science.*
  - ✦ *Full spectrum world-class research from 6.1 to Transition.*
- ✦ **NRL/FNMOC Collocation and Partnership is a Success Story.**
  - ✦ **Rapid transition of S&T.**
  - ✦ **Teamwork in all phases of the process.**
- ✦ **NRL and FNMOC Team Serves Joint Customers.**
  - ✦ **Broad spectrum of DOD and non-DOD agencies rely on both research and operational products produced by NRL & FNMOC.**
- ✦ **Monterey Location Remains Cost Effective.**
  - ✦ **Expensive to relocate.**
  - ✦ **No significant short- or long-term cost savings.**