



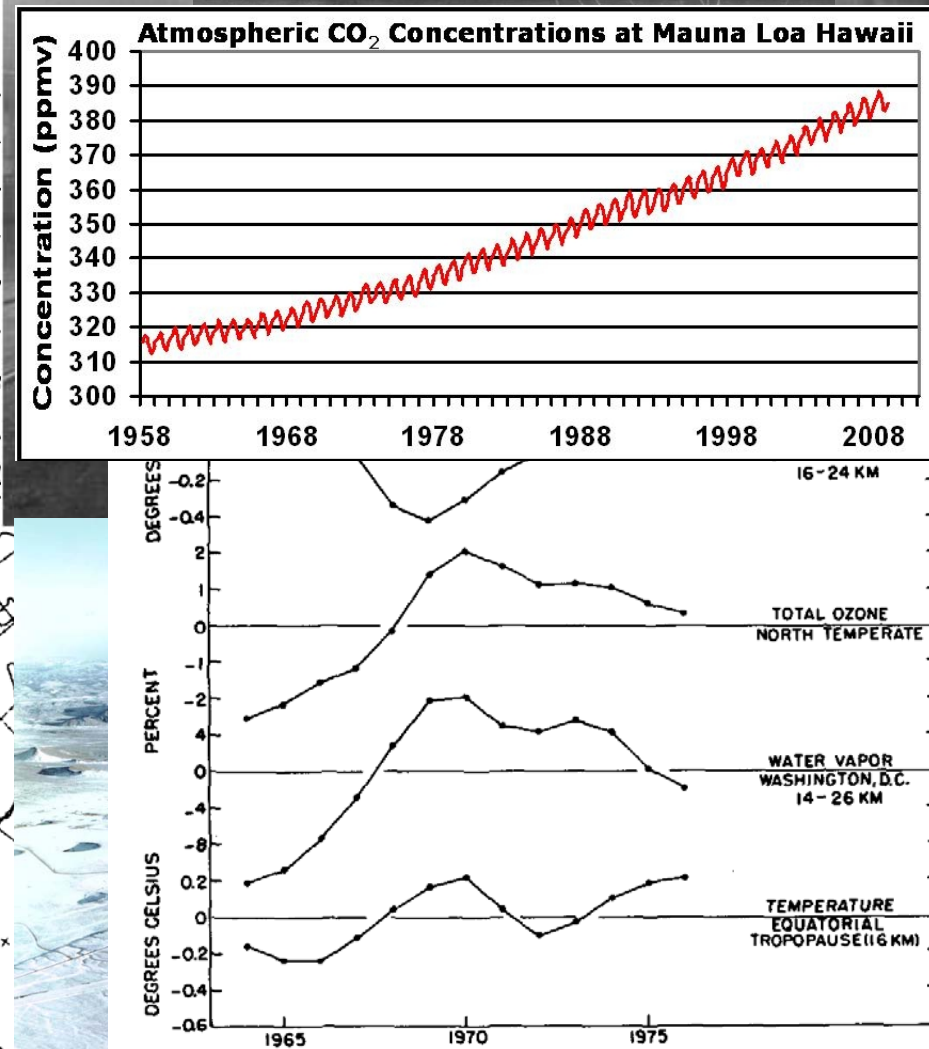
Air Resources Laboratory Overview

Steve Fine
Air Resources Laboratory

ARL Laboratory Review
May 3-5, 2011

Genesis of Lab

- 1948: Special Projects Section of U.S. Weather Bureau
- Provide meteorological expertise to other Federal agencies
- Atmospheric factors were very important to emerging issues of the 1940s, 1950s, and 1960s
 - **Cold War & Nuclear Arms Race**
 - **Weapons Testing**
 - Safety
 - Detection
 - **Nuclear energy: safety**
 - **Air pollution**
 - **Climate change**





Science Themes

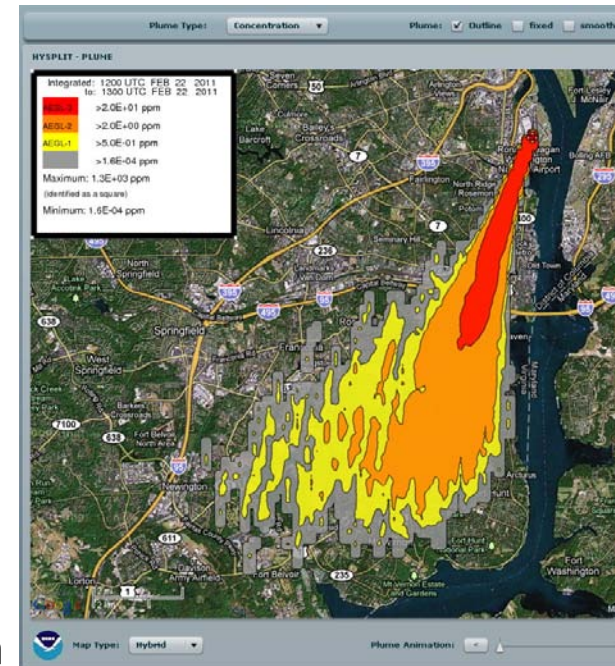
Atmospheric Dispersion and Boundary Layer

Goals

- Improve dispersion predictions and understanding of those predictions through dispersion research, models, and tools
- Improve measurement and prediction of the boundary layer and the underlying land-surface

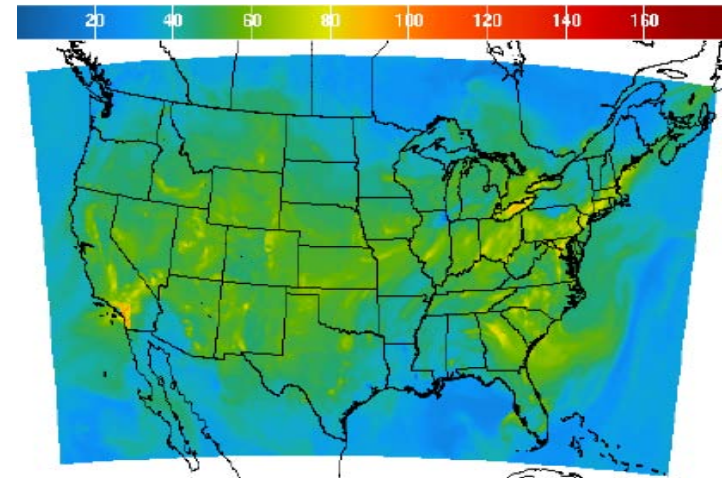
Major Activities

- Boundary-layer characterization and prediction
- Dispersion modeling
- Decision support tools
- Model evaluation
- Renewable energy
- Support for DOE, NASA, DOD, DHS, WMO



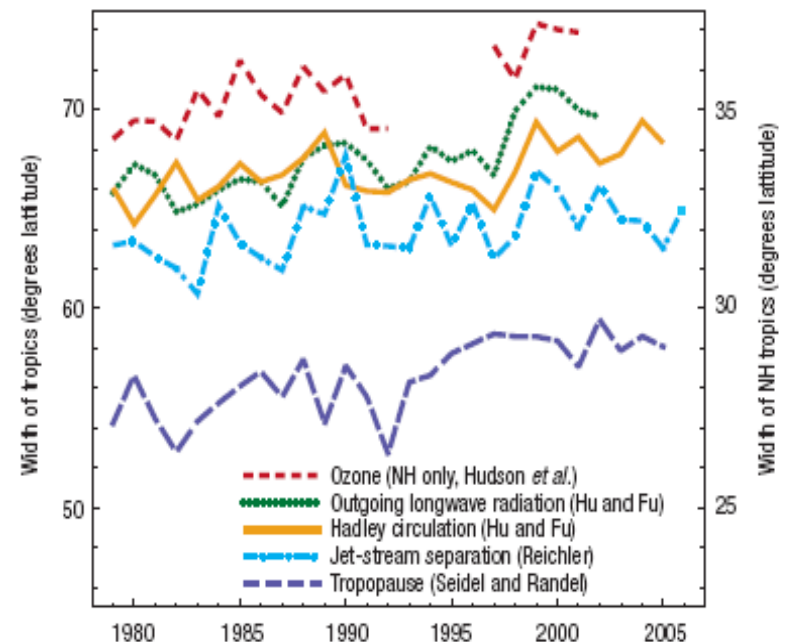
Air Quality

- Goals
 - Improve NOAA's operational air quality predictions
 - Improve understanding of ecosystem-relevant air pollution, including mercury and nutrients
- Major Activities
 - Air quality forecast system R&D
 - Monitoring and process studies
 - Assessment of mercury and nutrient fluxes to/from ecosystems



Climate

- Goals
 - Improve the understanding and prediction of climate variability and change
- Major Activities
 - Reference observations
 - Atmosphere-land surface interactions
 - Climate variability and change analysis
 - Assessment of regional climate impacts





Integration Among Themes

Dispersion / Boundary Layer

Modeling for toxics, ash, smoke, dust
Flows around sound barriers

Air-land fluxes
Climatology of the boundary layer
Urban climate

Air Quality

Climate-air quality modeling
Co-location of observing sites

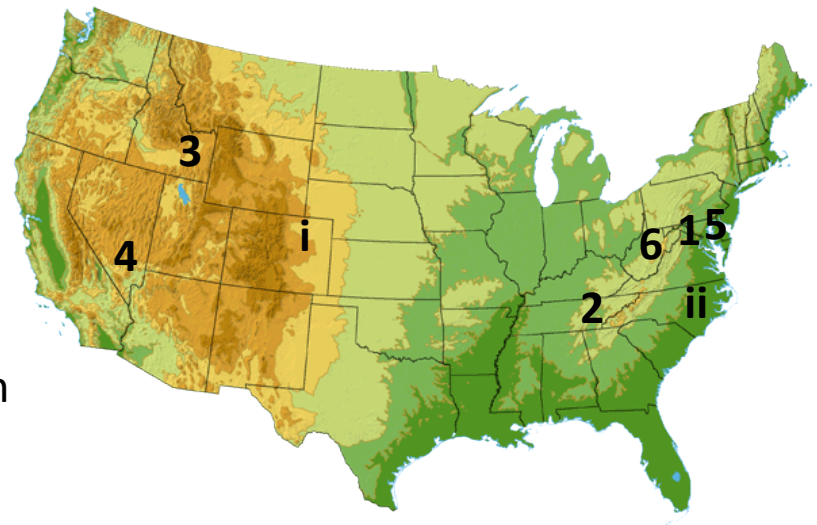
Climate



Locations, Staff, and Funding

Lab Organization

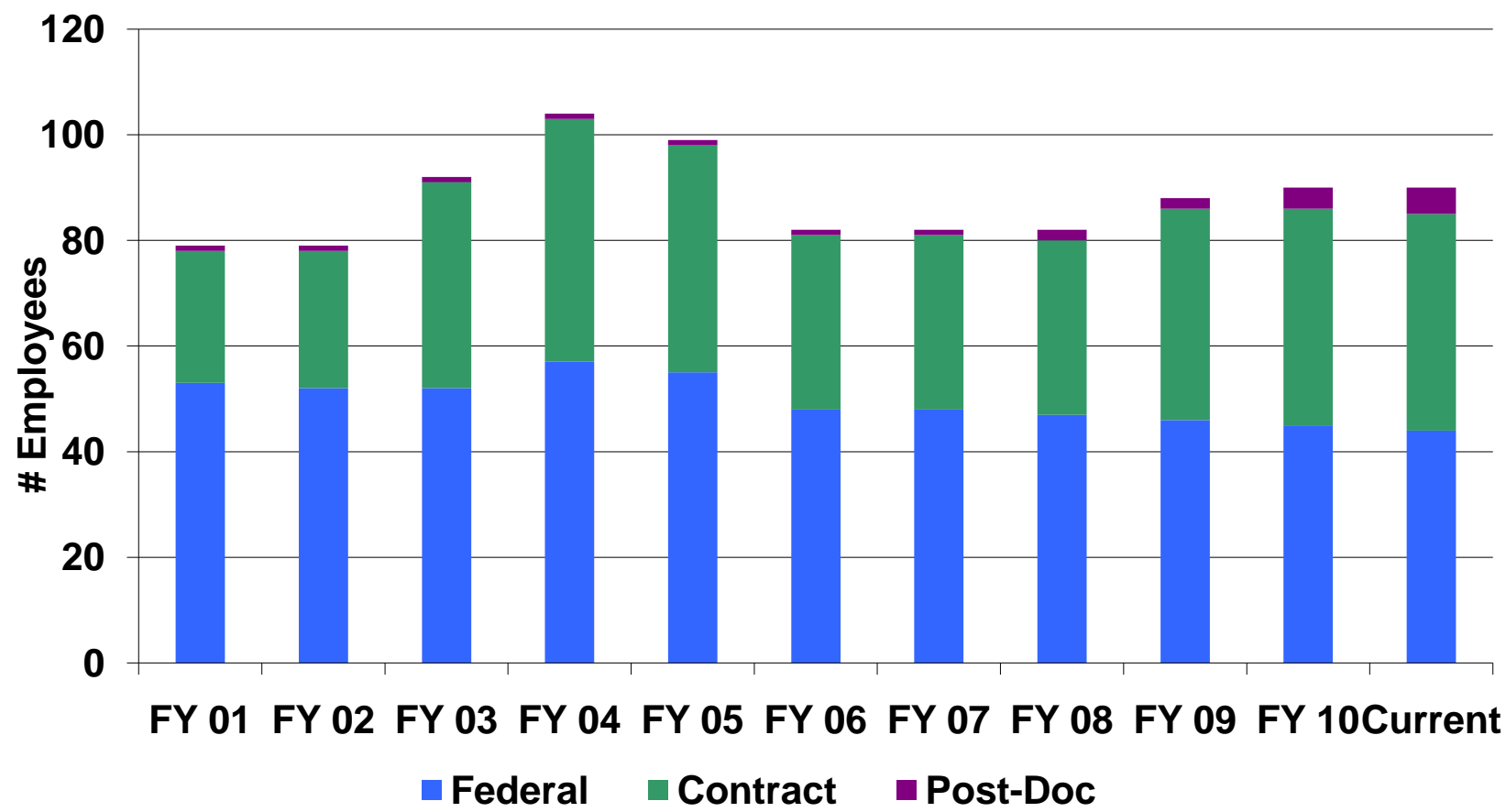
- Four primary locations
 1. Headquarters
 - Atmos. dispersion, air quality, climate
 2. Atmospheric Turbulence & Diffusion Division
 - Atmos. Dispersion, boundary layer, air quality, climate
 - Support for Dept. of Energy (DOE)
 3. Field Research Division
 - Atmos. dispersion, boundary layer
 - Substantial support for DOE
 4. Special Operations & Research Division
 - Atmos. dispersion, boundary layer
 - Substantial support for DOE
- Staff at two additional locations
 5. NOAA Chesapeake Bay Office
 6. Canaan Valley Institute
- Two Former Locations Transferred in Last 6 Years
 - i. Surface Radiation Research Branch (SRRB) (transferred Fiscal Year [FY] 2006)
 - ii. Atmospheric Sciences Modeling Division (ASMD) (transferred FY 2008)





Staff Profile

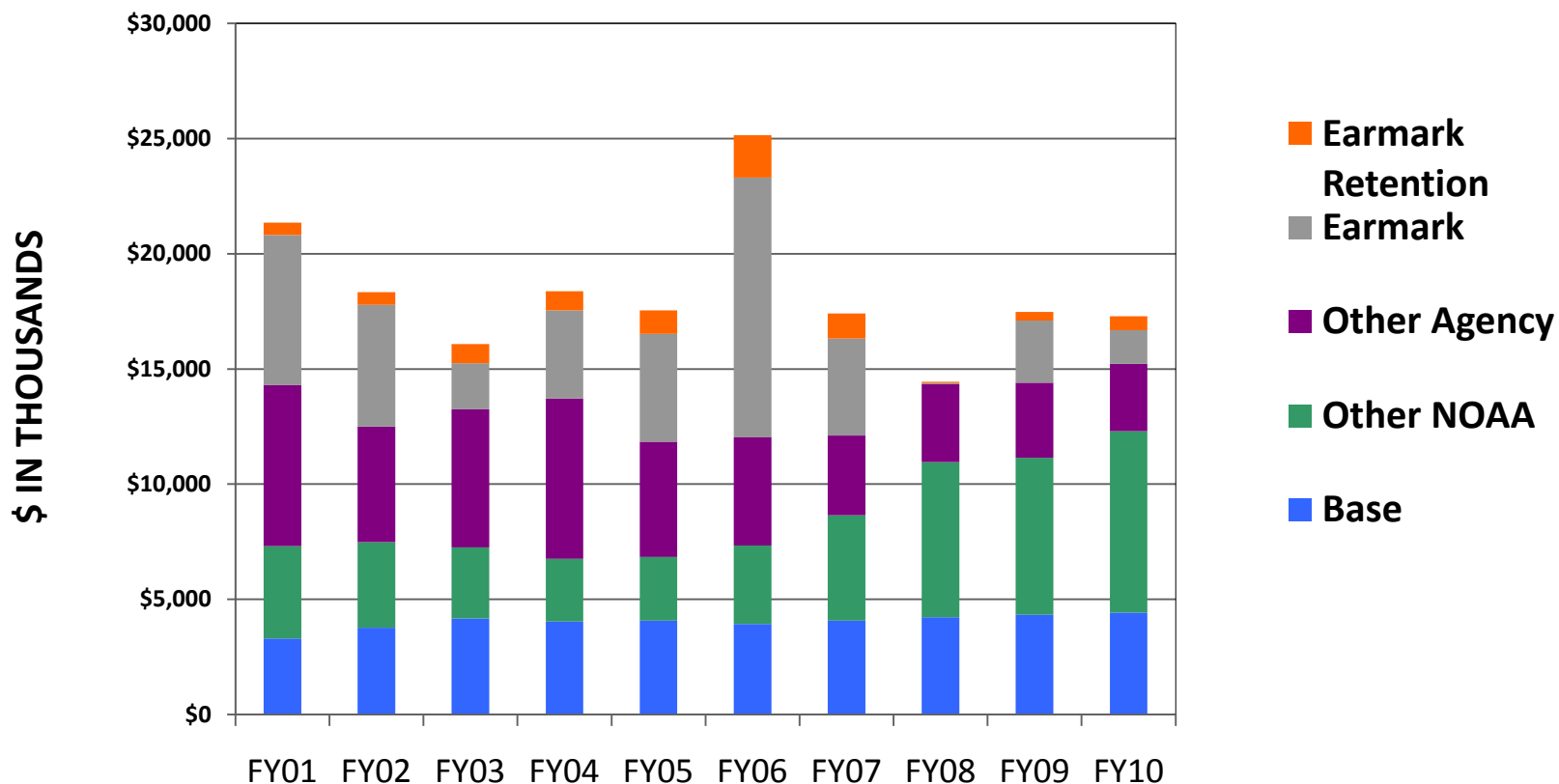
(For locations still in Lab)





Funding Profile

(For locations still in Lab)



****FY 08 OAR Managed Earmarks**

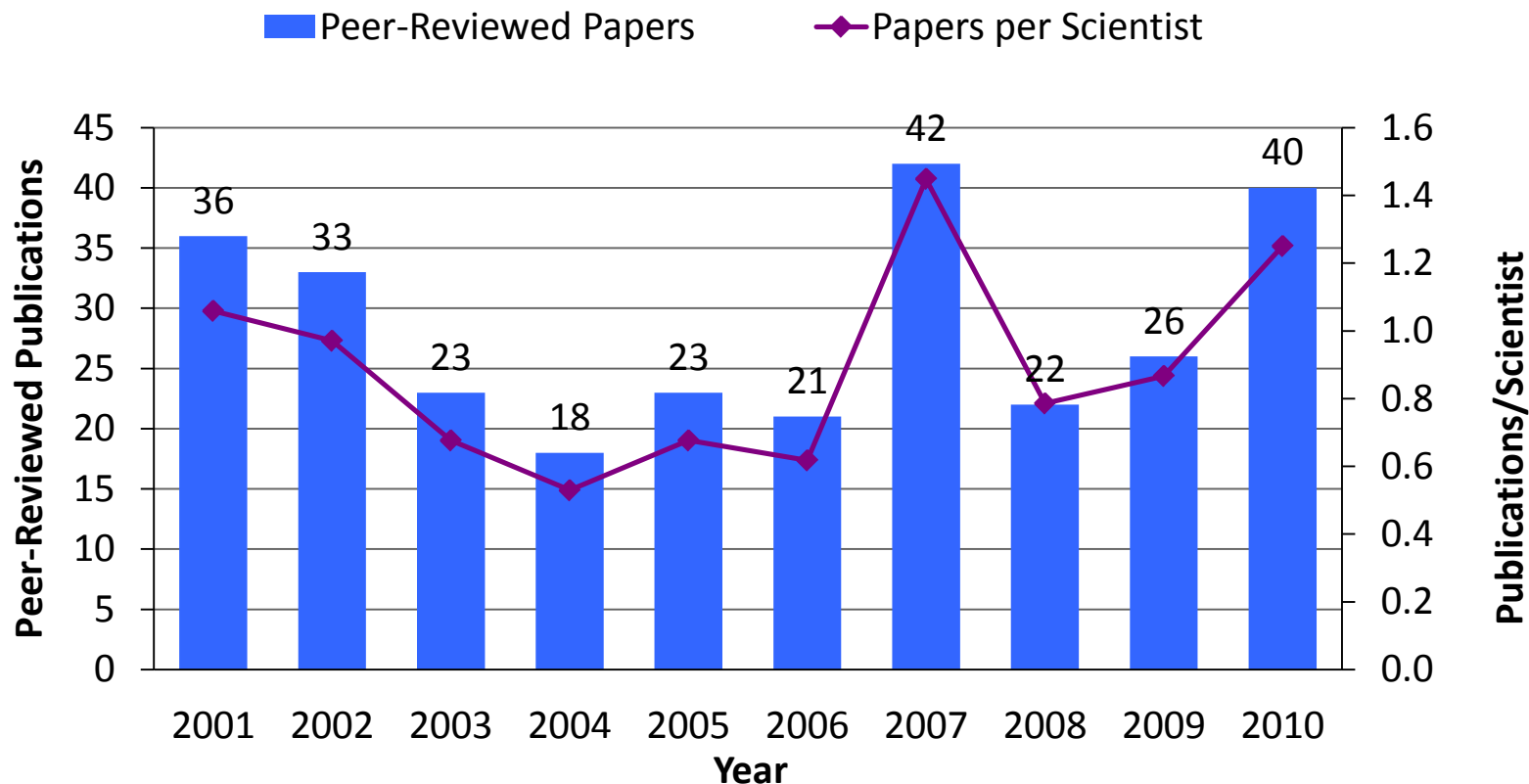


Highlights of Quality, Relevance, and Performance



Quality: Number of Peer-Reviewed Publications

(2001-2010, for locations still in lab)





Quality: Top 11 Active Scientists by # of Pubs

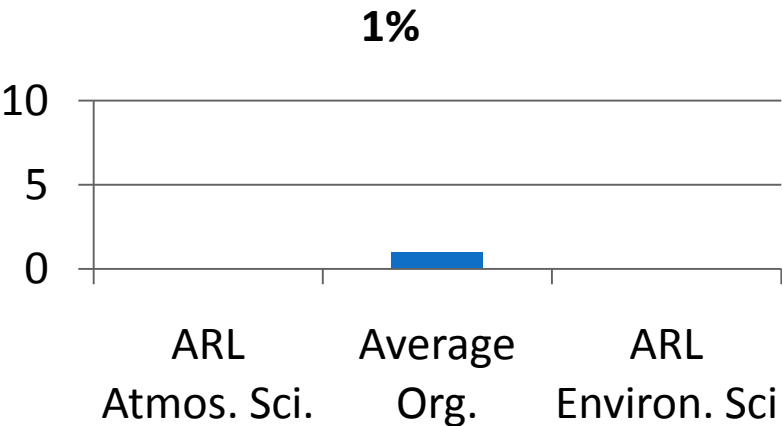
(Based on Web of Science, covering 1991-2010)

Scientist	Peer-Reviewed Publication Count	Total Citations	H-Index	# of Years Publishing
Tilden Meyers	89	5,403	37	25
Dian Seidel	60	2,441	27	23
Roland Draxler	35	1,062	16	34
Marc Pitchford	30	511	11	30
Rick Saylor	29	908	17	23
Winston Luke	28	415	12	19
Julian Wang	27	8,379	14	19
Tianfeng Chai	23	244	9	10
Praveena Krishnan	21	135	7	9
Melissa Free	20	504	12	15
Steve Brooks	20	541	11	14



ARL Publications Cited More Frequently than Average

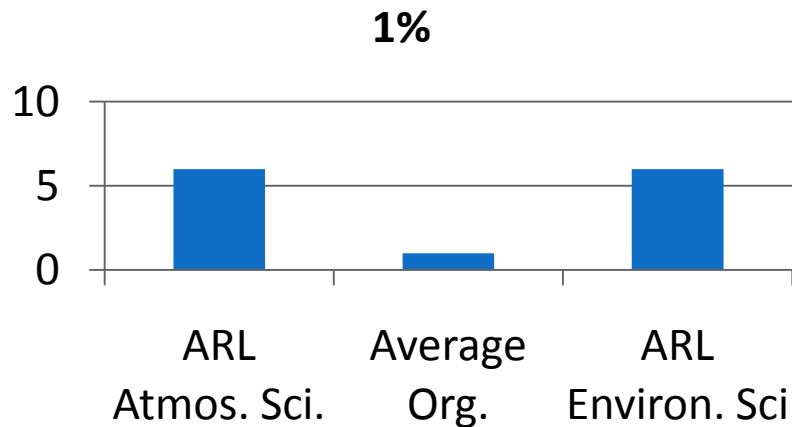
% of Pubs in Field's Top 1% Most Frequently Cited





ARL Publications Cited More Frequently than Average

% of Pubs in Field's Top 1% Most Frequently Cited



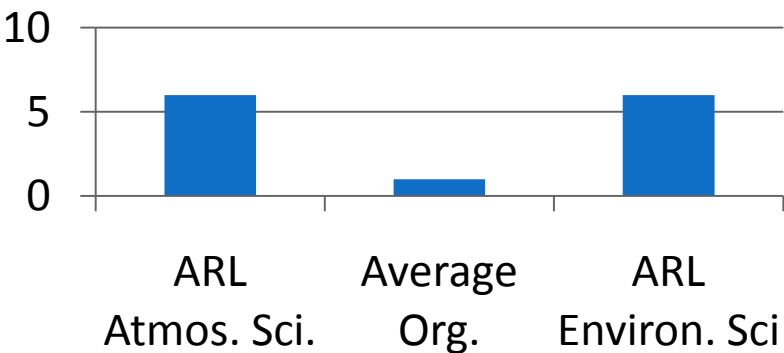
Source: Belter, NOAA Central Library



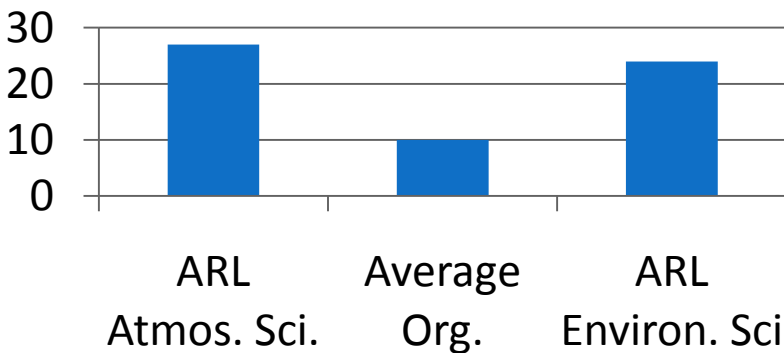
ARL Publications Cited More Frequently than Average

% of Pubs in Field's Top 1%, 10%, and 50% Most Frequently Cited

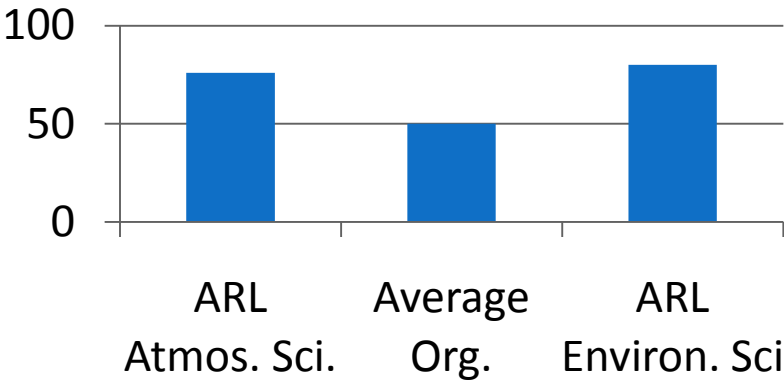
1%



10%



50%



Source: Belter, NOAA Central Library
Based on Web of Science for papers
published 1999-2010 by all ARL divisions.



Quality: Selected Awards 2000-2011

(For locations still in Lab)

- International
 - 2007: Nobel Peace Prize for IPCC work (4 scientists)
 - WMO Norbert Gerbier-Mumm International Award
 - 2004: "Stratospheric temperature trends: observations and model simulations"
 - 2003: "Environmental controls over carbon dioxide and water vapor exchange of terrestrial vegetation"
 - Chinese Academy of Sciences Outstanding Paper Award (2003)
- National
 - 2003: Presidential Rank Award for Meritorious Senior Professionals for "outstanding scientific leadership and direction of the laboratory"
- Department of Commerce
 - Gold Medals
 - 2009: HYSPLIT development
 - 2007: "...showing that global average atmospheric warming is similar to surface warming"
 - 2003: "...for the study of airborne geosciences worldwide."
 - 2000: Significantly improving measurements and predictions of air-surface exchange



Quality: Selected Customers

- Customers
 - NOAA
 - National Weather Service: air quality forecasting system development
 - Natl. Climatic Data Center: climate monitoring network design and implementation
 - Other Federal
 - Dept. of Energy: specialized dispersion and meteorological services, renewable energy field study
 - Dept. of Defense: dispersion tools and expertise
 - Dept. of Homeland Security: dispersion tools
 - NASA: specialized dispersion assessment
 - U.S. EPA: air quality measurements and analysis, roadway tracer study, particulate matter assessments
 - National Park Service: monitoring network leadership
 - Other
 - Texas Commission on Environmental Quality: air quality modeling and analysis



Relevance: Selected Societal Topics

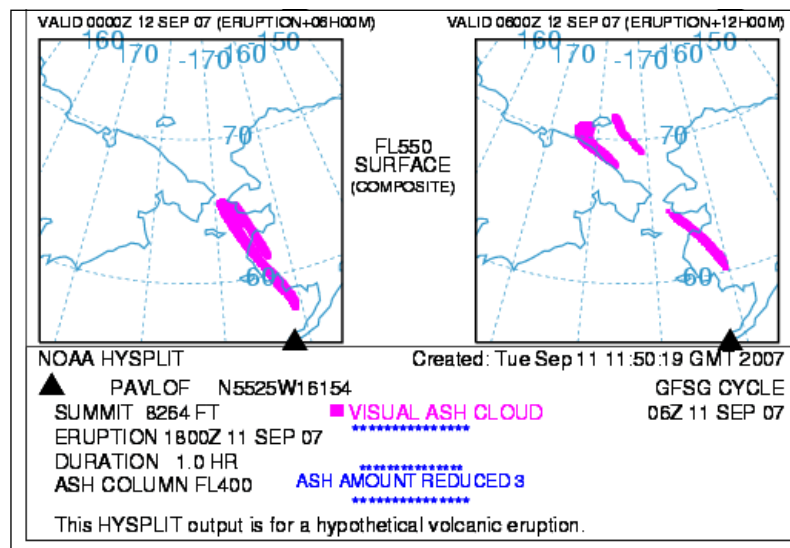
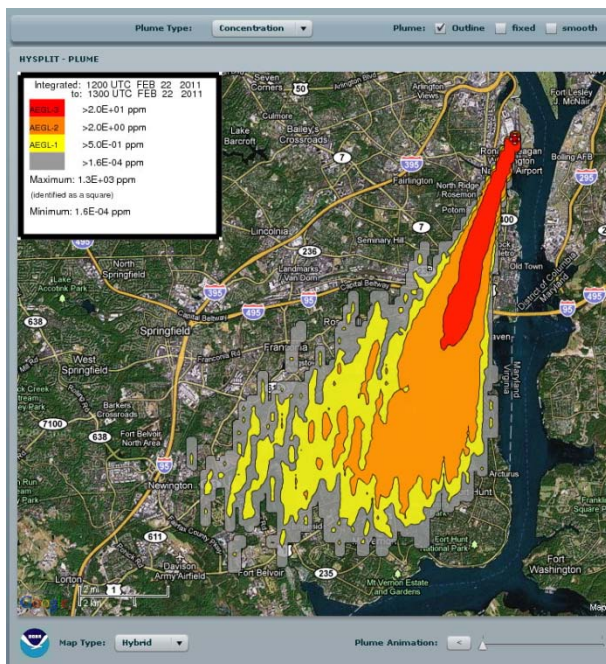
- Dispersion and Boundary Layer
 - Dispersion predictions and related tools
 - Predictions for the wind energy industry
- Air Quality
 - Predictions of ozone and fine particulate matter
 - Ecologically significant pollutants: mercury and nitrogen
- Climate
 - Reference observations
 - Analysis of climate variability and change



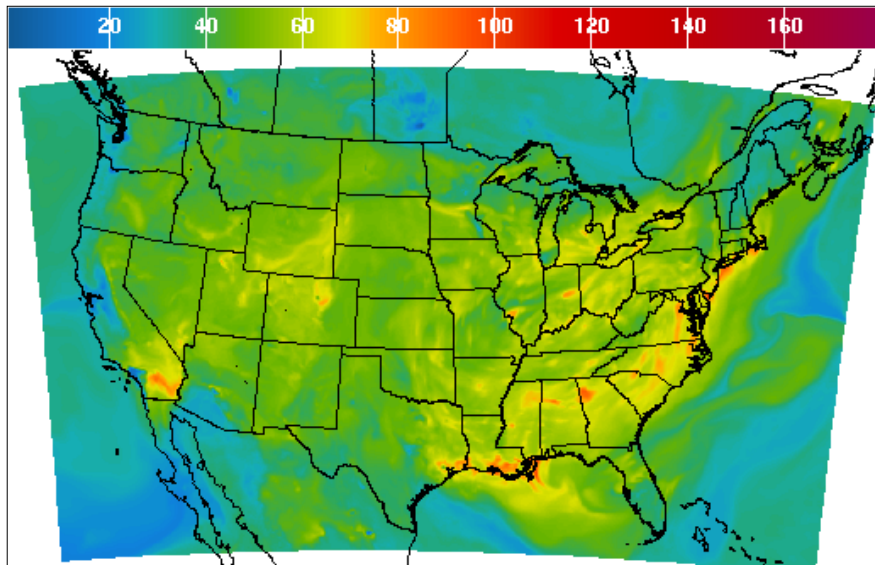
Relevance: Contributions to NOAA Priorities

- NOAA Strategic Plan
 - Climate: Improved understanding & assessments
 - Weather: high-impact events, improved transportation efficiency and safety, healthy people, more productive and efficient economy (e.g., renewable energy)
 - Coasts: Improved water quality
- NOAA Research Plan 2008-2012
 - Dispersion
 - Improve plume prediction capability
 - Climate
 - Integrated observations, analysis, and data stewardship
 - Information on forcings and feedbacks
 - Improve climate predictive capability
 - Air Quality
 - Improve predictions
 - Reduce uncertainties in assessments

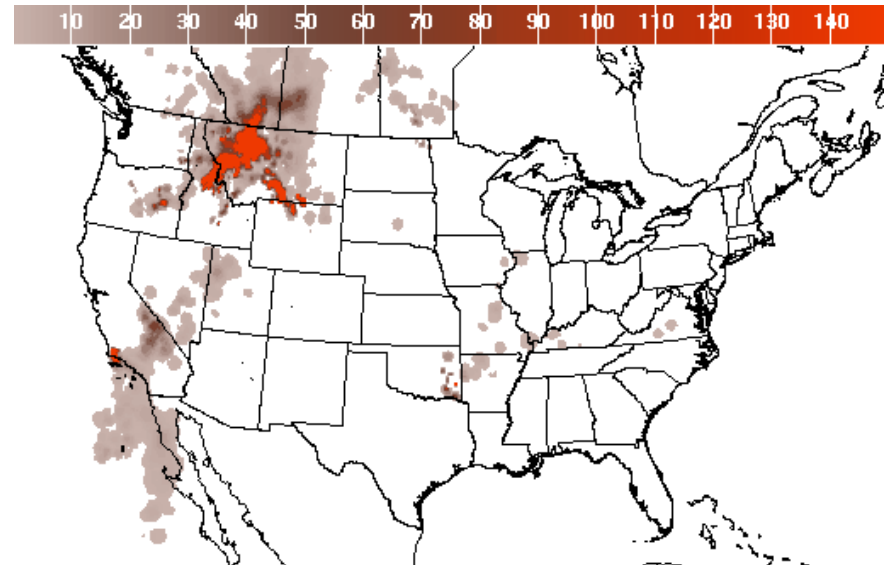
Performance: Dispersion & Boundary Layer



Performance: Air Quality



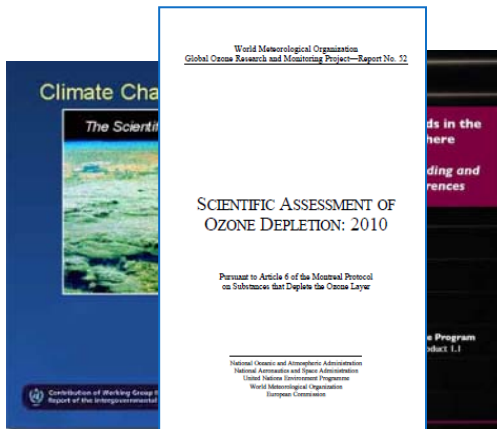
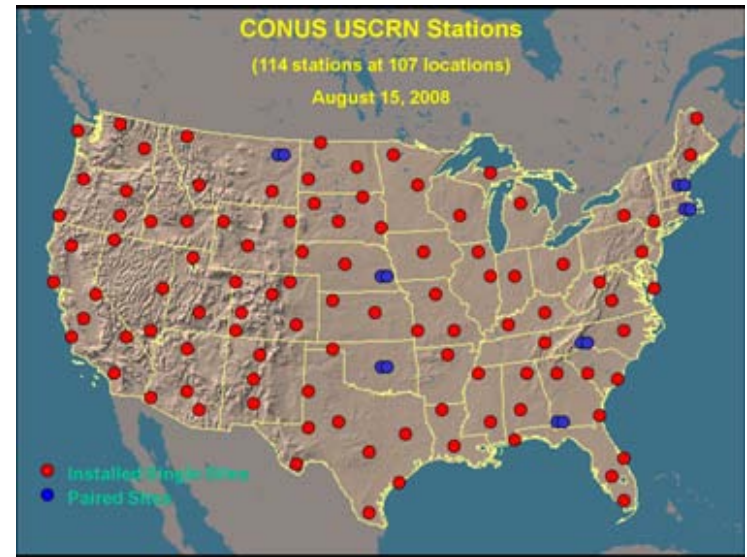
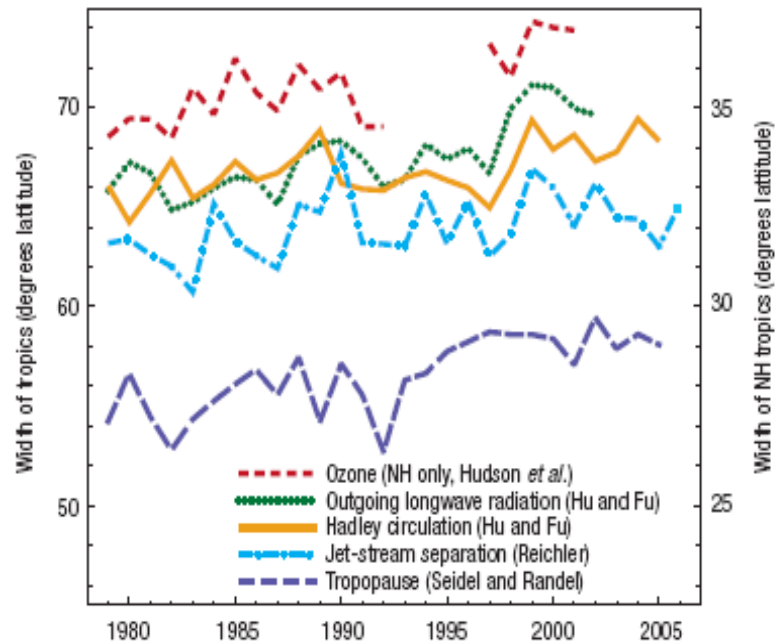
1Hr Avg O₃



1Hr Avg PM_{2.5}



Performance: Climate





Last Review and Response: ARL Core Capability Analysis— A Strategic Review (2005)



Overview

- That review did not have the same charge as the current series of OAR lab reviews; a primary motivation was high percentage of reimbursable funding and a concern about alignment with NOAA priorities
- Charge:

Conduct an in-depth assessment of research within the Air Resources Laboratory and, where appropriate, identify changes that would serve to more closely align these activities with the mission of [NOAA] and improve the overall effectiveness and efficiency of NOAA's research enterprise...
- Four major recommendations



Recommendations 1-3

- ARL has made significant progress in addressing recommendations 1-3 (emphasis added)
 - “ARL should **focus on fewer research areas**, selecting those where it has demonstrated exceptional competence and sufficient resources to make a significant impact on the science....”
 - “ARL should **realign its strategic planning and annual implementation processes** to ensure that its limited resources are focused on achieving scientific goals in these critical areas....”
 - “OAR should request an exception from reimbursable funding guidelines for ARL for the work by **ASMD** and should more fully integrate this group and its research with the rest of ARL, OAR, and NOAA’s program structure....”
- Significant progress made on recommendations 1 and 2
- Recommendation 3 focused on ASMD
- Ongoing actions described later



Recommendation 4: Transfer Applications at Western Divisions

- “OAR should find a more appropriate home for the observational support and analysis activities currently conducted by ARL divisions in Idaho Falls, ID and Las Vegas, NV....”
- Actions
 - With concurrence of OAR management, working to more closely integrate R&D activities with observational support and analysis
 - Find opportunities to pursue both DOE and NOAA priorities
 - Integrate observational support and analysis more closely with R&D activities



Science Planning and Evolution

Planning Process:

Example: Redirect resources from filter pack measurements of dry deposition of S, N to mercury measurements



Customer and community input were considered at all levels.

Planning Process:

Example: Understand low-level winds and improve predictions for renewable energy applications



Customer and community input were considered at all levels.

Planning Process:

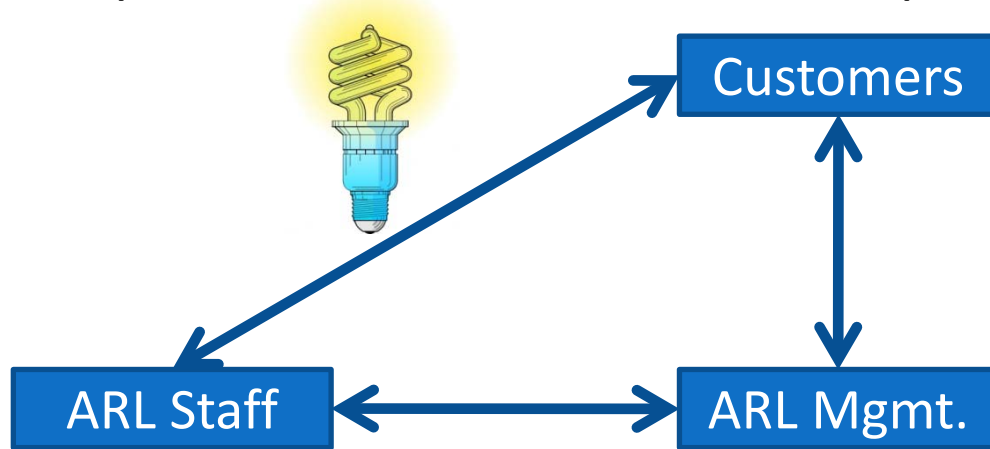
Example: Investigate climatology of the boundary layer



Customer and community input were considered at all levels.

Planning Process:

Example: NWS-funded work on air quality forecast system





A Lab in Transition

- ARL not where we want it to be
- Several lab-wide transitions in progress
- Slow—changing expertise, technologies, processes
- Motivations
 - Improve value to NOAA and other customers
 - Improve critical mass
 - Respond to/anticipate evolving societal needs
 - Respond to recommendations from last review

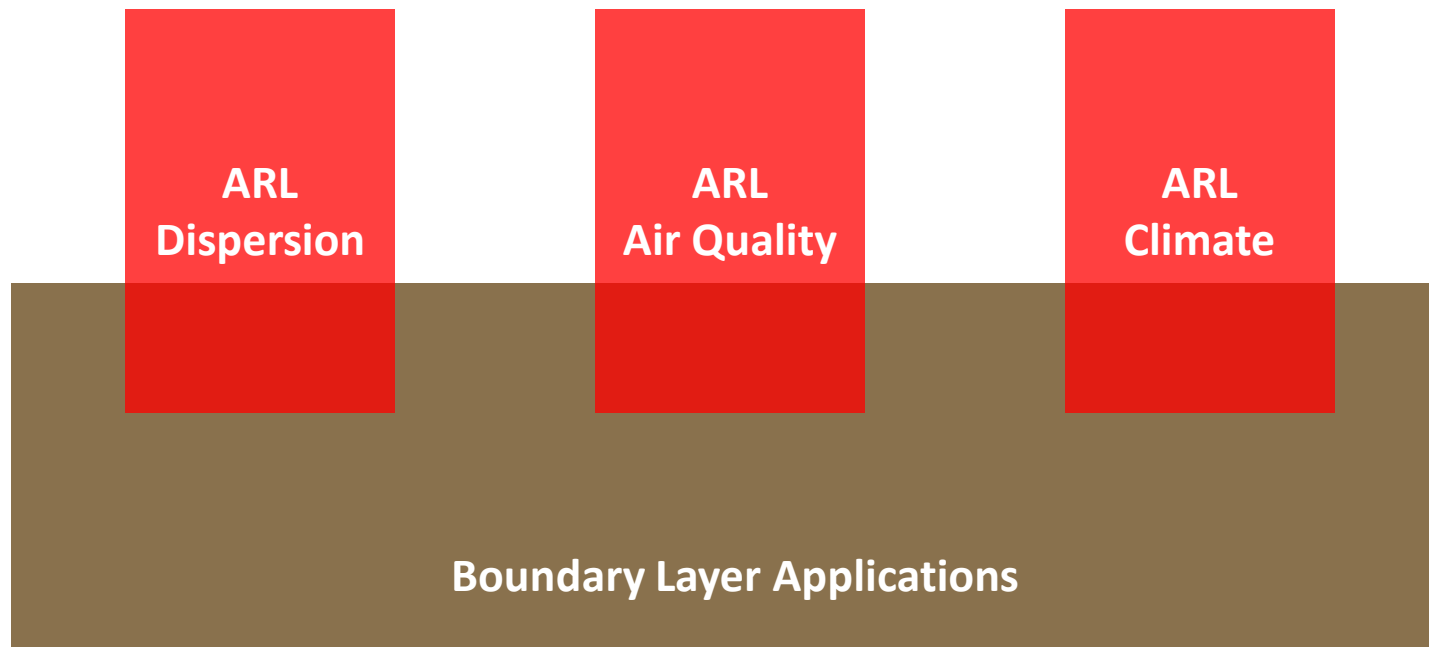


Transition: Greater Integration with NOAA Priorities and Activities

- Continue evolution from original ARL mission of serving other agencies
- Accomplishments:
 - Greater involvement in NOAA planning
 - Increased coordination with other NOAA dispersion groups
 - Cooperation with ESRL on renewable energy
 - Increased participation in regional air quality assessments
- Ongoing Challenges
 - Consideration of small or new activities in NOAA planning—dispersion, climate analysis, regional climate modeling



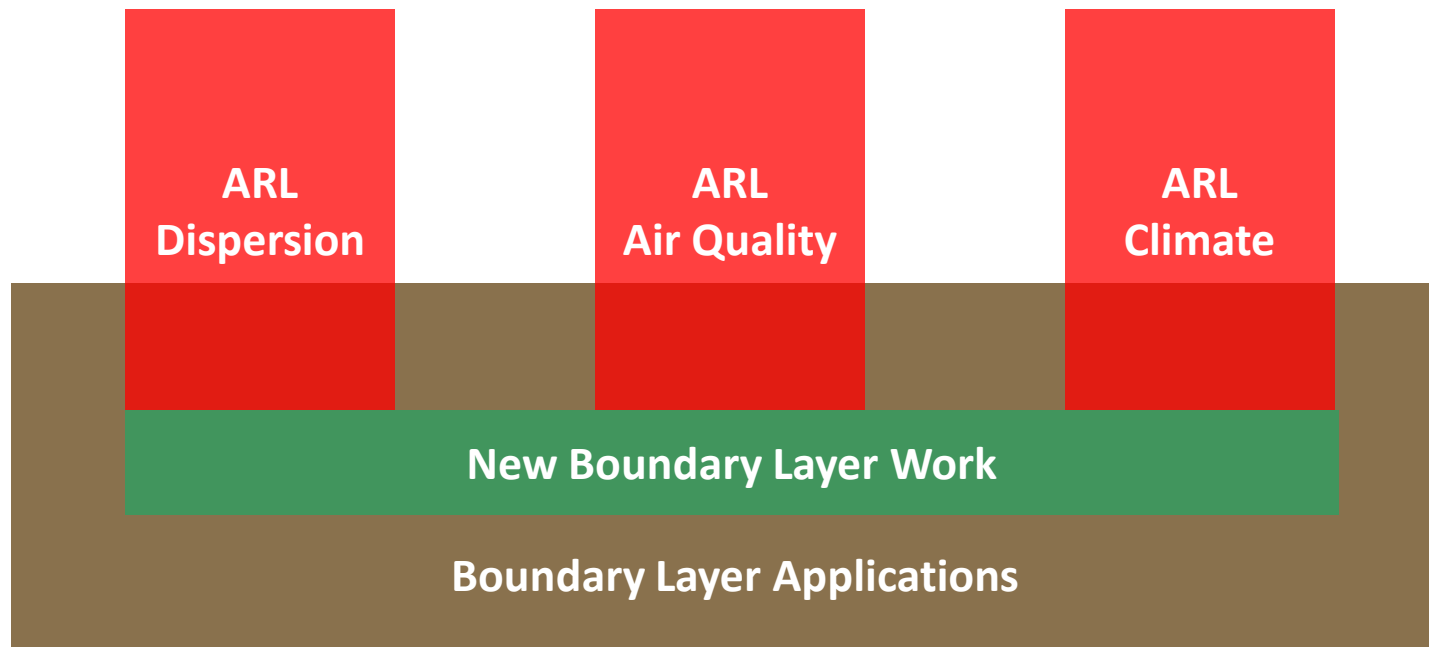
Transition: Establish Boundary Layer as Another Focus Area



Areas of overlap are notional



Transition: Establish Boundary Layer as Another Focus Area



Areas of overlap are notional



Transition: Establish Boundary Layer as Another Focus Area

- Addresses multiple imperatives: improve alignment with NOAA, growing societal interest/need, opportunities to leverage ARL expertise
- AA and DAA have supported concept—natural area for ARL
- Potential disadvantages: broadens ARL scope, potential overlap with other NOAA efforts
 - Mitigating by focusing on areas that are closely linked with existing work and expertise and coordinating with other NOAA groups
- Established target topics, most new work in planning stage



Transition: Greater Integration Among Divisions

- Historically, each division focused on its own customers and funding
- Want to strengthen connections among divisions without weakening connections with customers
- Accomplishments:
 - Increased technical collaborations
 - More frequent communication among divisions on science issues
- Challenges: further opportunities to integrate scientific and technical activities



Transition: Integration of Research and Technical Services

- Enhance value to NOAA and other customers by better integrating specialized services for DOE with Lab's R&D
- Accomplishments:
 - Agreements with DOE now recognize research role of ARL
 - HYSPLIT being prepared for use to support Idaho National Laboratory (already used at Nevada National Security Site)
 - Feedback/support from those divisions improved HYSPLIT
 - Idaho site supported multiple field studies
- Future opportunities: renewable energy, arid boundary layer, more work on data analysis/utilization at SORD, UASs



Major Ongoing Challenges for ARL

- Continuing to implement transitions
- Maintaining and improving the quality and value of R&D in current fiscal environment
- Increasing investments in key areas for the Nation and NOAA
 - Dispersion—integrated, enhanced NOAA capabilities
 - Boundary layer—wind energy, initiation of convection, etc.
 - Climate—analysis, air-land interactions, regional modeling
 - Nutrients
- NOAA Climate Service—ensuring that ARL climate-relevant activities are appropriately integrated