Activity Area 1. Climate Science / Earth System Science and Modeling

Science Themes

Advance understanding, modeling, prediction, and projection of the Earth's atmosphere, ocean, land, and cryosphere as an integrated system, including:

- Process studies and field campaigns

- Earth system observations and monitoring

- Predictability studies of climate phenomena

- Testing for transitions of R2O and R2A

- Improving model representations of key processes and prediction technologies

- Lead national assessments

- Applying Earth system and climate models to societally-relevant challenges

- Projecting future climate variability & change

- Coordinating joint federal research activities

Key Programs in Activity Area 1
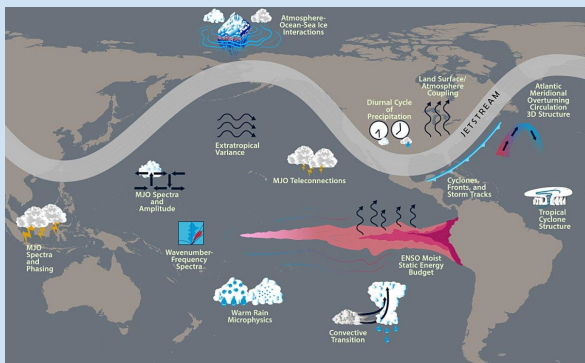
Pre-recorded Presentations

- Atmospheric Chemistry, Carbon Cycle, and Climate (**AC4**) Program
  Presenter: **Monika Kopacz**

- Climate Observations and Monitoring (**COM**) Program
  Presenter: **Virginia Selz**

- Climate Variability and Predictability (**CVP**) Program
  Presenter: **Sandy Lucas**

- Earth Radiation Budget Program (**ERB**)
  Presenter: **Greg Frost**

- Modeling, Analysis, Predictions and Projections (**MAPP**) Program
  Presenter: **Dan Barrie**

Scope and Key Accomplishments

Dataset Development and Analysis
- Observational dataset development and analysis
- Use of existing observations to improve climate understanding, modeling, monitoring and assessments

Understanding
- Understanding of mechanisms and predictability on S2S to decadal timescales
- Attribution of climate extremes
- Process-level understanding/modeling
- Field experiments (FIREX, YMC, ATOMIC)
- Lab studies

Modeling
- Climate Process Teams (CPTs) connecting observations, theory and modeling
- High-resolution global coupled modeling
- Process-level model diagnostics

Predictions, Projections & Applications
- CMIP analyses contributing to National Assessments
- Exploring applications for sea level, marine ecosystem and sea-ice predictions
- Drought understanding, monitoring and outlooks
- Research on air quality prediction
- R2O and R2A transitions (NMME)

- **Contributing to key NOAA initiatives (**Climate and Fisheries Initiative; Coastal Inundation at Climate Timescales ; Precipitation Prediction Grand Challenge (PPGC))
- **Leading two and contributing to all four of the CPO risk area teams**

Best Practices to Achieve Goals in Activity Area 1

- Decide research priorities to **address administration and NOAA's priorities** and to **contribute to CPO risk areas** in collaboration with NOAA labs/centers and external research communities

- Support highest-quality, higher-performing research projects through the **competitive and proposal-driven process**

- **Complement and accelerate OAR Lab research** by exploring new frontiers, fostering discovery, "filling gaps"

- Operate through **annual solicitation** to ensure new research areas, and support high-risk, high-reward investments

- **Facilitate coordination and collaboration with** the NOAA Labs/Centers, US agencies and national/international research communities

Future Strategic Considerations:

- Does the portfolio in Activity Area 1 cover the right science topics?

- What are the nice fusion opportunities between user demand-side needs and foundational science?

- What is the ideal balance between complementing research across NOAA (within OAR and cross-LOs) vs. exploring newer research areas?

- With increased climate budgets, should CPO/ESSM deepen funds for current research areas or expand to broader research areas, e.g. terrestrial and oceanic biogeochemistry research?