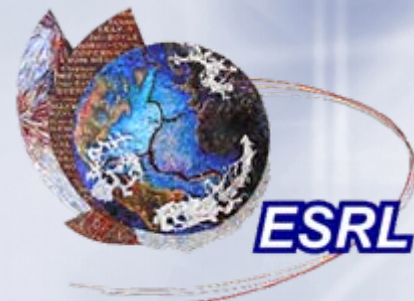


*ESRL Review of the
Regional and Local-Scale
Assimilation and Modeling
Theme*

Co Leaders: John McGinley and Georg Grell, GSD



Goal

- ❖ Provide you with a familiarization of regional and local modeling activities at ESRL
- ❖ How regional modeling fits in with prediction, understanding, and monitoring of the earth system



Basics

- ✧ Modeling or Numerical Environmental Prediction - Time-integration of pertinent governing equations of a system, subject to specified initial conditions, leading to a prediction of a future state
- ✧ Data Assimilation - the combining of spatially and temporally sparse observations into a unified and consistent description of a system specifying an initial condition

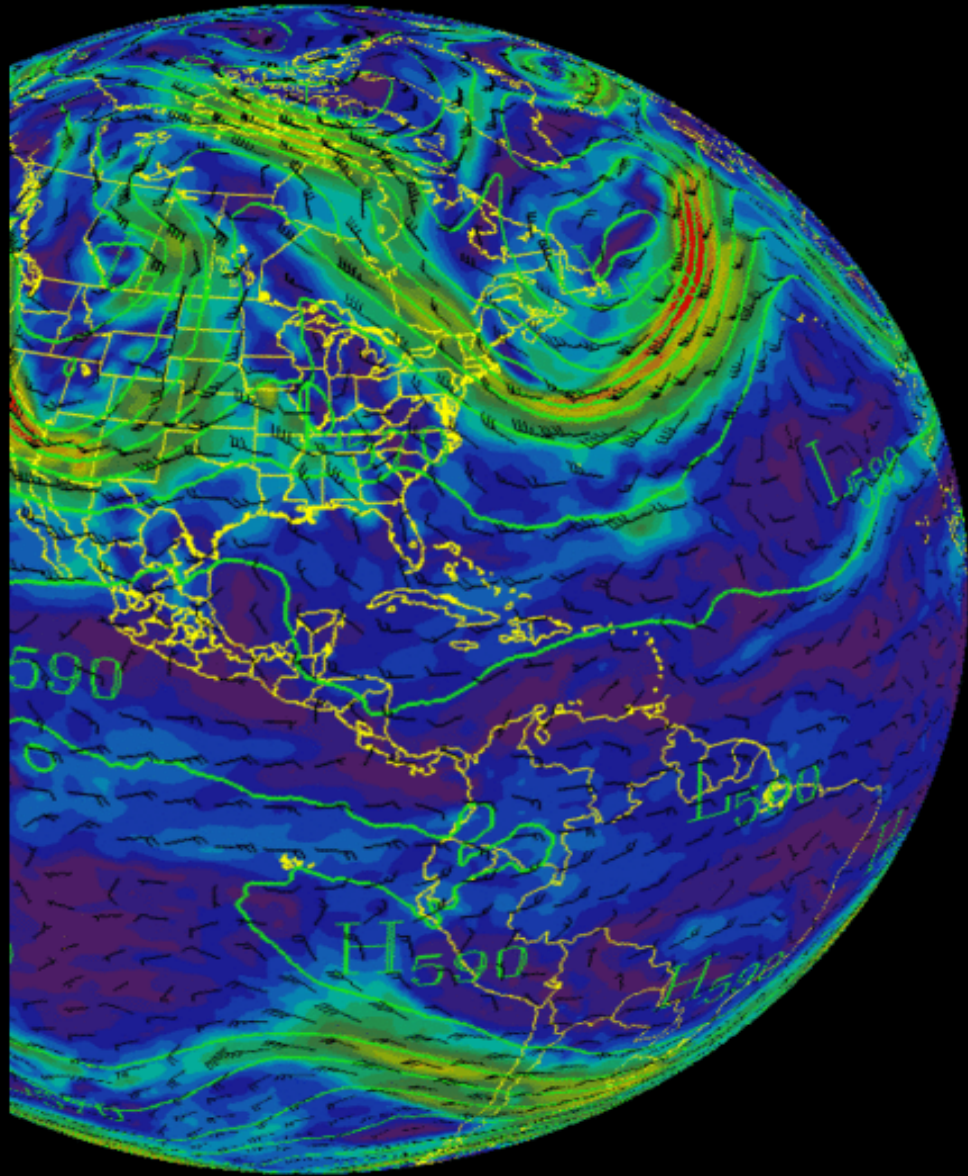


What does "Regional and Local" imply for Assimilation and Modeling?

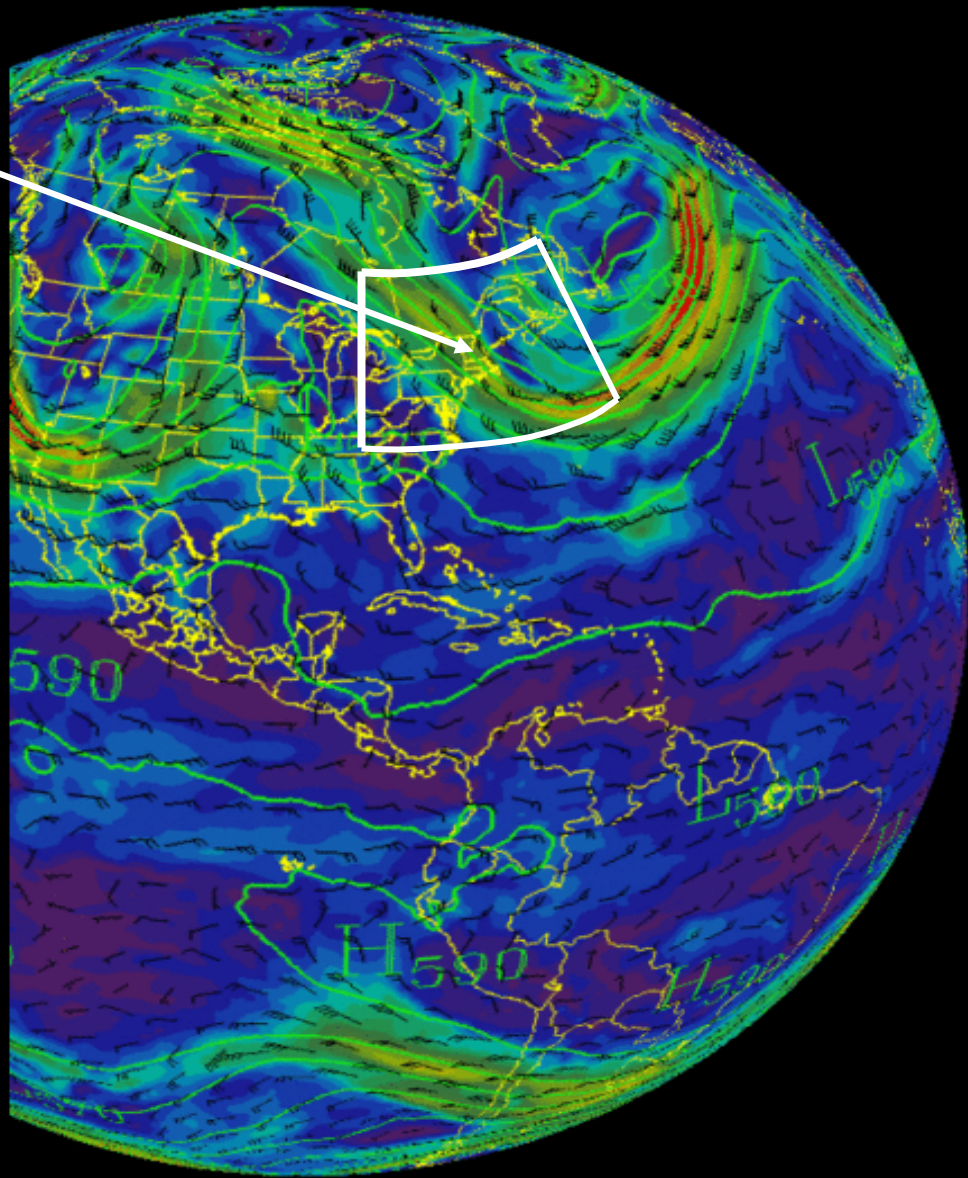
- ✧ The domain is a sub-set of a larger assimilation and modeling domain
- ✧ Environmental conditions on the boundaries of the regional domain are provided by a model running on the larger domain...inner domain is termed a "nest"
- ✧ Regional models tend toward forecasts of higher spatial resolution and short time spans.
- ✧ Computational costs are much lower with a limited domain



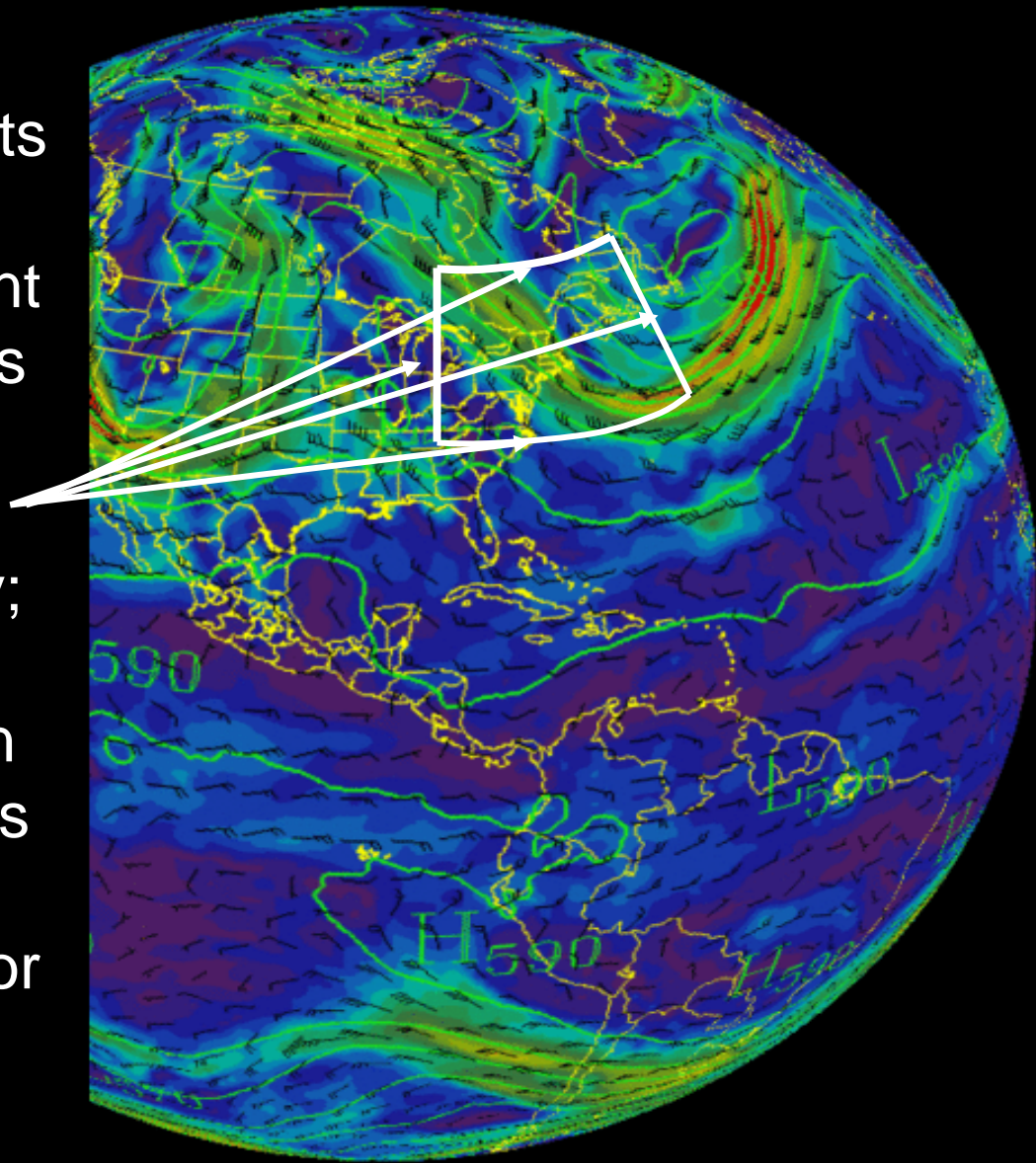
We have a global model running at course resolution; we need high resolution forecasts over the northeast US



A regional domain is nested in a global domain



Global model sets the time-dependent conditions on the regional boundary; high resolution forecast is made in the interior

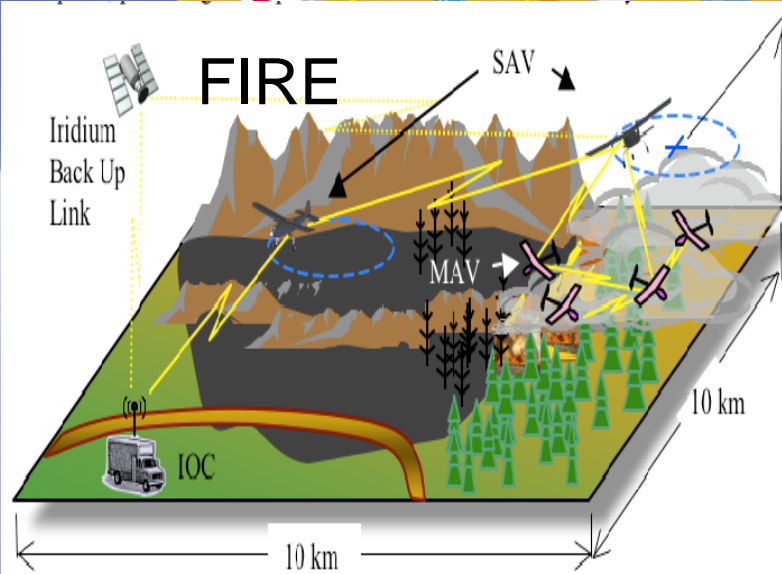
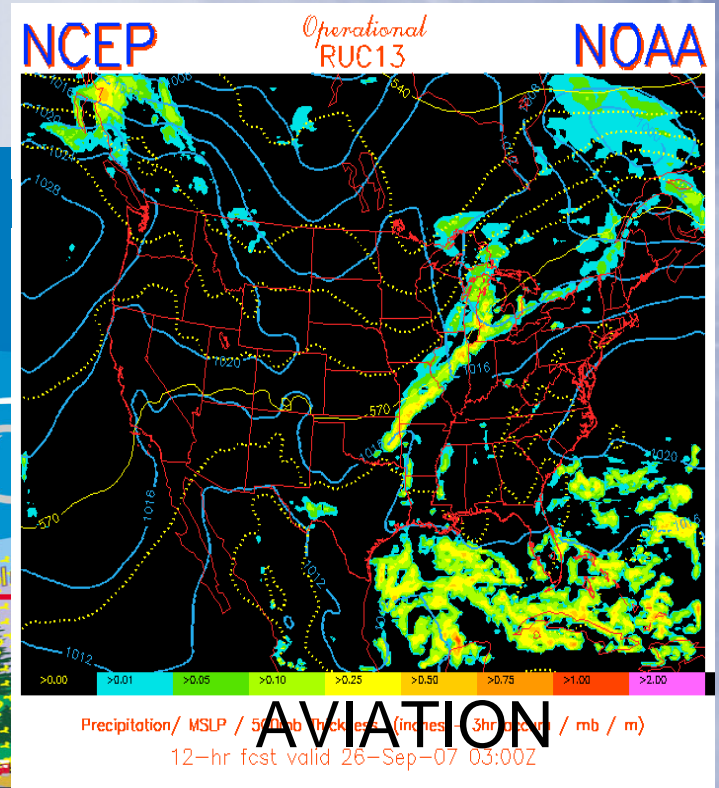
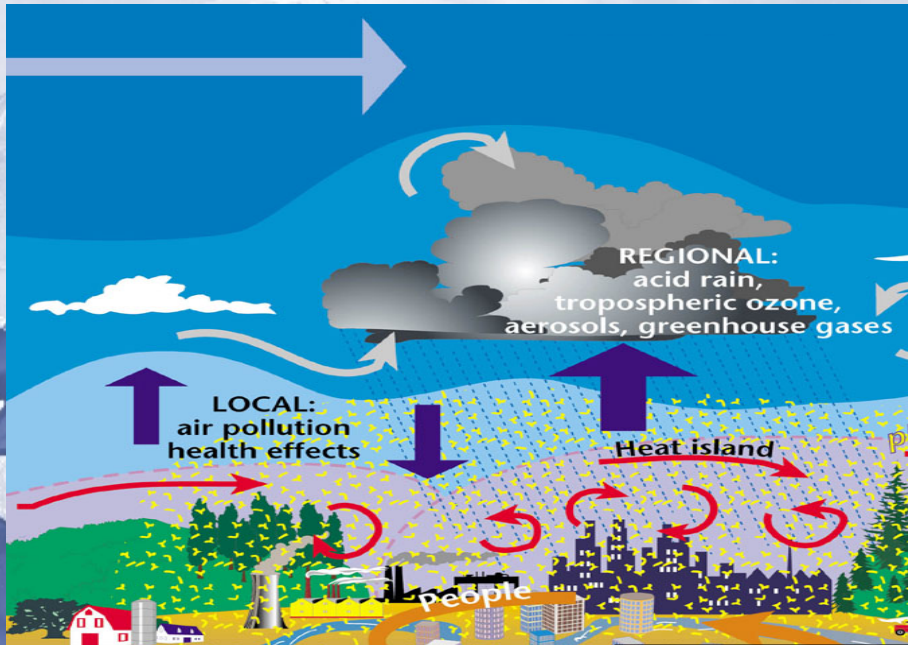


What are the applications for Regional and Local Assimilation and Modeling?

- ✧ Applications that require higher resolving capability unavailable in say, a global domain
 - ✧ Aviation/ transportation weather
 - ✧ Air quality
 - ✧ Urban weather
 - ✧ Fire weather
 - ✧ Severe weather
 - ✧ Hydrology and Flooding



CHEMISTRY and URBAN



SEVERE WEATHER

What are the aims of Regional and Local Assimilation and Modeling?

- ✧ Improved forecast services - providing the time and space detail required
 - ✧ Weather warnings
 - ✧ Transportation decisions
 - ✧ Probabilistic prediction
- ✧ Phenomenological understanding- providing a complete picture from sparse sets of observations
 - ✧ Air chemistry
 - ✧ Air-sea interaction
 - ✧ Atmospheric and ocean dynamical systems
- ✧ Regional and local impacts of global climate
 - ✧ Impact of oceans
 - ✧ Impact of aerosols and chemistry






Ensuring Relevancy of ESRL Modeling

❖ Earth System Modeling Framework

❖ Developmental Test Center



Community Collaboration: The Earth System Modeling Framework (ESMF)

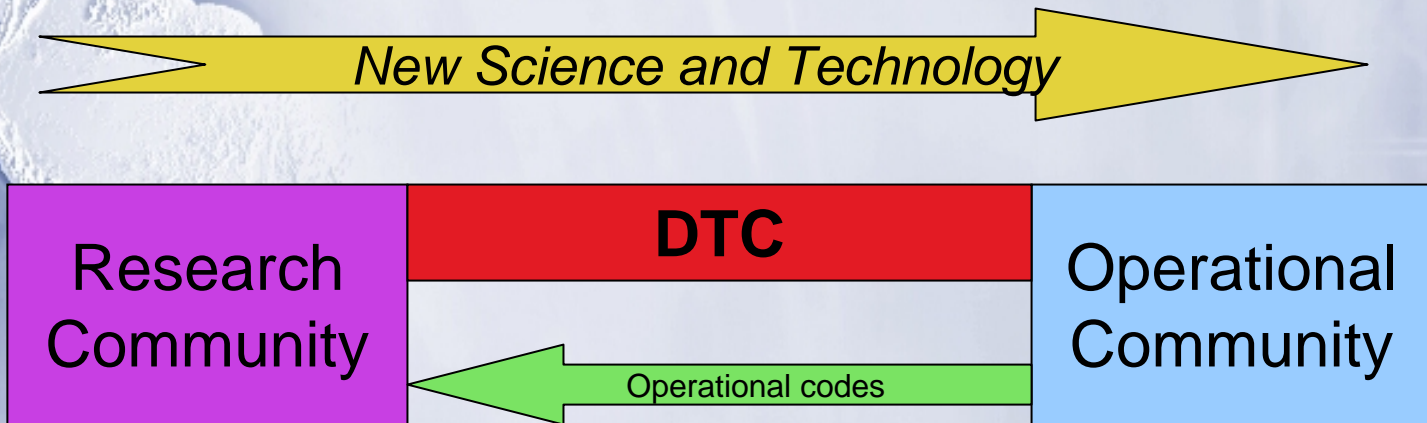
- ✧ The Earth system is complex and no longer can we isolate one earth process from another....eg ocean/atmosphere
- ✧ ESMF offers a simplified means to combine earth system modeling components to address problems of interest
- ✧ ESMF has a growing set of toolkits, interfaces, and process models that allow rapid transfer of knowledge and efficient model development
- ✧ Regional and local modeling and assimilation efforts are key contributors -- ESRL will utilize ESMF in its regional modeling activities.



Transfer to Operations: The Developmental Testbed Center (DTC)

- ✧ Gains made in some ESRL modeling efforts must have a path to operations
- ✧ The DTC serves as a bridge between research and operations to facilitate the transfer of new science to the operational centers
- ✧ The research community gets an operations-like testbed to evaluate new NWP methods; the operational community sees how the new NWP methods fare prior to consideration for implementation
- ✧ ESRL is heavily involved in DTC activities related to regional modeling and assimilation

DTC Concept



ESRL Efforts (15 min each)

- ✧ Model Development.....Georg Grell
- ✧ Data Assimilation.....Stan Benjamin
- ✧ Ensembles and Probabilistic Post Processing
.....Paul Schultz
- ✧ Air Quality.....Jim Wilczak
- ✧ Air-Sea Interaction.....Jian-Wen Bao
- ✧ Regional Climate.....Ola Persson



Summary

- ❖ ESRL performing a broad range of research using regional models and assimilation
 - ❖ Model development
 - ❖ Data assimilation
 - ❖ Ensembles and post processing
 - ❖ Air quality
 - ❖ Air-sea interaction
 - ❖ Regional Climate
- ❖ ESRL playing a key role in development of operational systems and performing phenomenological research
- ❖ Through ESMF and the DTC, good connectivity will be maintained with the research and operational communities

