

iRESM will be executed through:

Coupling state-of-the-art climate and integrated assessment models with hydrologic demand and availability, ecosystem, and energy systems, iRESM will provide a means to evaluate and project plausible regional mitigation and adaptation strategies applicable to any region in the world.

- » Analysis capabilities directed at models, including enhanced computational resources.
- » Regional process, Earth system and integrated assessment modeling.
- » Uncertainty evaluation and quantification including analysis for decision making.
- » Rich visualization features to illustrate complex highly spatially and temporally resolved results.

These advancements will enable more skillful projections of climate change and its impacts, while providing tools to effectively manage risk and investment decisions.



Hurricane Katrina, 29 August, 2005, landfall over Gulf states. Photo courtesy of NASA/GSFC, MODIS Rapid Response.

There is general agreement that the extent to which emissions are, or are not, reduced over the next few decades will have consequences for climate change impacts later in the century.

The integrated Regional Earth System Model Initiative is creating integrated Regional Earth System models to understand options for a changing world.

The iRESM initiative builds on Pacific Northwest National Laboratory's existing portfolio of research in climate science, including:

- » Global and regional climate modeling.
- » Integrated assessment modeling.
- » Sectoral energy systems modeling.
- » Coastal ecosystem and hydrodynamics modeling.
- » Field measurements and observations.
- » Data synthesis, analysis, and visualization.
- » Uncertainty quantification and decision making analysis.

iRESM is part of PNNL's Atmospheric Sciences and Global Change Division's goal to transform the Nation's ability to understand the consequences and tradeoffs of decisions that impact energy, water, ecosystems, and socio-economics with climate.

PNNL-SA-75036

Pacific Northwest National Laboratory
902 Battelle Boulevard
Richland, WA
www.pnl.gov/atmospheric/iresm



Pacific Northwest
NATIONAL LABORATORY

Proudly Operated by **Battelle** Since 1965

integrated Regional Earth System Model (iRESM) Initiative



"Climate change doesn't happen to countries...it happens to people."



iRESM is an initiative led by PNNL to help transform the Nation's ability to predict climate change and its impacts by providing decision makers with a better understanding of the variability and uncertainties of climate policy and decision making.

The integrated modeling tools being developed through this initiative address the subtleties, complexities, and feedbacks in the interaction between mitigation and adaption strategies, and will be applicable to any region of the world.

Tradeoffs and Consequences of Climate Change

Policy and decision making, in response to climate change, will likely require both economic and environmental tradeoffs. Decisions about allocating scarce water across competing municipal, agricultural, and ecosystem demands are just a few of the challenges ahead, along with decisions regarding competing land use priorities such as biofuels, food, and species habitat. Many current activities have addressed pieces of this complexity, though none have attempted to fully integrate human and environmental processes at the regional level.

Mitigation must include processes at a global level and extended time frame. However, adaptation is more relevant on a regional scale and shorter time frame, which encourages current research to address mitigation and adaptation separately, even though strategies for mitigation influence our ability for adaptation, and vice versa.

- » What are response options for reducing global greenhouse gas emissions?
- » What are our options for adapting to unavoidable climate change?
- » What are the implications of mitigation?

Science Questions

iRESM will address key questions facing decision makers:

- » What are the regional characteristics and opportunities for mitigation and adaptation strategies?
- » How do changes in mean climate and climate variability affect adaptation and mitigation strategies?
- » What are the interactions between management decisions and natural processes that contribute to rapid or nonlinear changes in the environment?
- » How do mitigation and adaptation strategies interact in the next few decades?

iRESM will expand the current capability in regional climate and integrated assessment models to include both Earth system and human system components, while incorporating spatially explicit modeling of energy infrastructure for energy, water, and land use.

The iRESM approach will provide insight into the interactions and feedbacks between human and earth systems, such as the effects of irrigation on regional climate, and in turn, the impacts of regional climate on agriculture.

