# Enabling Research Tools for Sustained Climate Assessment

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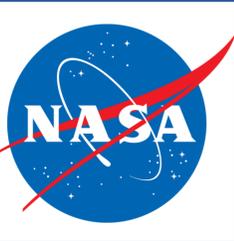
## 1. USGCRP and Sustained Assessment

- **The U.S. Global Change Research Program (USGCRP) was established by Congress in 1990** to "assist the Nation and the world to understand, assess, predict, and respond to human-induced and natural processes of global change." Thirteen federal agencies directly participate.

- **Goal 3 of the 2012-2021 USGCRP Strategic Plan calls for building sustained assessment capacity** that improves the Nation's ability to understand, anticipate, and respond to global change impacts and vulnerabilities. National Climate Assessments (NCAs) fall under this goal.

- **A Sustained Assessment process benefits from long-term investments in Earth science** research that enable the scientific community to conduct assessment-relevant science.

## 2. NASA and Sustained Assessment

- **NASA is a major contributor to global climate and environmental assessment activities**, such as the IPCC Assessment Reports and the WMO/UNEP International Scientific Assessments of Ozone Depletion. **NASA is also a strong supporter of previous and ongoing NCAs.**

- **In support of the USGCRP Sustained Assessment objectives, NASA initiated several research programs over the past five years to assist the Earth observation community** in developing indicators, datasets, research products, and tools to support NCAs.

- **One aspect of the NASA assessment portfolio funds four "enabling tools" projects** at NASA research centers. Each tool leverages existing capacity within the center, but has developed tailored applications and products for NCAs.

- **NASA's objectives** are to ensure that NASA data, models, and researchers are available to the NCA so that assessment can draw upon NASA capabilities, and to expand the community of assessment-capable scientists who could participate in future assessments.

- See http://weather.msfc.nasa.gov/nca/index.html for additional information on NASA's NCA activities.

## Enabling Regional Climate Model Evaluation: A Critical Use of Observations for Establishing Core NCA Capabilities
### PI: Duane Waliser, NASA Jet Propulsion Laboratory
### https://rcmes.jpl.nasa.gov/

The Regional Climate Model Evaluation System (RCMES) provides observations and IT tools to carry out regional climate model evaluations which can support quantitative climate assessment activities and inform decision support agencies.
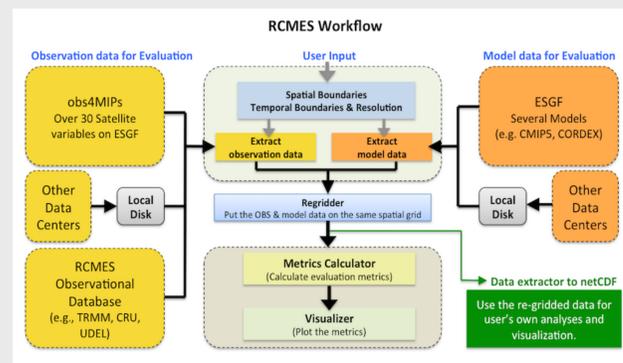


The goals are to make observation datasets, including NASA satellite data, more accessible to the regional climate model community; make the model evaluation process simpler, quicker and more comprehensive; and provide researchers with tools that allow them to spend more time analyzing results and less time coding. This will help quantify model strengths/weaknesses to inform model improvements.

## A Reanalysis Synthesis of EOS Observations at Regional Scales to support the National Climate Assessment
### PI: Mike Bosilovich, NASA Goddard Space Flight Center
### https://gmao.gsfc.nasa.gov/projects/NCA/

The Modern-Era Retrospective analysis for Research and Applications, Version 2 (MERRA-2) provide a synthesis of satellite and in situ observations across weather and climate time scales. The scientific objective is to connect the analyzed large-scale weather associated with historical extreme events to better forecast and prepare for future extremes
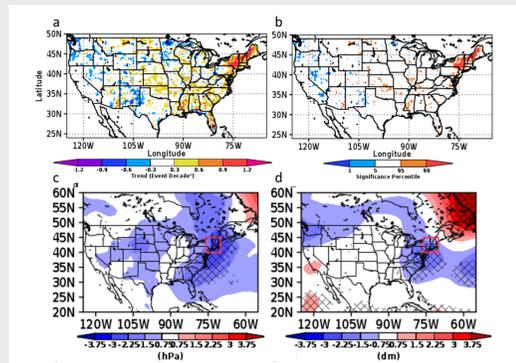


Northeast extreme precipitation events in June, July, and August: (a) Trend (1980-2014) in the number of events at the 95th percentile based on CPC gauge data. (b) Significance of the trend in (a). (c) The difference in sea level pressure and (d) 500-hPA height for the northeast during 95th percentile precipitation events, calculated by subtracting the mean composite for 1980–96 from the composite for 1997–2014. Hatching denotes a statistical significance of 95%.

## NASA Earth Exchange (NEX) Supporting Analyses for National Climate Assessments
### PI: Rama Nemani, NASA Ames Research Center
### https://nex.nasa.gov

NEX is a platform for the Earth science community that provides a mechanism for collaboration. NEX combines supercomputing, Earth system modeling, workflow management, NASA remote sensing data feeds, and a knowledge sharing platform to deliver a complete work environment in which users can explore and analyze large datasets, run modeling codes, collaborate on projects, and share results.
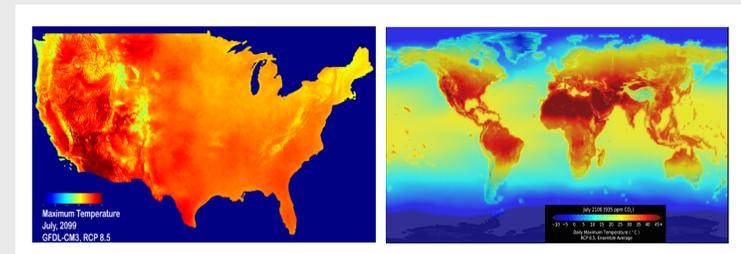


NEX enabled the production of downscaled climate products, including an 800 m CONUS monthly dataset (NEX-DCP30) and a ~25 km x 25 km daily global dataset l (NEX-GDDP)

OpenNEX provides opportunities to collaborate with external groups. Teams have used it to build portals and visualization tools (e.g. US Geological Survey, Planet OS). Google Earth Engine and Amazon Web Services make NEX capabilities available to any user for nominal fees.

Lectures, tutorials, and other information available via OpenNEX: https://nex.nasa.gov/nex/static/htdocs/site/extra/opennex/

## An Integrated Terrestrial Water Analysis System for the National Climate Assessment
### PI: Mike Jasinski, NASA Goddard Space Flight Center
### http://ldas.gsfc.nasa.gov/NCA-LDAS/

The NCA- Land Data Assimilation System (NCA-LDAS) is an integrated terrestrial water analysis system created as an end-to-end tool for assessment and dissemination of terrestrial hydrologic indicators.
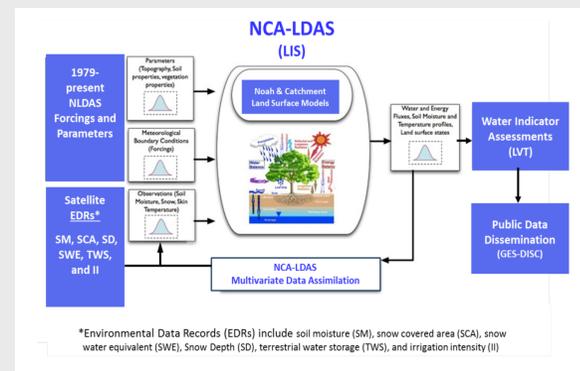


NCA-LDAS supports sustained assessment of our national terrestrial hydrologic climate for improved scientific understanding, and the adaptation and management of water resources and related energy sectors. The project recently released a new daily data product (NCA-LDAS Ver 001). It covers the continental US from 1979-2015 and was generated using the Noah-3.3 Land Surface Model with multivariate satellite data assimilation within NASA's LIS software framework.