NASA Announces A New Approach To Earth Science Data Analysis

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(PhysOrg.com) -- The way we analyze planet Earth will never be the same, thanks to a new initiative at NASA that integrates supercomputers with global satellite observations and sophisticated models of the Earth system in an online collaborative environment. As part of its celebration of Earth Week, NASA unveiled the NASA Earth Exchange (NEX) at a “Green Earth” public forum held at the NASA Exploration Center, Moffett Field, Calif.

By making NEX available, NASA expects to better enable scientists to collaboratively conduct research and address the impacts of changes in climate and land use patterns on ecosystems. NEX will link NASA’s supercomputing resources with massive Earth system data sets, and provide a collection of tools for analysis and visualization.

"Currently, it can require months for scientists to gather and analyze global-scale data sets, due to computing limitations, data storage requirements and network bandwidth constraints”, said Ramakrishna Nemani, senior research scientist at NASA Ames Research Center, Moffett Field, Calif. “By bringing NASA supercomputer resources to bear on the problem, we can reduce that time to hours, accelerating research on topics ranging from global rates of forest change to the effects of climate change on the reliability of our water resources.”

For example, scientists at NASA have created global high resolution “snapshots” of the Earth’s vegetation from Landsat data over the past 30 years. These snapshots contain quantitative information that is detailed

enough to characterize human-scale processes such as urban growth, agricultural irrigation, and deforestation. By comparing vegetation cover and biomass estimates from different time periods, scientists can improve our understanding of where and how the Earth is changing. Using NEX, scientists are now able to create snapshots of global vegetation patterns containing over half a trillion pixels in less than ten hours.

NEX uses a new approach for collaboration among scientists and science teams working to model the Earth system and analyze large Earth observation datasets. Using on-line collaboration technologies, NEX will bring together geographically dispersed multi-disciplinary groups of scientists focused on global change research. Scientists will be able to build custom project environments containing the datasets and software components needed to solve complex Earth science problems. These project environments, built using virtualization technology, will be highly portable and reusable and will automatically capture the entire analysis process, including the data and processing steps required to replicate the results in an open and transparent way. For example, results from the processing of the global Landsat data would be available to scientists with the additional expertise required to analyze rates of urbanization, deforestation, or biodiversity impacts. The science teams would have access to not only the data, but also each processing step used to create the global mosaics.

The NEX uses NASA’s largest, most powerful supercomputer, Pleiades, a 56,832-processor Silicon Graphics International Altix ICE system, Pleiades' storage system, with an approximately 1.4 petabyte capacity, and the hyperwall-2 visualization system, featuring 128 screens, which measure 23-feet by 10-feet is located at the NASA Advanced Supercomputing (NAS) facility at NASA's Ames Research Center, Moffett Field, Calif.

"Pleiades now provides an enormous capability for scientists to make new discoveries and gain insight into Earth's system," said William Thigpen, high-end computing capability deputy project manager at the NAS.

"Fitting these Landsat tiles together was like working a giant, complicated jigsaw puzzle¬ - it was not a trivial matter," said Tim Sandstrom, science visualizations expert at the NAS facility. "It required custom algorithms, an extensive amount of memory and a large number of processors, afforded by NASA's supercomputers."

NASA's Earth Science Division in the Science Mission Directorate at NASA headquarters, Washington, D.C., sponsored the NASA Earth Climate Exchange to complement the agency's efforts to capture global Earth observations from space.

The NAS facility's supercomputing environment operates under the agency's High End Computing Capability (HECC) Project, which plans for and provides high-end computing systems and services to support NASA's mission needs in aeronautics, exploration, science and space operations.

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