NASA EARTH EXCHANGE (NEX)

Earth Science Collaborative for Global Change Science

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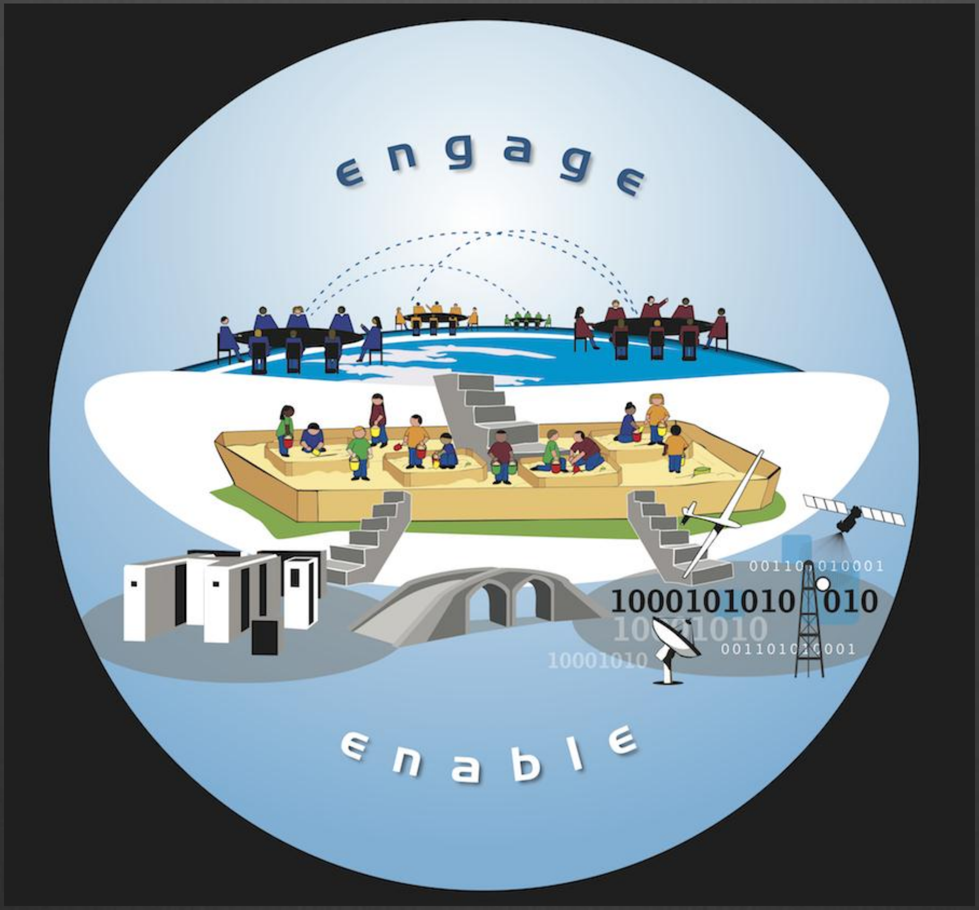


NEX is a virtual collaborative designed to *engage* and *enable* the Earth science community in *discovery* and *decision-making* by combining observations, supercomputing and social networking.

Need for an Earth Science Collaborative

- ***Earth science at NASA is a community effort***
  (over 422 institutions around the world published 5 or more papers (2000-2012) using MODIS data alone)

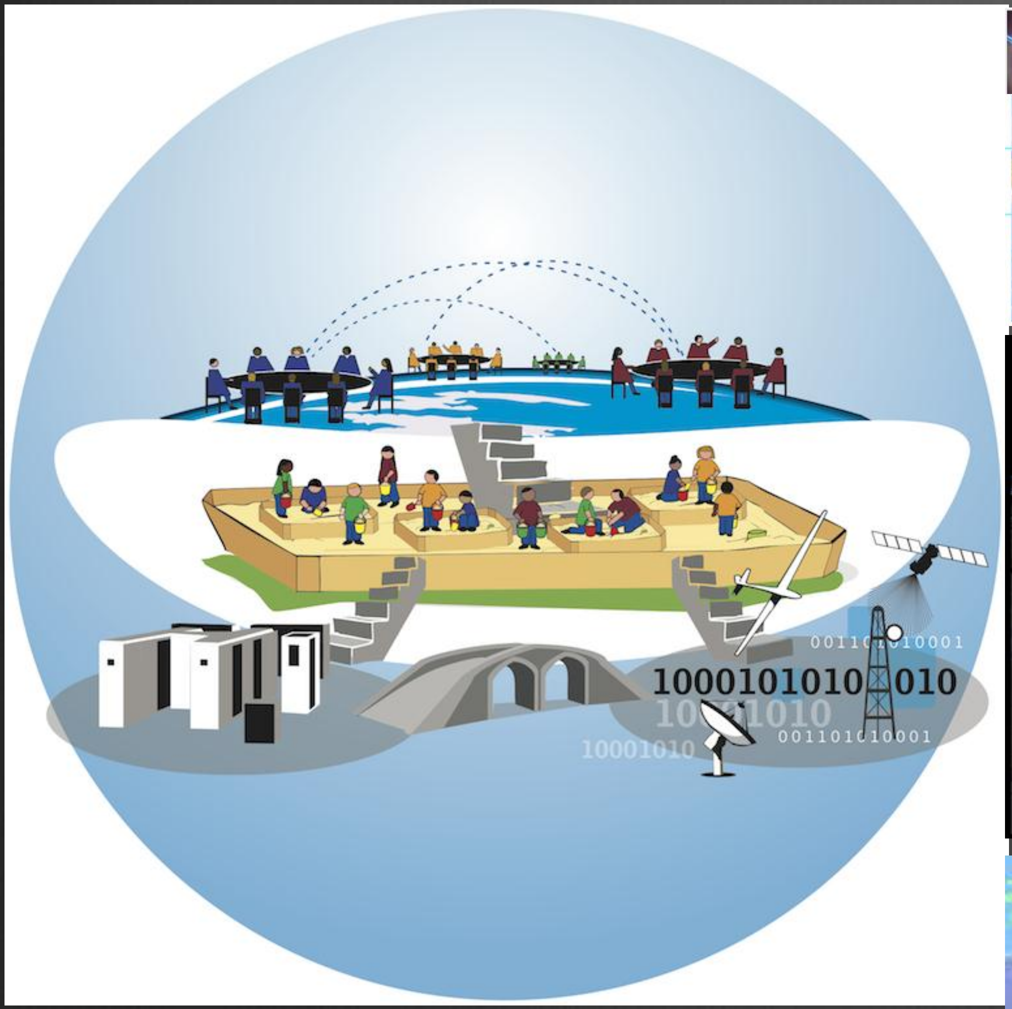
- **100s of investigators spend on average 60-80% of their time dealing with data.** (finding, ordering, waiting, downloading, pre-processing..)

- **Moving data sets that are getting larger each year over WAN is getting expensive & time-consuming.**

- **Sharing knowledge (codes, intermediate results, workflows) is difficult. Repeated low level IT efforts waste time and resources.**

- **No mechanisms exist allowing transparency and repeatability.**

NEX Implementation



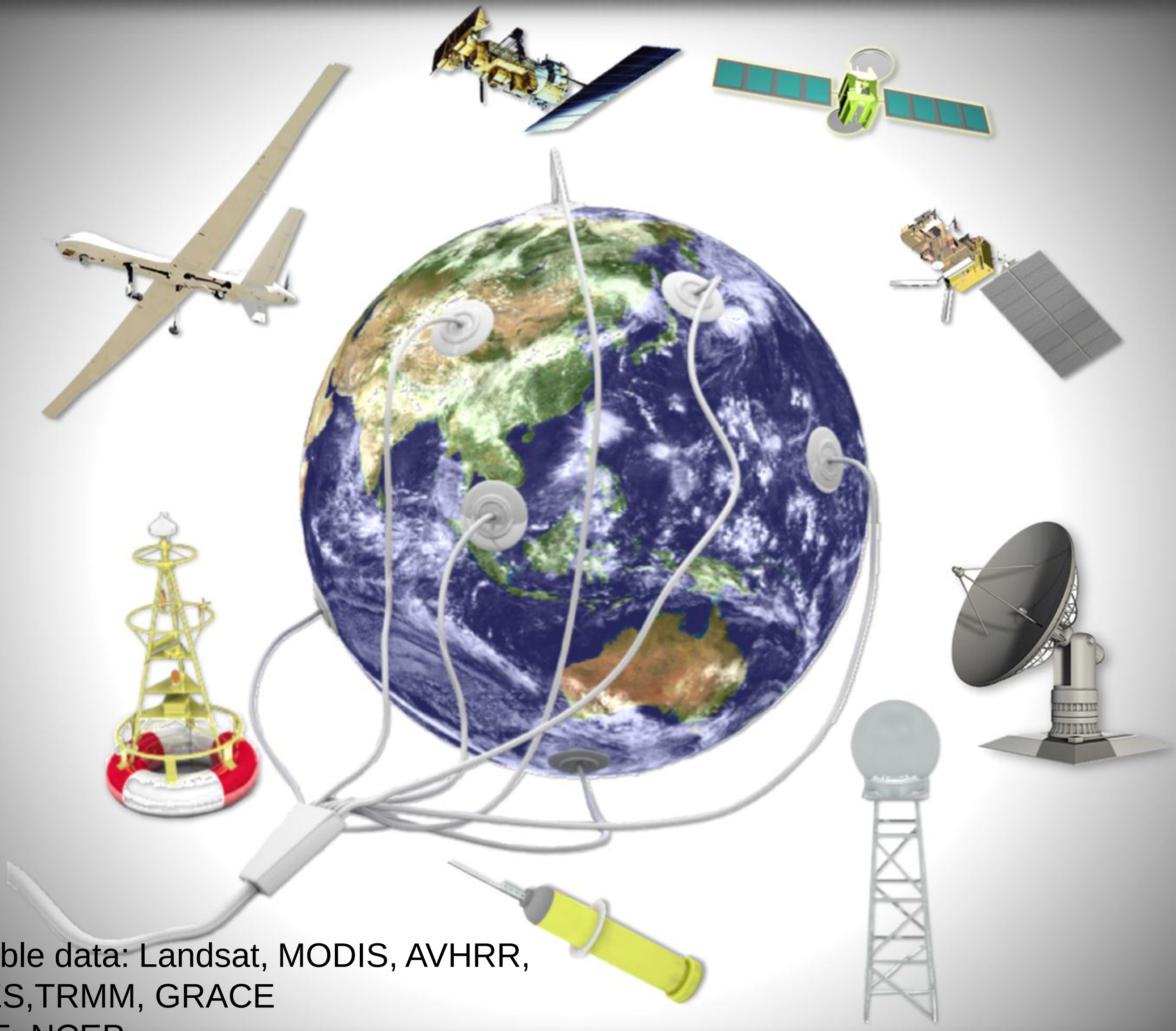
COLLABORATION
(over 250 members)

COMPUTING
(9PB, 180,000 cores)

Centralized
Data Repository
(over 400 TB of data)

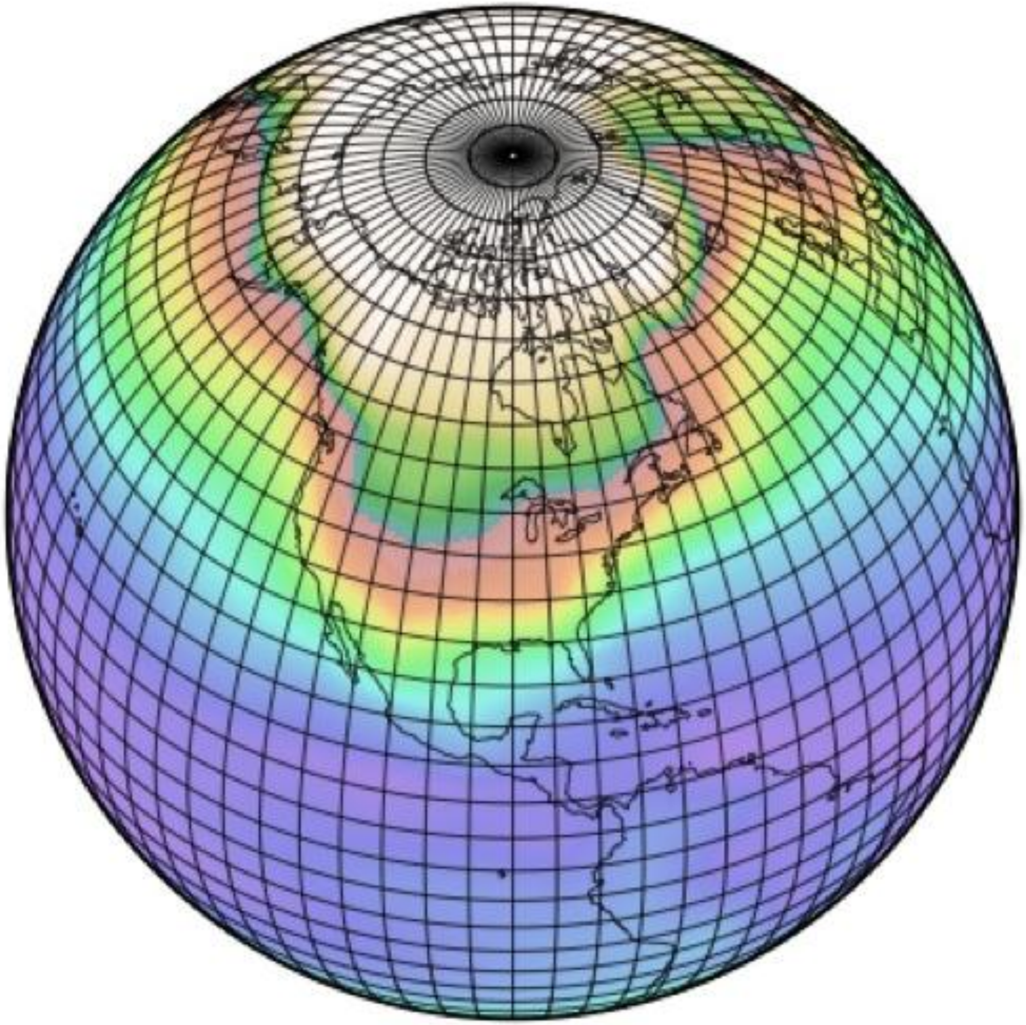
9PB of on-line storage
50PB of tape storage
512 CPUs readily accessible, 180,000 total

Access to ready-to-use data



Available data: Landsat, MODIS, AVHRR,
CERES,TRMM, GRACE
CMIP5, NCEP

Access to models/analysis tools



Climate, Weather, Hydrology, Ecology

Knowledge capture

Access to workflows to build upon

GEOPHYSICAL RESEARCH LETTERS, VOL. 38, L07402, doi:10.1029/2011GL046824, 2011

Widespread decline in greenness of Amazonian vegetation due to the 2010 drought

Liang Xu,[1] Arindam Samanta,[1,2] Marcos H. Costa,[3] Sangram Ganguly,[4] Ramakrishna R. Nemani,[5] and Ranga B. Myneni[1]

Received 19 January 2011; revised 3 March 2011; accepted 8 March 2011; published 8 April 2011.

[1] During this decade, the Amazon region has suffered two severe droughts in the short span of five years – 2005 and 2010. Studies on the 2005 drought present a complex, and sometimes contradictory, picture of how these forests have responded to the drought. Now, on the heels of the 2005 drought, comes an even stronger drought in 2010, as indicated by record low river levels in the 109 years of bookkeeping. How has the vegetation in this region responded to this record-breaking drought? Here we report widespread, severe and persistent declines in vegetation greenness, a proxy for photosynthetic carbon fixation, in the Amazon region during the 2010 drought based on analysis of satellite measurements. The 2010 drought, as measured by rainfall deficit, affected an area 1.65 times larger than the 2005 drought – nearly 5 million km^2 of vegetated area in Amazonia. The decline in greenness during the 2010 drought spanned an area that was four times greater (2.4 million km^2) and more severe than in 2005. Notably, 51% of all drought-stricken forests showed greenness declines in 2010 (1.68 million km^2) compared to only 14% in 2005 (0.32 million km^2). These declines in 2010 persisted following the end of the dry season drought and return of rainfall to normal levels, unlike in 2005. Overall, the widespread loss of photosynthetic capacity of Amazonian vegetation due to the 2010 drought may represent a significant perturbation to the global carbon cycle. **Citation:** Xu, L., A. Samanta, M. H. Costa, S. Ganguly, R. R. Nemani, and R. B. Myneni (2011), Widespread decline in greenness of Amazonian vegetation due to the 2010 drought, *Geophys. Res. Lett.*, *38*, L07402, doi:10.1029/2011GL046824.

1. Introduction

[2] There is concern that in a warming climate the ensuing moisture stress could result in Amazonian rainforests being replaced by savannas [*Cox et al.*, 2004; *Salazar et al.*, 2007; *Huntingford et al.*, 2008; *Malhi et al.*, 2008], in which case the large reserves of carbon stored in these forests, about 100 billion tons [*Malhi et al.*, 2006], could be released to the atmosphere, which in turn would accelerate global warming significantly [*Cox et al.*, 2000]. Hence, the drought sensitivity of these forests is a subject of intense study – recent articles on the response and vulnerability of these forests to droughts illustrate the various complexities [*Phillips et al.*, 2009; *Saleska et al.*, 2007; *Samanta et al.*, 2010a, 2010b; *Malhi et al.*, 2008; *Brando et al.*, 2010; *Anderson et al.*, 2010; *Meir and Woodward*, 2010]. Severe d
as those associated with the El Niño Southe
(ENSO), when the plant – available soil moistu
a critical threshold level for a prolonged period,
result in higher rates of tree mortality and in
flammability [*Nepstad et al.*, 2004, 2007; *da*
2010]. The drought of 2005, however, wa
ENSO-related droughts of 1983 and 1998 – it w
severe during the dry season in southwestern A
not impact the central and eastern regions [*M*
2008]. Of particular interest are reports of los
[*Phillips et al.*, 2009], decreased vegetation mo
[*Anderson et al.*, 2010] and higher fire counts [
2007] during the 2005 drought, and contradict
vegetation greenness changes inferred from sat
tions [*Saleska et al.*, 2007; *Samanta et al.*, 20
This lively state of current affairs is documente
items [*Tollefson*, 2010a, 2010b].

[3] On the heels of the once-in-a-century [*M*
2008] drought in 2005, comes an even more s
in the Amazon region [*Lewis et al.*, 2011]. The
2010 drought still need to be investigated and
unknown, but like the 2005 drought it was
coincided with the dry season. The *Rio Negro*
the Manaus harbor is one of the most useful
acterization indexes in Amazonia because it in
fall totals over the entire western Amazon ba
longest available time series record in the region
This index was at its lowest level (13.63 m ab
reference level, not 13.63 m lower in October t
term average for that month, as stated by *Lewis*
since 1902 on October 23, 2010 (Figure 1). Th
in 2005 was 14.75 m, or eighth lowest in the
Negro Manaus time series (Table S1). The m
channel, *Rio Solimões*, also reached recor
between October 14 and October 23, 2010 a
tions on its course (Tabatinga, Itapéua, Care
intins). The river levels began to ascend with
rains in mid- to late-October 2010. As of N
2010, the *Rio Negro* level is tracking the m
recorded river stage recovery (Figure 1). Year
the driest year on record according to these riv

[4] There is presently only a single report on
the 2010 drought on Amazon vegetation, name

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[2] Atmospheric and Environmental Research Inc., Lexington, Massachusetts, USA.
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[4] Bay Area Environmental Research Institute, NASA Ames Research Center, Moffett Field, California, USA.
[5] Biospheric Science Branch, NASA Ames Research Center, Moffett Field, California, USA.

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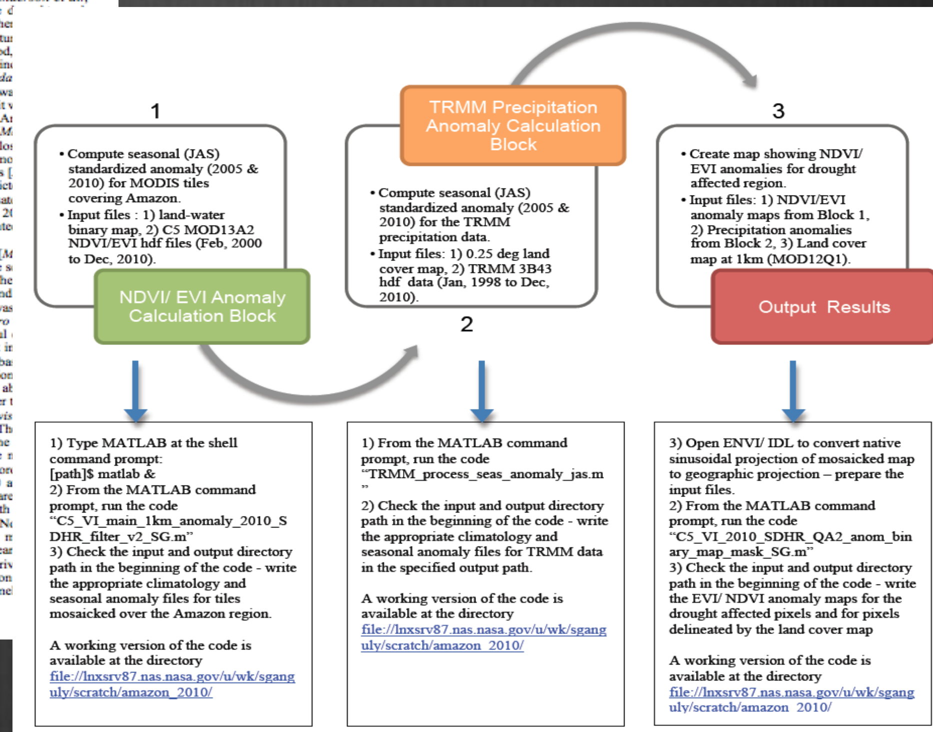
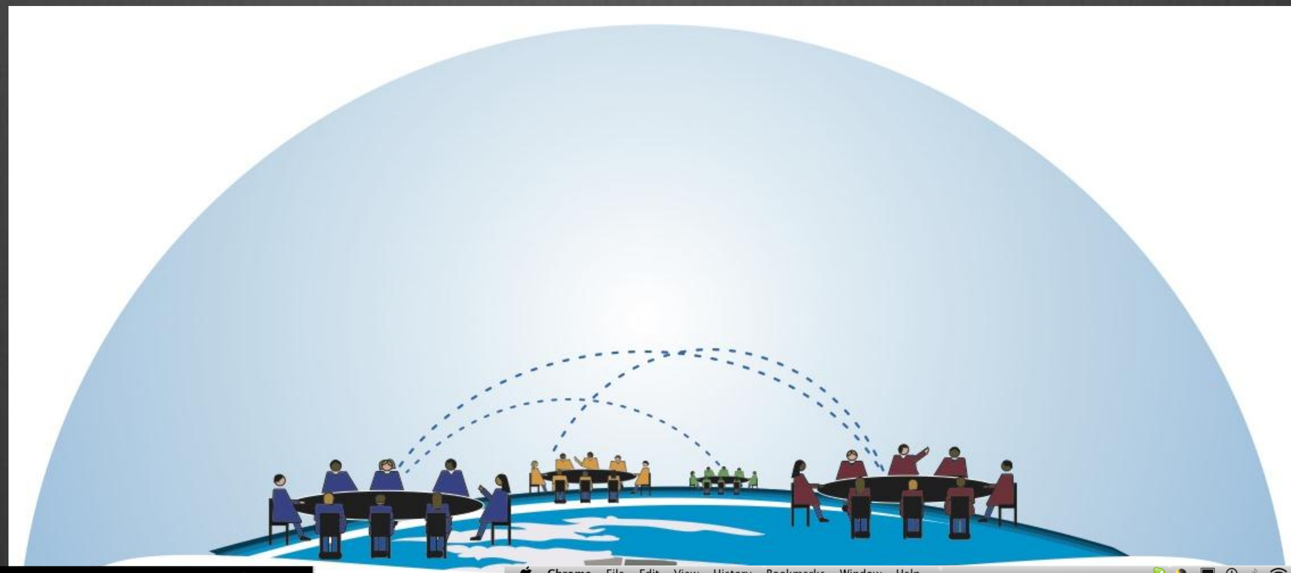


Network

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Modeling Strategies for Adaptation to Linked Climate and Land Use Change in the United States
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Related Research Areas
Carbon Cycle & Ecosystems, Climate Variability & Change
Over the coming century, changes in climate and land use and land cover (LULC) have the potential to create major changes in land surface temperature, watershed runoff, and ecosystem productivity throughout much of the world. There are a number of potential best management practices (BMPs) for land use planning and design that could be implemented to mitigate impacts resulting from changes in climate and land use. We propose to use a coupled land use - climate change modeling approach to explore the potential impacts of climate and land use change on productivity, watershed outflow and other processes under different adaptive BMP scenarios. The model will simulate implementation of BMPs to varying degrees, and various adaptive scenarios will be compared to "business as usual" scenarios to evaluate the potential benefit of the BMPs. Results from the simulations will be summarized on a decadal time-step and at the small watershed and local jurisdiction (e.g. county) scale.
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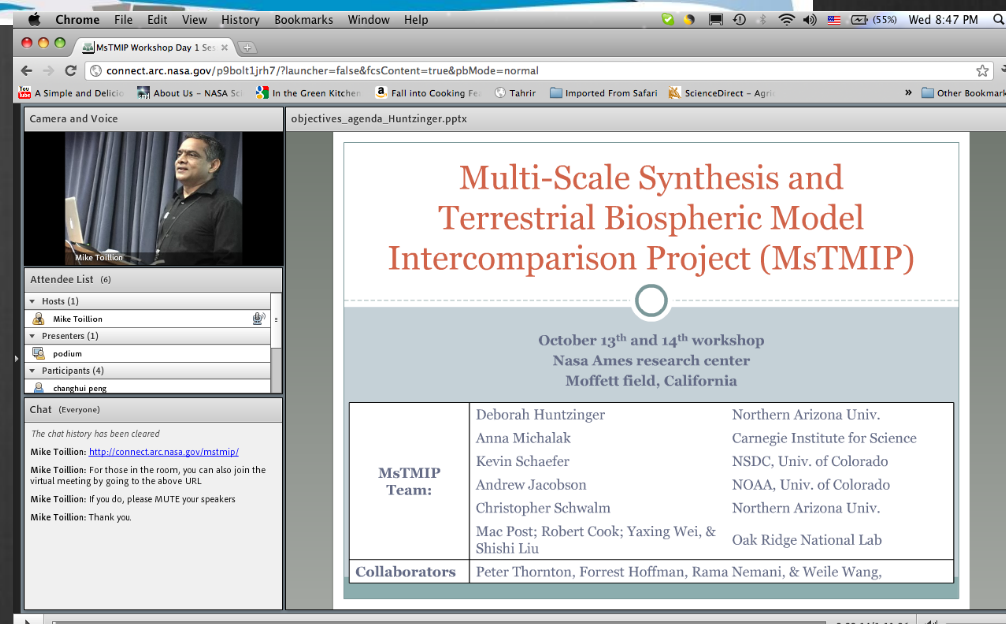
Phone: 508-444-1530 Fax: 508-444-1830
Email: sgoetz@whrc.org
http://www.whrc.org/about/cvs/sgoetz.html
http://lcluc.umd.edu/project_details.php?projid=197
Project Highlight
5 members / 3 resources
Started: Aug 10, 2010
Last Activity: Mar 26, 2011
Admin:
NDC-cmilesi
NDC-fmelton
Scott
Editors:
NDC-rnemani
NDC-wwang3
What can I do on this project?
New Member
Scott Goetz
Joined 6 months, 3 weeks ago
Related Projects
The Expansion of Rubber ...
1 members
4 resources
A New Method For ...
1 members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Camera and Voice
Mike Toillion
Attendee List (6)
Hosts (1)
Mike Toillion
Presenters (1)
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Participants (4)
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Chat (Everyone)
The chat history has been cleared
Mike Toillion: http://connect.arc.nasa.gov/mstmip/
Mike Toillion: For those in the room, you can also join the virtual meeting by going to the above URL
Mike Toillion: If you do, please MUTE your speakers
Mike Toillion: Thank you.
objectives_agenda_Huntzinger.pptx
Multi-Scale Synthesis and Terrestrial Biospheric Model Intercomparison Project (MsTMIP)
October 13th and 14th workshop
Nasa Ames research center
Moffett field, California
MsTMIP Team:
Deborah Huntzinger | Northern Arizona Univ.
Anna Michalak | Carnegie Institute for Science
Kevin Schaefer | NSDC, Univ. of Colorado
Andrew Jacobson | NOAA, Univ. of Colorado
Christopher Schwalm | Northern Arizona Univ.
Mac Post; Robert Cook; Yaxing Wei, & Shishi Liu | Oak Ridge National Lab
Collaborators
Peter Thornton, Forrest Hoffman, Rama Nemani, & Weile Wang,
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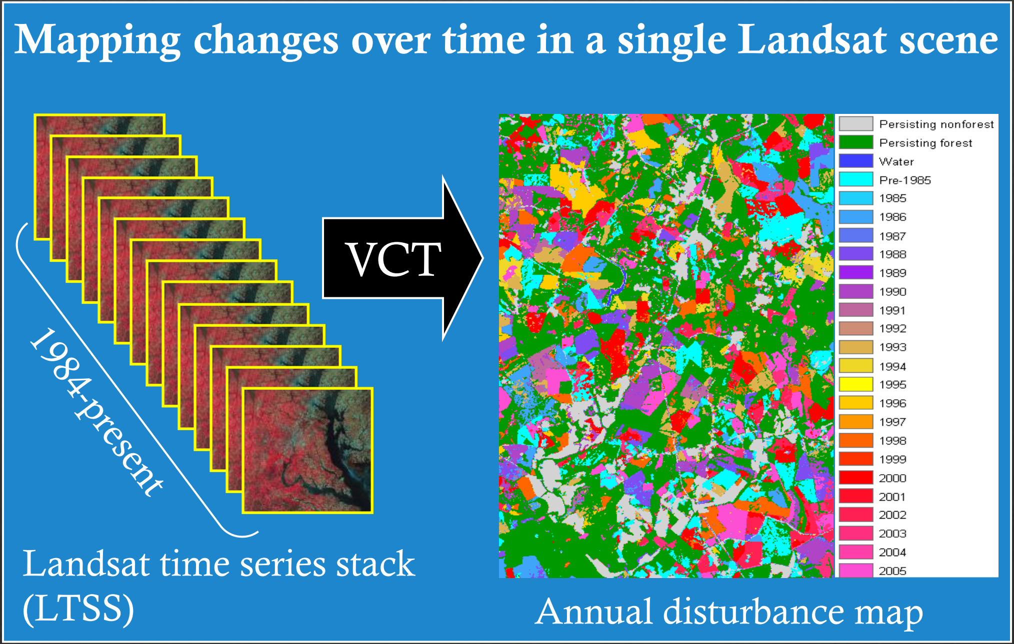
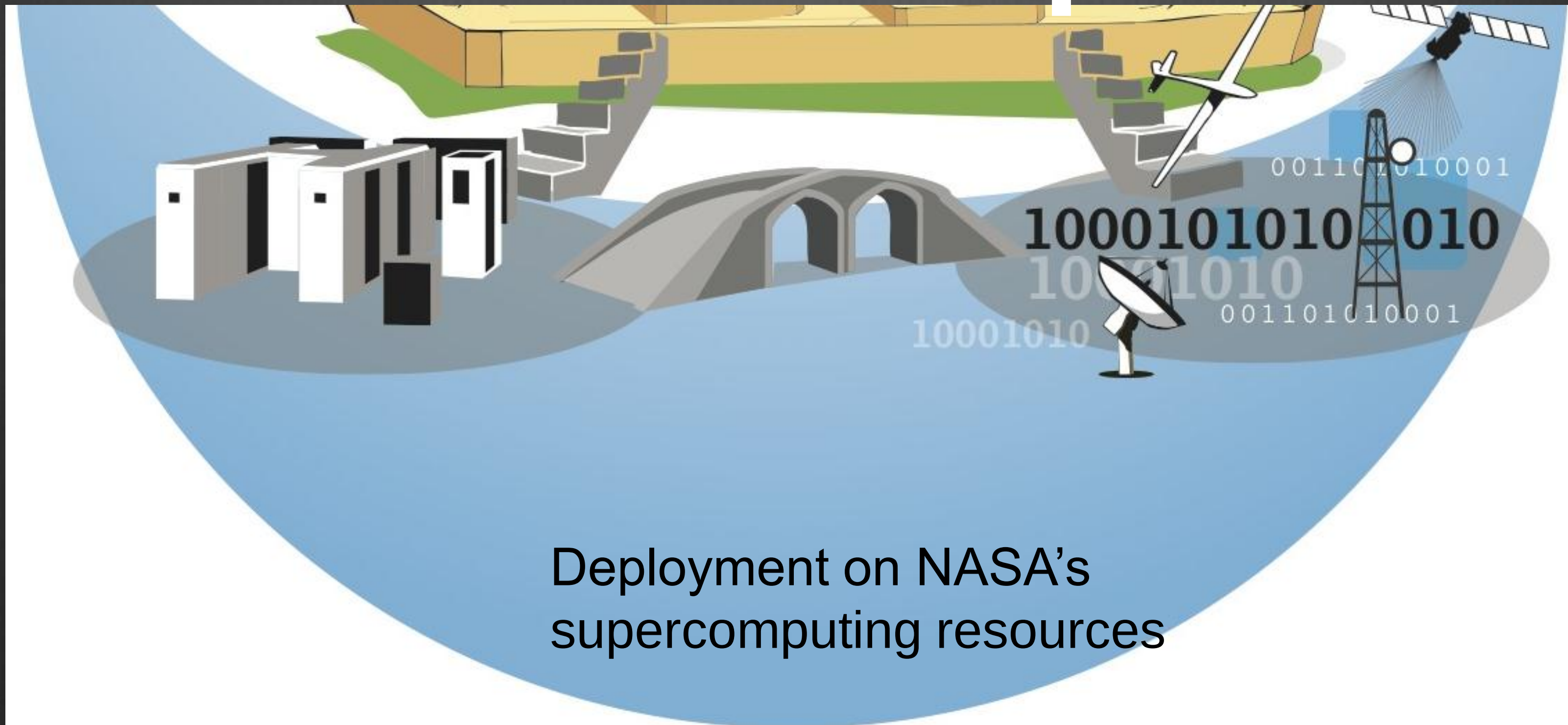
Prototype

Smaller platform for prototyping and development efforts

Two 48 core clusters
200TB storage in each



Scale it up

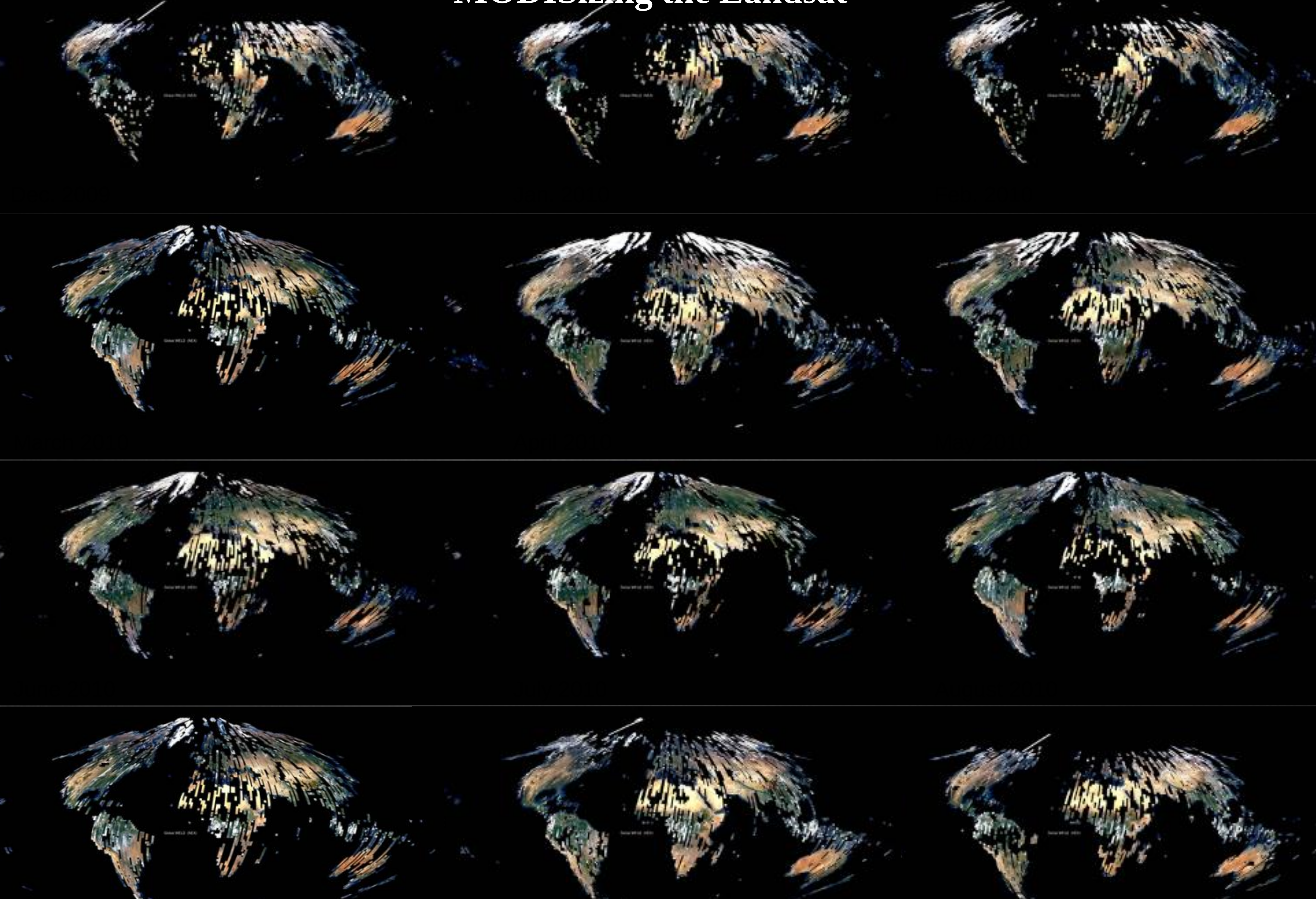


From a single scene to global (9000 in 3 hours)

NEX Visualization

14x11 feet display directly coupled to the supercomputer

MODISizing the Landsat

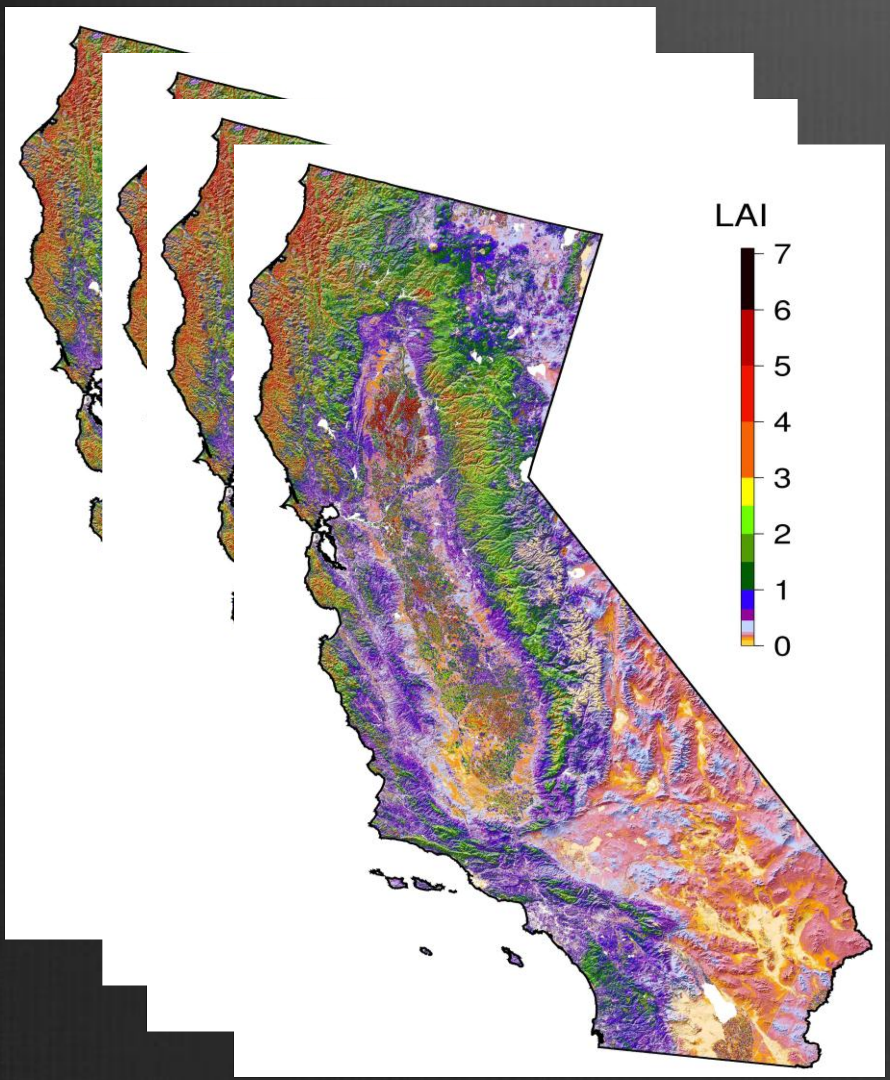


Monthly Landsat composites, processed 75000 scenes, WELD, SDSU

Prototyping

Monthly Leaf Area Index at 30m resolution

1984 to present



Adapted MODIS algorithm for Landsat

Key product for Carbon Monitoring system Biomass product

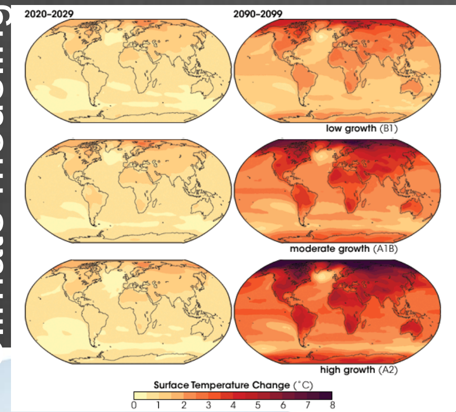
USGS transitioning the product to be operational with LDCM

Algorithm/data available for NEX users

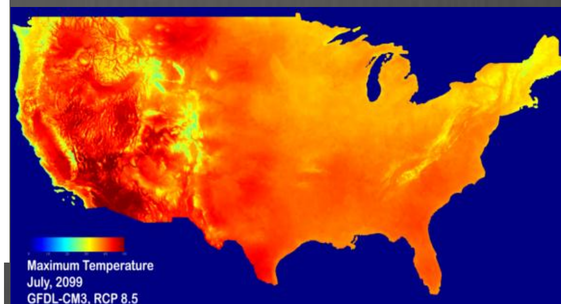
Climate Assessment and Adaptation Research Facility

Promoting consistency, repeatability, and transparency in global change science

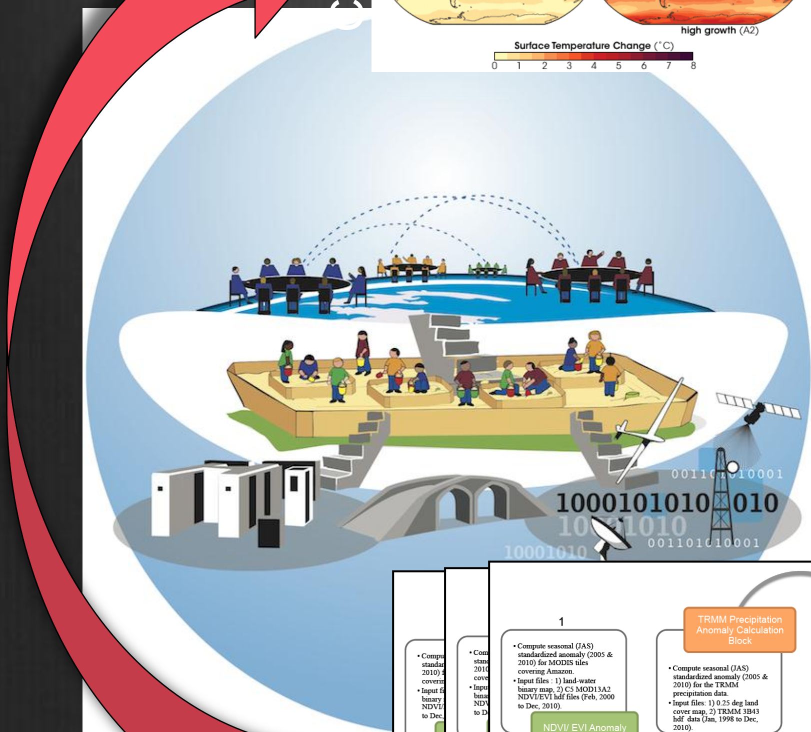
Climate modeling



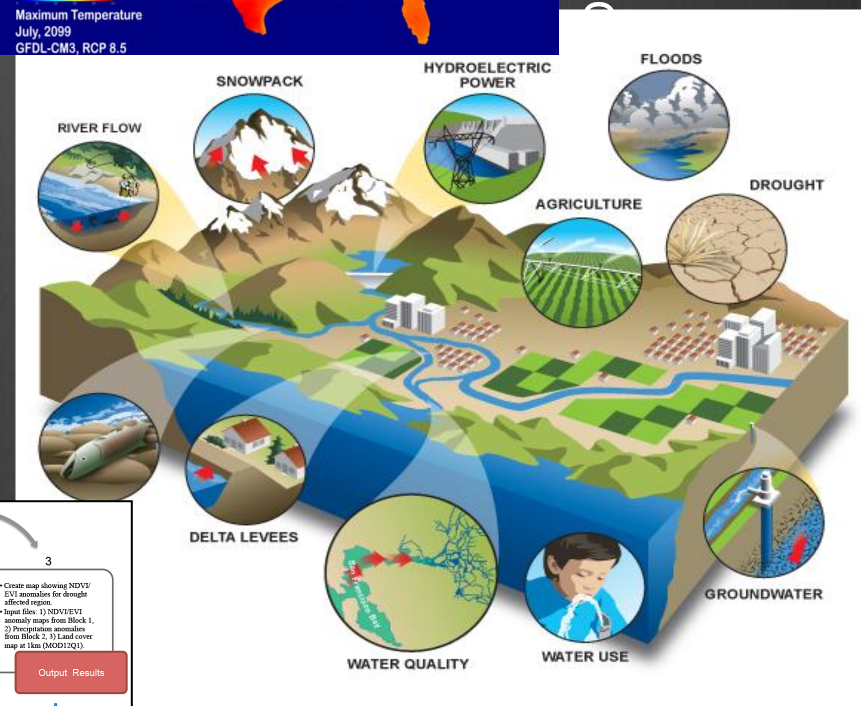
Downscaling



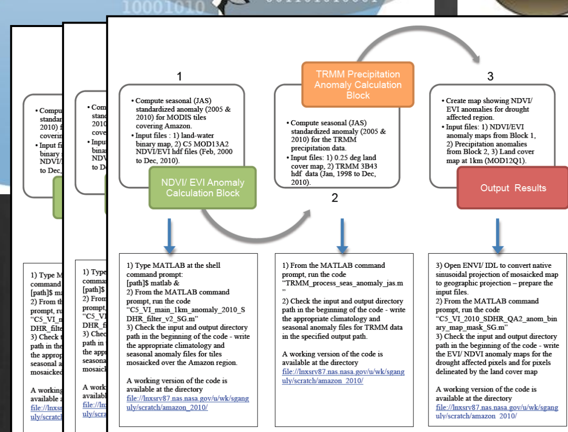
Every 4 years



Impacts modeling

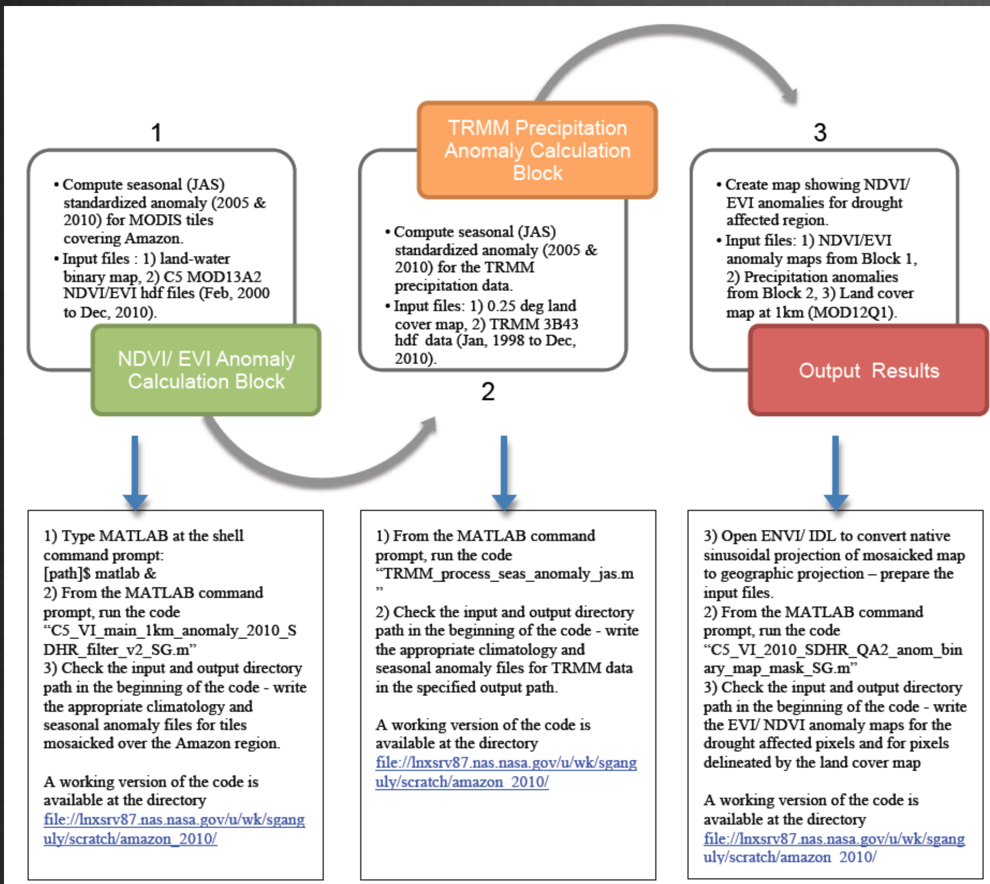


Workflows

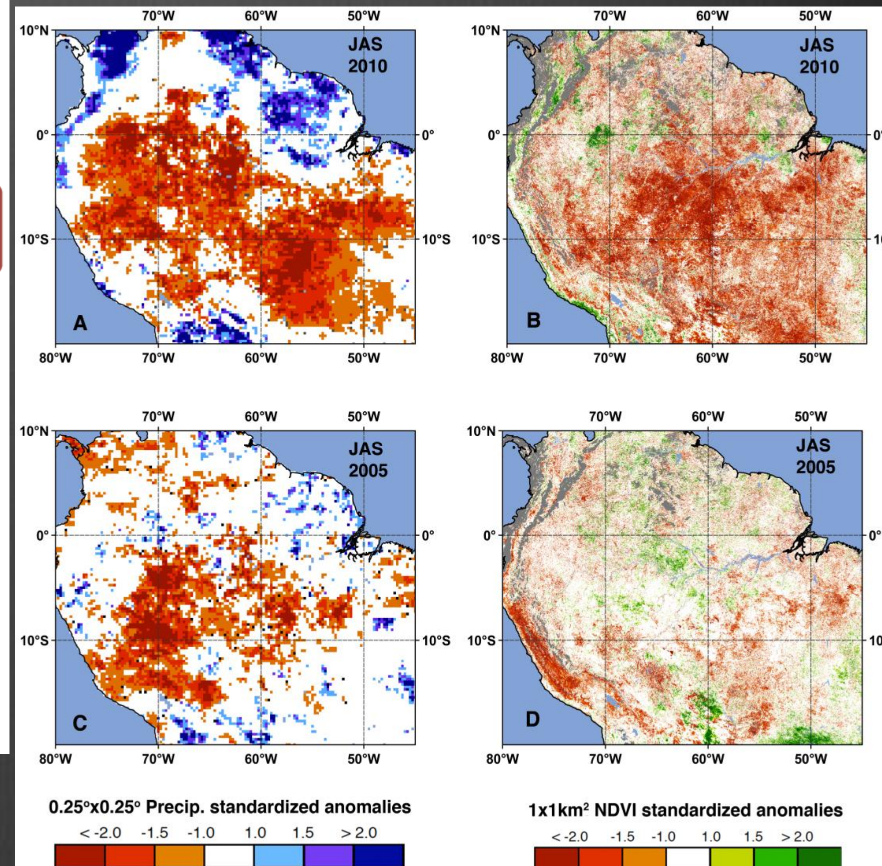


Drought Monitoring

Anomaly detection/Workflows



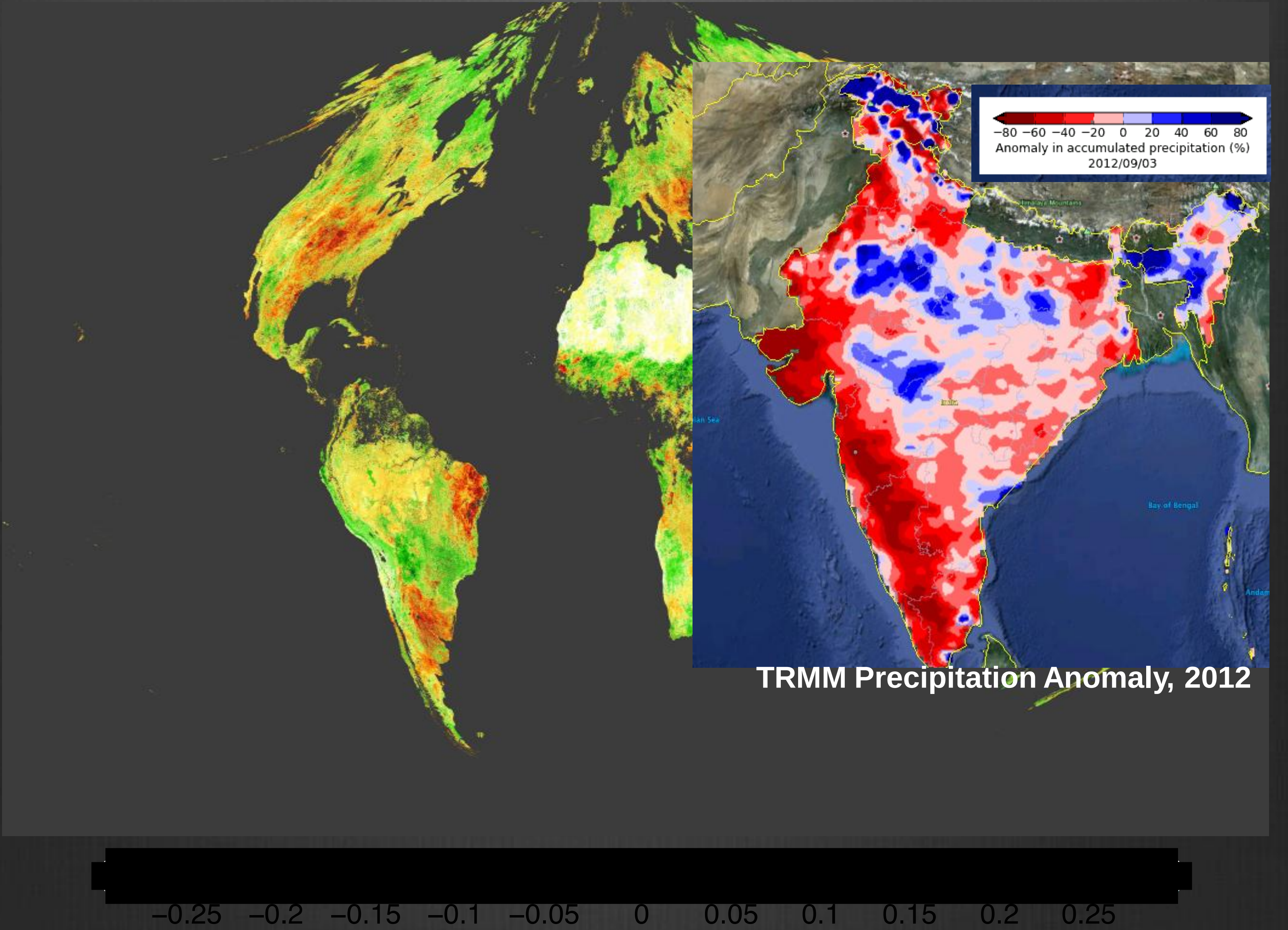
Satellite analysis of Amazon droughts (2005, 2010)

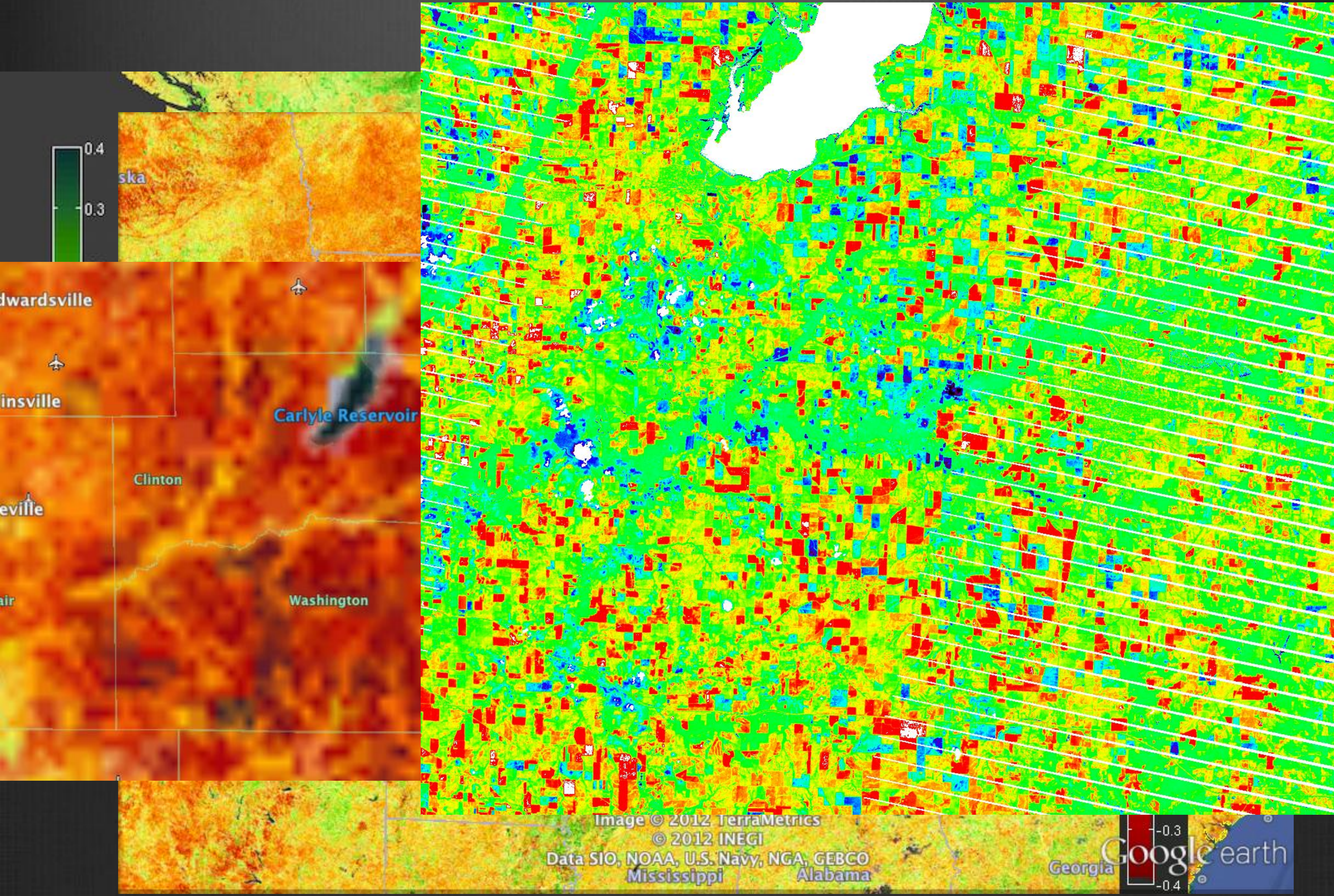


TRMM MODIS

Samanta et al., 2010; Xu et al., 2011, Geophysical Research Letters.

Global Drought Monitoring, 2012

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0.3
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Clinton
Washington
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Google earth

Summary

- Lowers the barrier of entry (co-locating data, model codes, and compute resources).
- Allows knowledge sharing (through workflows and virtual machines).
- Provides a framework for transparency, reproducible/verifiable results.
- Platform for prototyping or extending applications.