Earth Information System (EIS)

Monthly Highlights

## November 2023

https://www.earthdata.nasa.gov/eis

EIS models post-fire water and carbon cycle response in Amazon Basin

- ET, GPP impacts due to disturbances from fires and deforestation are modeled over South America at 1 km during 2003-20 within LIS using data assimilation of land cover, vegetation, and soil conditions.

- Compounding disturbances significantly inhibit the ET and GPP recovery trajectory, where recurring fires exacerbate losses from deforestation and droughts (boxed scenarios).

- Human disturbances caused up to 4% lower water use efficiency in the fire year, with largest impacts from fires occurring in drought years.


Domain for ET impacts shown in dark grey, with burned areas in red
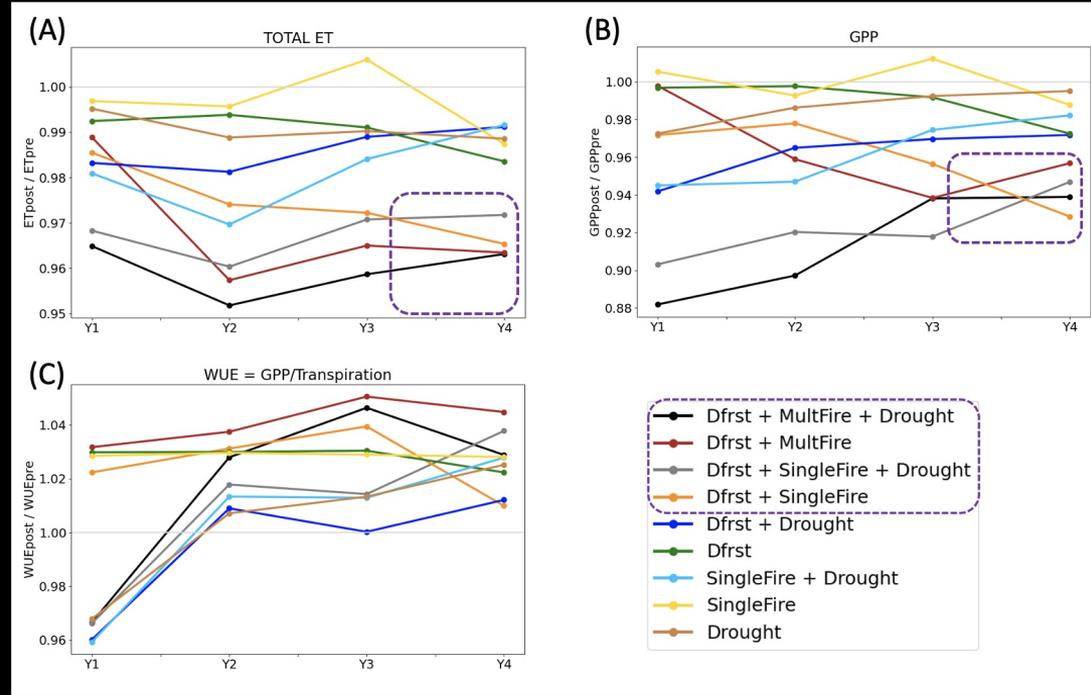
Post-fire impacts on *(A)* total ET and *(B)* Gross primary production (GPP) due to different disturbances over four post-fire years (Y1-Y4), derived using Noah-MP LSM runs that incorporate DA and annual landcover changes. Scenarios denote deforestation (conversion of forests to non-forest), multiple or single fire occurrences, and drought (SPEI < -0.5). *(C)* Resulting changes to water use efficiency caused by different disturbance scenarios.

EIS El Niño Response Working Group

Difference from average temperature (°F)
-9   0   9

Monthly sea surface temperature Niño3.4 Index values

every El Niño since 1950

El Niño threshold

La Niña threshold

2022-2023
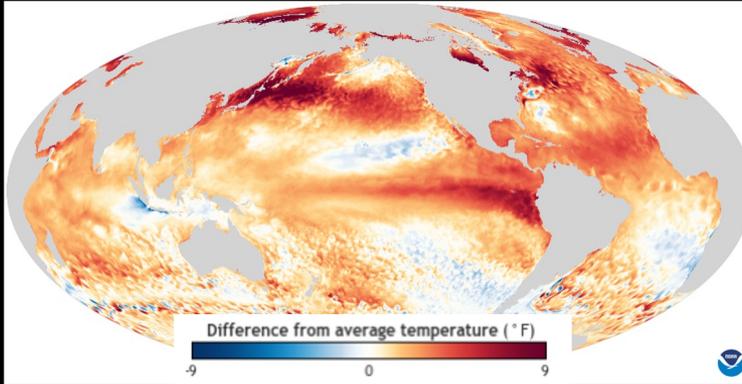
Current El Niño could rival the 2015 El Niño, but is complicated by historic global ocean warming.

The EIS model has enabled us to stand up a rapid response working group to investigate current and future changes in the Earth system.

Example interdisciplinary science question:
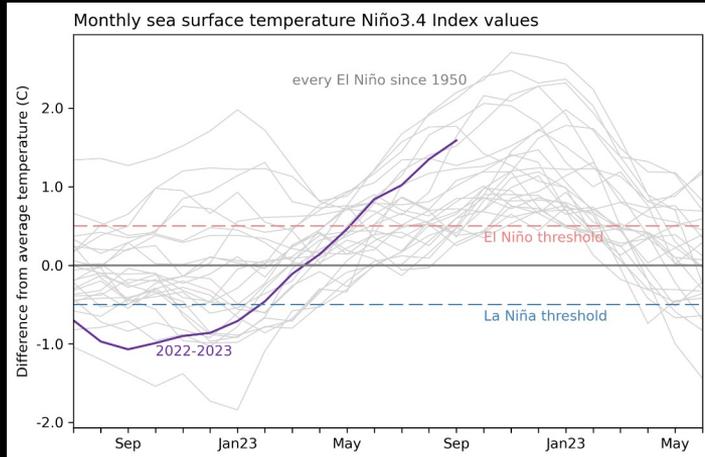
How is 2023 El Niño affecting net carbon exchange, fire emission, soil moisture, atmospheric demand, river runoff, evapotranspiration, etc.?

Water Security

Fire

Agriculture and Crops

Greenhouse Gases
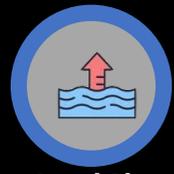
Sea Level Change and Coastal Risk

AGU23
WIDE. OPEN. SCIENCE.

San Francisco, CA & Online Everywhere
11-15 December 2023

Click here to see the full list of EIS presentations and talks at AGU 2023.

TOWN HALL 53D
Friday, December 15
1:00-2:00pm PST
Moscone Center 2002 - West

PANELISTS
Denis Felikson
NASA Goddard Space Flight Center

Kevin Bowman
NASA Jet Propulsion Laboratory

Chris Hain
NASA Marshall Space Flight Center

Manil Maskey
NASA Marshall Space Flight Center

Elijah Orland
NASA Goddard Space Flight Center

Lesley Ott
NASA Goddard Space Flight Center

Adnan Rajib
University of Texas, Arlington

NASA's Earth Information System: Enabling Open, Accessible, and Integrated Earth System Science

The NASA Earth Information System (EIS) is a game-changing collaboration activity, which builds bridges across NASA centers, missions, programs, and scientific disciplines to produce synthesized information on the Earth system in support of science-based decision making in five thematic areas: Water Security, Fire, Sea-Level Change and Coastal Risk, Greenhouse Gases, and Agriculture. EIS utilizes emerging cloud computing capabilities to provide stakeholders and data users unified access to: (1) analysis-ready datasets from observations and models; (2) scalable computational resources; and (3) technologies for developing and sharing science workflows among team members and our stakeholders.

Join us to participate in a panel discussion about this innovative approach to open, collaborative, and actionable science.

eis
earth information system

EIS Schedule at AGU 2023

Monday, December 11	Tuesday, December 12	Wednesday, December 13	Thursday, December 14	Friday, December 15
8:30AM-12:50PM PST **Poster:** Modeling the impacts of fire induced soil hydrophobicity and vegetation disturbances on hydrologic response in the western US **Click here**	**10:30AM-10:45AM PST** **Hyperwall:** Earth Information System: Earth System Science for Impact NASA Booth #531, Exhibit Hall	**8:30AM-12:50PM PST** **Poster:** Active Fire Line as a Key Control on Hourly Fire Growth for Predictive Modeling **Click here**	**8:30AM-12:50PM PST** **Poster:** Challenges of Drought Assessments in a Nonstationary Global Water Cycle **Click here**	**10:23AM-10:26AM** **eLightening talk:** Use of a Satellite-derived Fire Tracking Database to Evaluate Fire Spread Models **Click here**
	8:30AM-12:50PM PST **Poster:** Satellite remote sensing observation based groundwater monitoring over Bangladesh **Click here**	**8:30AM-12:50PM PST** **Poster:** Leveraging additional VIIRS information to improve fire tracking, behavior, and emissions estimates **Click here**	**8:30AM-12:50PM PST** **Poster:** Testing coherence across ensembles of statistically downscaled montane snow projections **Click here**	**1:00PM-2:00PM** **Townhall:** NASA's Earth Information System (EIS): Enabling Open, Accessible, and Integrated Earth System Science **Click here**
	8:30AM-12:50PM PST **Poster:** Linking Active Fire Properties to Post Fire Impacts on Vegetation, Streamflow, and Mass Wasting Hazards **Click here**	**10:40AM-10:50AM PST** **Talk:** Detangling the uncertainties plaguing ice-sheet model projections **Click here**	**9:00AM-9:10AM PST** **Talk:** How Well Can We Forecast Weather That Drives Rapid Fire Spread? **Click here**	**2:10PM-6:30PM PST** **Poster:** Impact of hydrologic variables on agriculture using a coupled hydrology and agriculture system **Click here**
	2:10PM-6:30PM PST **Poster:** Creating an open-source science ecosystem and culture for NASA's Earth Information System **Click here**	**11:15AM-11:25AM PST** **Talk:** Improving the Representation of Western U.S. Wildland Fire Diurnal Cycles in Smoke Forecasting Model Frameworks and Fire Emissions Inventories **Click here**	**2:10PM-6:30PM PST** **Poster:** High resolution modeling of global drought Propagation **Click here**	
		11:30AM-3:30PM PST **Poster:** Enhancing the Accessibility and Interactions of Satellite-Informed Hydrologic Projections Under Climate and Forest Changes for Water Managers **Click here**	**15:03AM-15:13AM PST** **Talk:** Post-fire water balance recovery impacted by droughts in Western U.S. as revealed by remote sensing observations **Click here**	

Stakeholder Workshop on NLDAS-3 Development

EIS and SPoRT-LIS teams co-hosted a workshop on November 8, 2023 for 35 NLDAS "superusers" to discuss their needs for NLDAS-3 given model and data assimilation upgrades. Discussion topics and comments are summarized on the following three slides, and a recording of the workshop is posted on the **NASA SPoRT website here**.

We asked, "**How does your organization use NLDAS products**?"

**Drought monitoring & research** – Colorado Climate Center

Production of the **US Drought Monitor** – National Drought Mitigation Center

Research on interactions between **climate & agriculture** – USDA Economic Research Service

Broker of **soil moisture information for the public** – NOAA NIDIS

Model initialization – IBM Research

Model benchmarking and forcing – Arizona State University
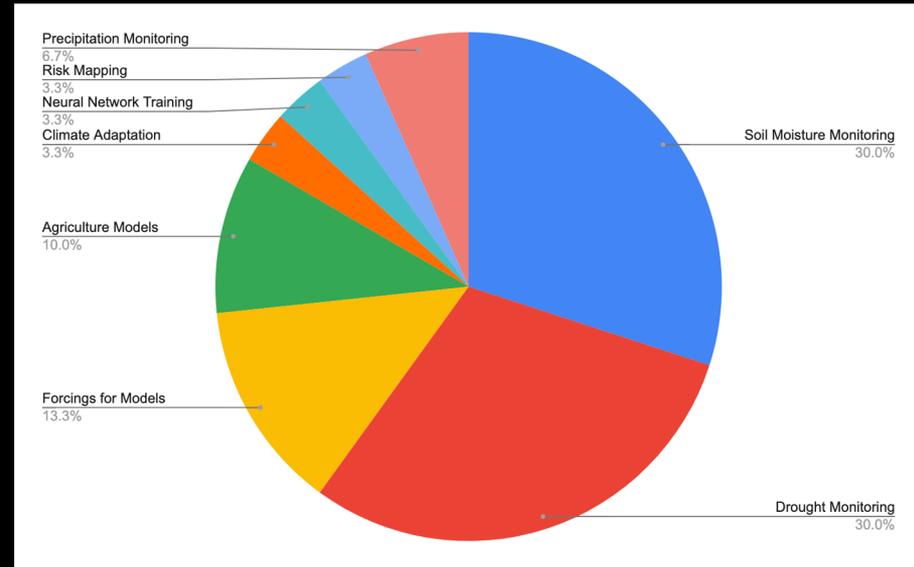
Stakeholder Workshop on NLDAS-3 Development

Model Forcings Breakout Group Comments

- Stakeholders indicated a need for atmospheric forcing datasets back to 1980 for historical context.

- Stakeholders also stated providing a long-term record without Data Assimilation (open loop) for comparisons could be very helpful.

- Potentially worth considering a correction to wind-driven under catch issues by leveraging station/local datasets.

- Stakeholders recommended comparisons against the AORC data, amongst other data products (e.g., those being produced by Yu Zhang).

- Resolving atmospheric deep convection would be relevant at higher resolutions to capture peak runoff and other key surface processes during floods and other extreme events.

- In response to the comment regarding deep convection capabilities, a question was posed if NLDAS-3 should be framed towards similar goals as the National Weather Service.

- Stakeholders are excited to have 1 km products and representation of the northern latitudes (Alaska).

Stakeholder Workshop on NLDAS-3 Development

Post-processing Breakout Group Comments
- Stakeholders indicated a need for alternate GIS-friendly formats other than GeoTIFF
- Cookbooks or Jupyter notebooks were suggested to generate GIS datasets from SPoRT-LIS for stakeholders
- Researchers need NetCDF file formats, downloadable via API (with bounding box, variable list)
- A collection of daily percentiles was requested
- Dynamic averaging or accumulation periods (3h, 6h, 24h) that make physical sense (e.g., snow melt during the day, shortwave radiation, ET)
- For developing interactive interfaces, suggestions included:
  - Translate interactive portal workflow into Python (or other) HTTP command that can be copy/pasted to download data
  - Allow on-the-fly averaging for shapefiles (CWAs, basins, counties), especially for percentiles
  - Time series for spatially averaged regions
  - Save analysis workflow and/or masks/shapefiles so that it can be repeated when new data arrives
  - Download data for pre-defined or user-defined regions (Jupyter notebook)
  - Publication-quality figure generation

Stakeholder Workshop on NLDAS-3 Development

Applications Breakout Group Comments
- Stakeholders are looking forward to having open data available and in as many formats we can support
- Stakeholders indicated a need for water balance showing different components of the system, showing different forcings – especially forcings out to 13 months
- Stakeholders indicated a need for a parallel validation system (on-the-fly validation) and better quantification/attribution of model and forecast error
- Stakeholders are excited for the possibility of highlighting flash droughts and degradation
- Evapotranspiration and and potential evapotranspiration are needed for the Midwest, especially when flash droughts occur
- Stakeholders addressed a desire for a very short-term forecast using high-resolution QPF (e.g., HRRR/HREF-forced for flooding events
- Change maps are key for some stakeholders and being able to point people to synergistic datasets – this will help solve multidisciplinary problems
- Better applications with respect to snow hydrology
- Accounting for depressions and pond water storage is of interest to Texas stakeholders

EIS Engagements and Outreach in November

Organization/ Meeting	Date(s)/Location	Thematic Area	Outcome
NLDAS-3 Stakeholder Workshop	Nov 8, virtual	Freshwater, Ag	Feedback from 35 "superusers" of NLDAS on needs for next gen system
NASA Acres Kick-off Meeting	Nov 2-3, St. Louis	Freshwater, Ag	Presented on NLDAS-3, updates, and stakeholders
USFS Atmospheric R&A Workshop	Nov 15-17, Atlanta, GA	Fire	Invited presentation on connecting fire weather, fire spread, and fire intensity using remote sensing observations
6th Global Wildfire Information System (GWIS) and GOFC-GOLD Fire Implementation Team Meeting	Nov 14-15, Montreal, CA	Fire	Presented on global fire danger products and forecast evaluation
WildFireSat Stakeholder Meeting	Nov 16-17, Montreal	Fire	Engagement on fire tracking algorithm development, fire lifecycle science and applications, and stakeholder needs
WMO expert panel on hydrology	Nov 28-30, Geneva	Freshwater	Engagement on the development of global hydrology synthesis products