National Aeronautics and Space Administration

NASA WATER INSIGHT PROJECT

NLDAS-3 Drought Monitoring Workshop Feedback Summary April 10, 2025

Needs and Capabilities - Breakouts

Workshop participants split into two breakout groups for more detailed Q&A, feedback and discussion on drought monitoring needs:

Meteorology/ Model Forcings/ Data Assimilation
Kim Locke, Fadji Maina, Kristen Whitney, David Mocko, Sujay Kumar, Melissa Wrzesien

Applications/ Downstream Products
Ryan Wade, Molly Woloszyn, Jonathan Case, Chris Hain, Brian Fuchs, Mike Hobbins, Jessica Erlingis

Applications/ Downstream Products Feedback

What downstream products would you like to see or are you developing? (question from registration form)

- Evapotranspiration (reference and actual)
- Drought indices like EDDI, SPEI
- Soil moisture percentiles
- Crop yields
- Forecast products
- Flash drought detection

Stakeholder Needs Categories – Which are most pressing?

Historical

- Climatologies & Percentiles
- Correspond to climate features

4 upvotes

Real-Time

- Blended drought indicators
- EDDI

5 upvotes

Forecasts

- Forecast percentiles
- Deterministic & Ensemble

6 upvotes

Visualization

- Data Formats
- Dynamic interaction
- Masking & slicing

1 upvote

Applications/ Downstream Products Feedback

What decisions are being made that NLDAS-3 data can help inform?

- NLDAS-3 can improve accuracy of the USDM; latency improvements are expected to help
- USDM categories are a trigger for Farm Bill assistance: Historically $29B+, most of which targeted on livestock forage
- Expansion to wildfire management community represents a huge opportunity; low latency of NLDAS-3 is on an incident time frame
- How do you get from NLDAS-3 fields to the properties of the fuel source? Opportunities to work with NASA FireSense and NOAA PSL on this issue.
- Agricultural community should also be targeted stakeholders for NLDAS-3
- Department of Interior, especially USGS – floods, landslides applications
- Agricultural and wildfire applications (including prescribed fires) can especially benefit from forecast component of NLDAS-3
- Departments of public health might be interested if forecasts depict both high temperatures and dry soil moistures (heatwave risks to human health)
- Forecast component might help NDMC, even though their mission is only focused on diagnostics; they are often asked whether it will be getting wetter or drier (e.g., flash droughts)
- Forecasts and CDI can be compared for verification and addresses regional/seasonal issues

Applications/ Downstream Products Feedback

What NLDAS-3 value-added product would benefit your organization and support decision making?

- A global version (HydroGlobe 5km is coming soon; 5km is more than adequate for global applications (broader patterns of dryness or wetness))
- Monthly values would be impactful if latency is less than 7 days
- Daily means (rather than hourly)
- Geographic expansion to Canada and Central America is significant investment in resources, what will be the benefit? Are there Canada stakeholders, etc.? (Canadian and AK forestry people (re: wildfire); NIDIS also has many connections with Canadian partners; North American Drought Monitor product issued monthly - NLDAS-3 could enable this to be produced more frequently; Cross-border data issues with Mexican and Canadian borders resolved; FEWS NET countries of interest are in areas now covered by NLDAS-3)
- SPoRT LIS data are also used for an AI streamflow forecasting project
- For us in the forecast biz, the ensemble forecasts would be beneficial for a variety of reasons (probability for flooding, flooding focus areas, flash drought forecasting, areas favored for blowing dust, convection, etc.) (What is cost/benefit for resolution vs. ensemble size? Would prefer greater number of ensembles, sacrificing resolution)
- Need for forecasting week 2 rapid onset flood and drought applications
- Blowing dust, weakly forced convection (e.g., Convective initiation in SE in summertime along wet/dry soil moisture boundaries)
- A note on historical; the greatest challenge with long-term SPEI is the transition at ~1980 going from NLDAS & PRISM data to the Livneh climate data when generating FAO56 PET. Even 4km NLDAS methodologies applied to model data prior to 1980 would help
- Option could be providing restart files so people could run their own <1km domains
- WPC QPF for Days 1-7?
- Would be better to get 1-3h precip rates instead of 6h product issued

Applications/ Downstream Products Feedback

What is your preferred method for visualizing and/or accessing the data? [e.g., through a decision-support system, webpage/dashboard, importing into GIS, etc.]

- Products could be issued via Web Map Services for adoption from less technical users
- Google Earth Engine (users should suggest this dataset directly to Google to demonstrate community need) (SMAP data got into Google Earth Engine for free this way)

Meteorology/ Model Forcings/ Data Assimilation Feedback

NLDAS-3 Forcing Validation: Precipitation was compared to: NLDAS-2, ERA5, MERRA-2, IMERG, CAPA, AORC, Daymet, Stage IV, NCEI ground measurements; Are there other datasets to add for validation?

- Have you considered comparing with satellite precip products? (Yes will be compared to IMERG)
- Also could look at total precipitable water and advected layered precipitable water (TPW, ALPW) (we only have surface meteorology in NLDAS. We don't consider/produce precipitable water amounts in the atmosphere. Only the total precipitation amounts reaching the ground (hourly).

Using dynamic lapse rates in NLDAS-3: will help account for local hourly variations in meteorological variations

- Please describe the moving window sectorizing application (Moving window option when calculating averages, climatologies, etc. Allow easy way to adjust moving window when calculating Climatologies; Full daily time series of all the hydrological variables will be available. The moving window would be an additional option to make post-processing easier. For example, the NLDAS-2 soil moisture percentile uses a 5-day window)

Post-processing Pipelines:

- For post-processing pipelines, is the team interested in state climatology offices or would prefer to stay within government for early adopters? (Yes, interested in working with all stakeholders. Would love to have people at the state climatology office levels give feedback. People at the state/local level may be able to spot issues that the developers may not notice)
- One outcome of this workshop will be to put together a smaller user drought focus group to work with NLDAS-3 team on specific applications.
- Plymouth State University in New Hampshire working on snow Climatologies; could combine some of that work with NLDAS-3.

Next Steps

- Continue the conversation (provide feedback and ask/answer questions) at NASA Water Insight GitHub discussions page: https://github.com/NASAWaterInsight
- Get involved with the NLDAS-3 Drought Focus Group to co-develop new applications and use case examples (email Kim Locke: kim.a.locke@nasa.gov)
- Watch for more updates on NLDAS-3 model improvements and completion here: https://ldas.gsfc.nasa.gov/nldas/v3

Thank you for participating!