



The FEWS NET Land Data Assimilation System (FLDAS): Earth System Modeling to Support Famine Early Warning

Kimberly Slinski^{1,2}, Amy McNally^{2,3,4}, Abheera Hazra^{1,2}, Jossy Jacob^{2,5}, Md Shahriar Pervez^{6,7}, Daniel Sarmiento³, Kristi Arsenault³, Shrad Shukla⁸, Weston Anderson^{1,2}, Michael Budde⁶, James Rowland⁶, Christa Peters-Lidard²

¹ University of Maryland, Earth System Science Interdisciplinary Center, College Park, MD

² NASA Goddard Space Flight Center, Greenbelt, MD

³ Science Applications International Corporation, Reston, VA

⁴ US Agency for International Development Famine Early Warning Systems Network, Washington, DC

⁵ Science Systems and Applications, Inc., Lanham, MD

⁶ US Geological Survey Earth Resources Observation and Science Center, Sioux Falls, SD

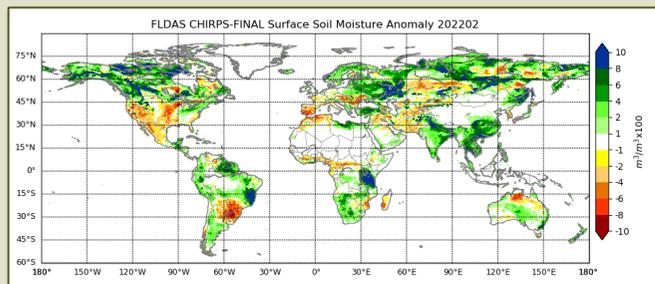
⁷ ASRC Federal Data Solutions, Sioux Falls, SD

⁸ University of California Santa Barbara Climate Hazards Center, Santa Barbara, CA

Frontiers in Hydrology Meeting 2022

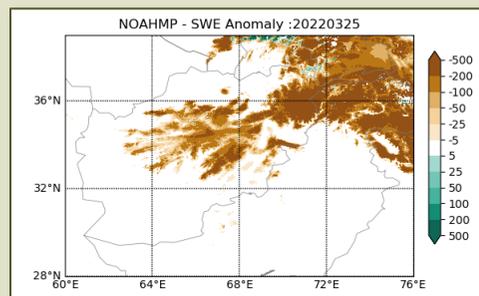
FLDAS Land Surface Modeling and Forecasting Products

FLDAS-Global



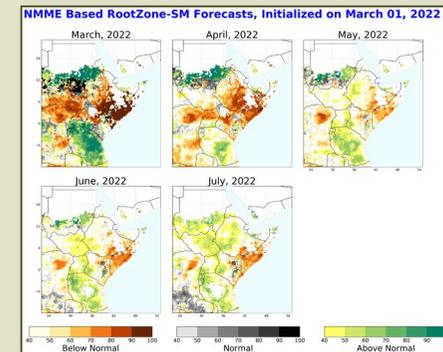
0.1-degree, monthly Noah3.6 global runs
(surface soil moisture anomalies shown)

FLDAS-Central Asia



High resolution (0.01-degree),
daily Noah-MP runs over Central
Asia (SWE anomalies shown)

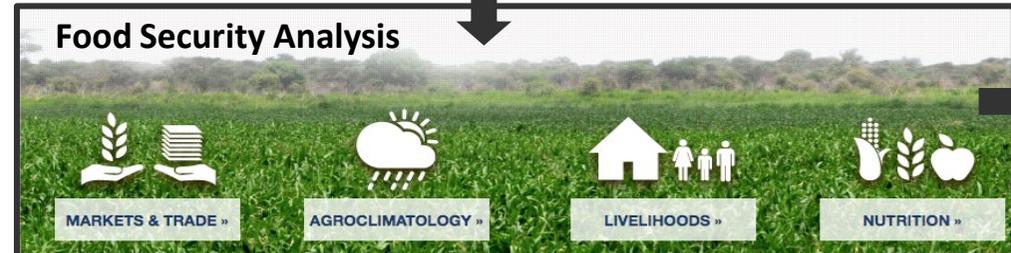
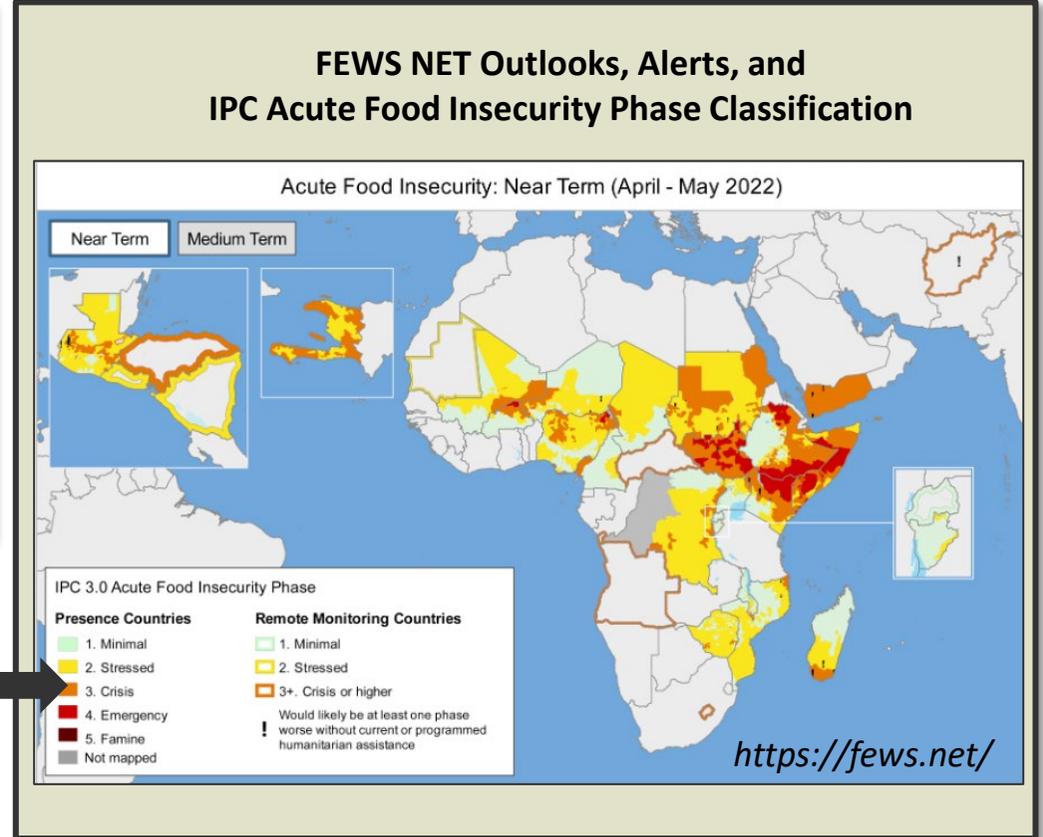
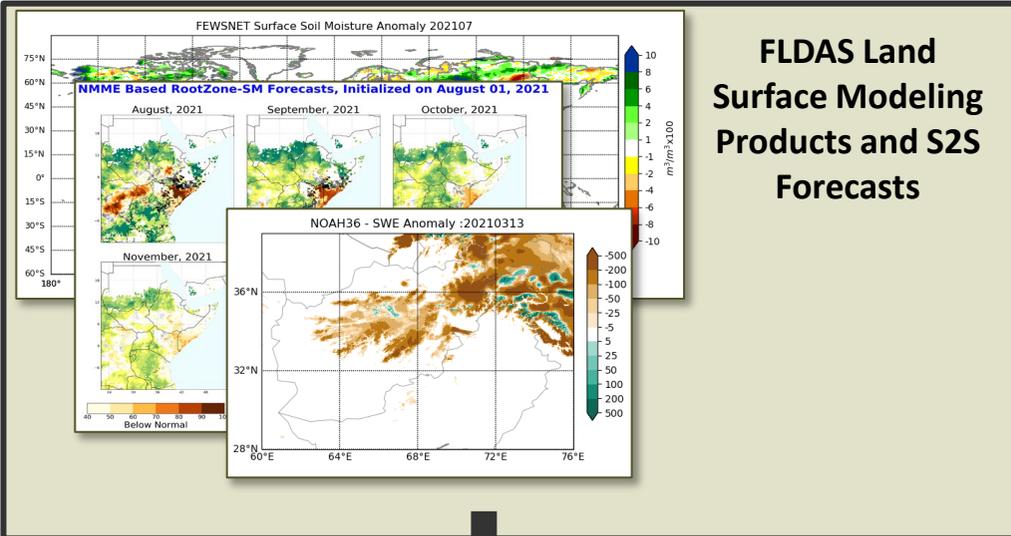
FLDAS-Forecast



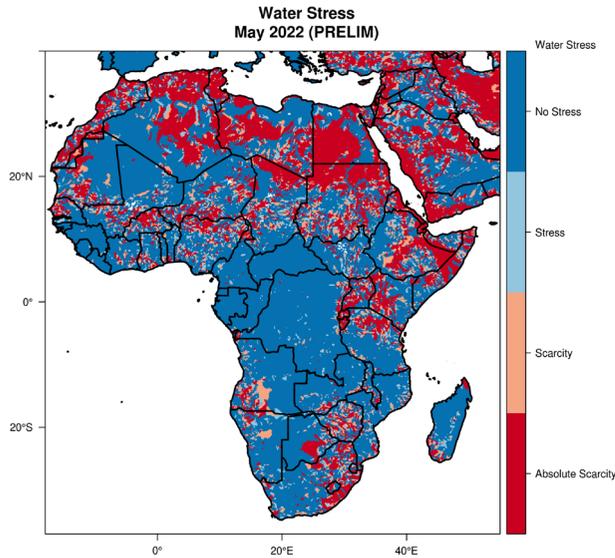
0.25-degree, 5-month forecasts over
Africa and the Middle East (root
zone soil moisture shown)

<https://ldas.gsfc.nasa.gov/fldas>

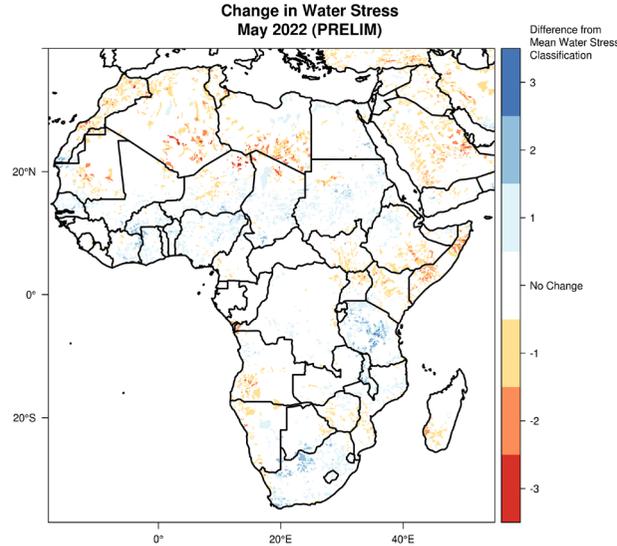
FLDAS Supports Food Security Early Warning



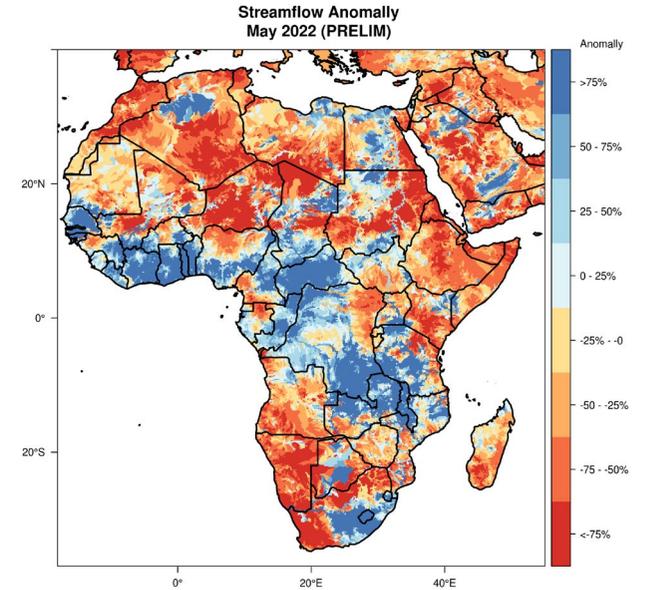
Water Stress



Water Stress maps highlight locations experiencing water stress based on current runoff and 2015 population.



Water Stress Anomaly maps highlight departure from average (1982-2017).



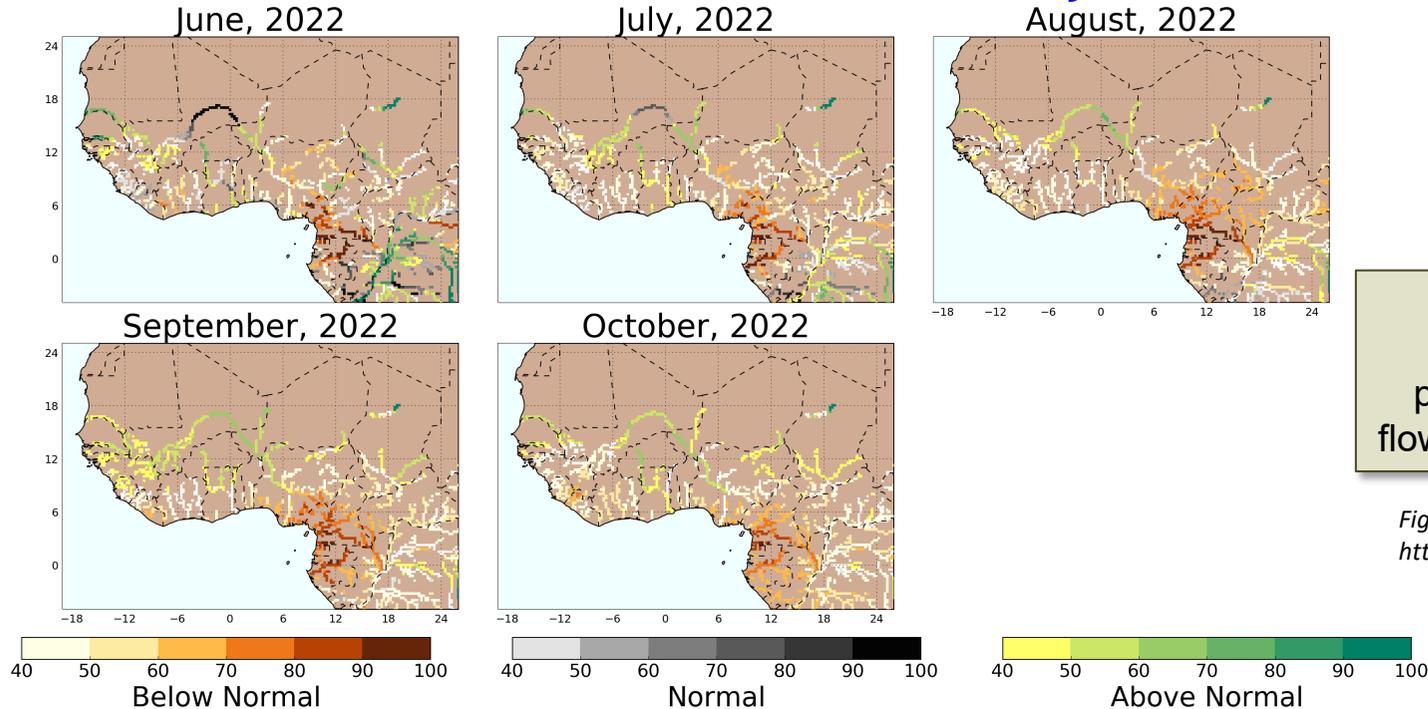
Streamflow Anomaly maps highlight water supply departures from average conditions (1982-2017).

Figures from: <https://ldas.gsfc.nasa.gov/fldas/models/global>

McNally, A., et al., 2019, *Acute Water-Scarcity Monitoring for Africa*. *Water* 11, no. 10

Seasonal Streamflow Forecasts

NMME Based Streamflow Forecasts, Initialized on June 01, 2022



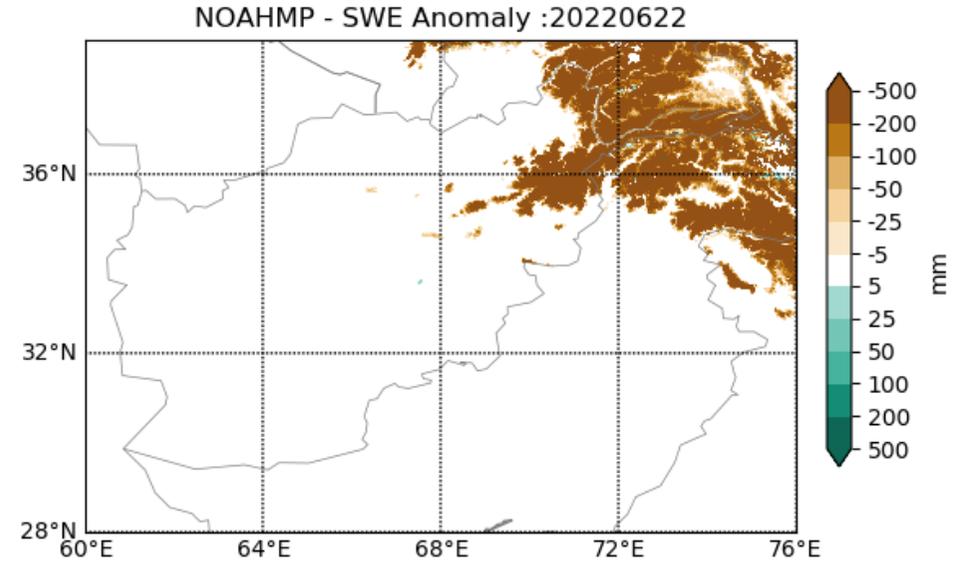
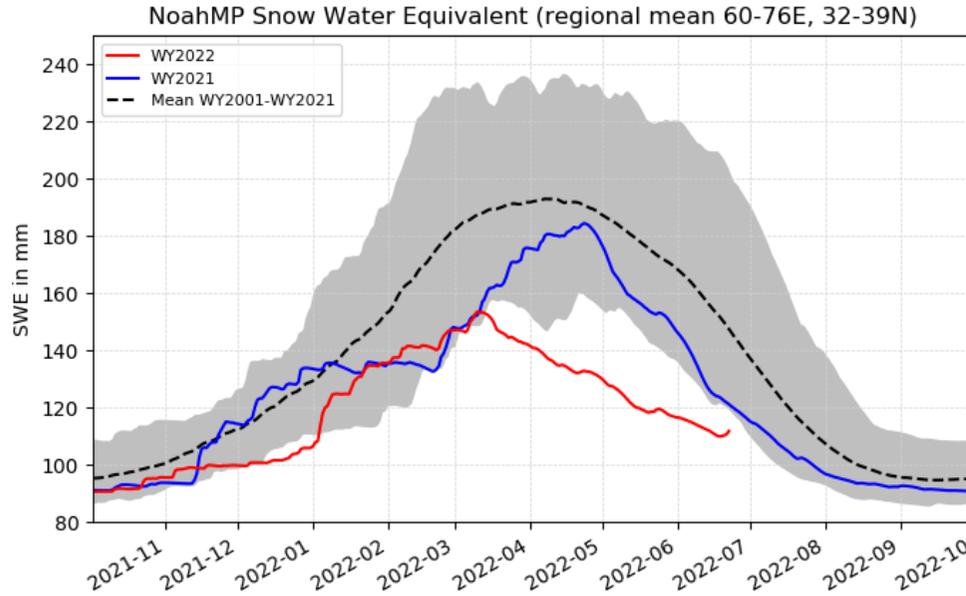
Seasonal ensemble streamflow forecasts from FLDAS-Forecast provide predictions of high and low flows in major rivers out to five months.

Figures from:
<https://ldas.gsfc.nasa.gov/fldas/models/forecast>

Arsenault et al., 2020, *The NASA Hydrological Forecast System for Food and Water Security Applications*, Bulletin of the American Meteorological Society, 101(7).

Hazra, A. et al., 2022, *NASA's NMME-based S2S hydrologic forecast system for food insecurity early warning in southern Africa*. In review for *Journal of Hydrology*.

Afghanistan Snowpack Monitoring

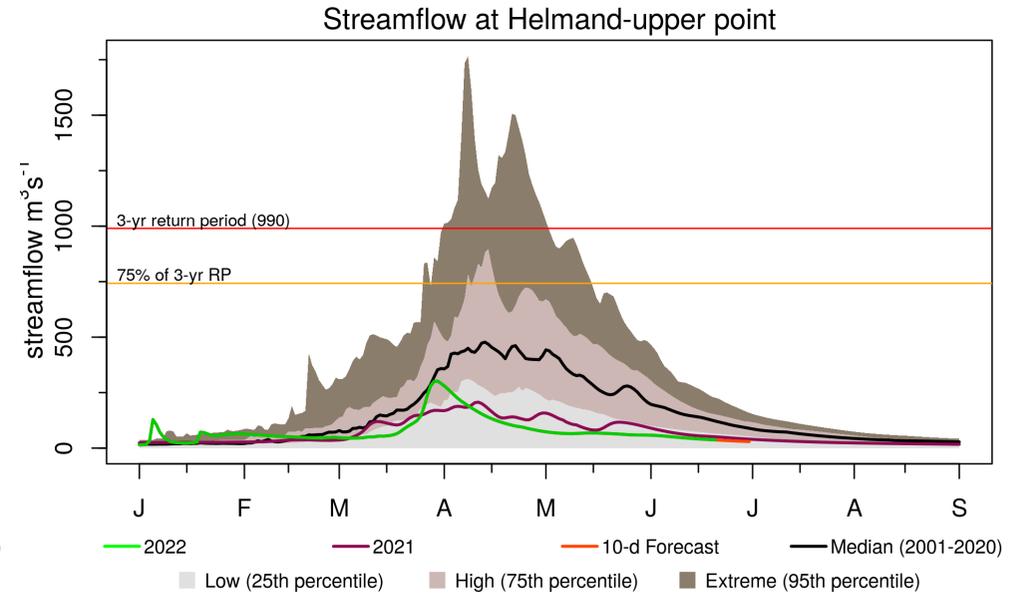
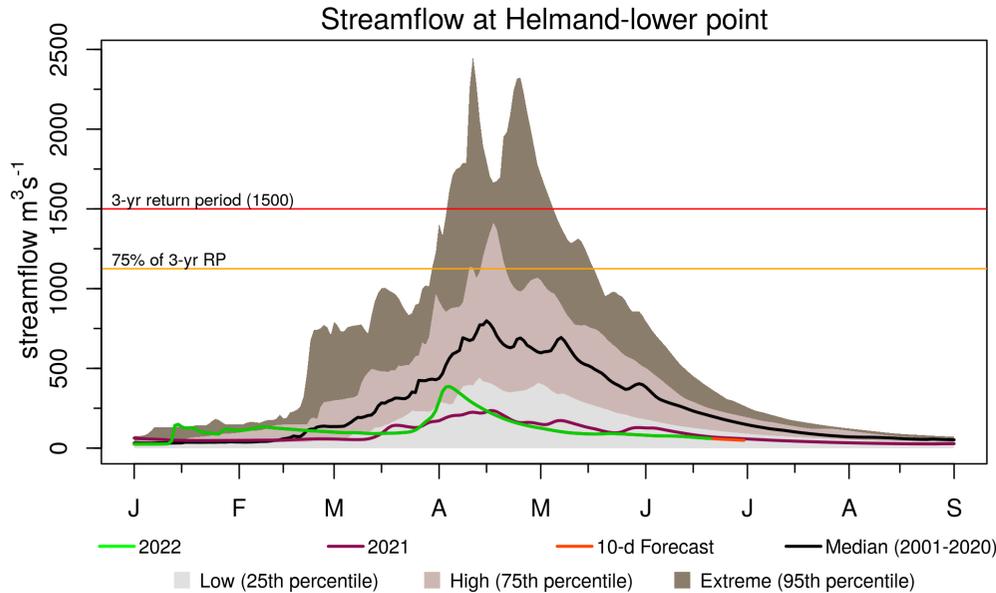


Snow water equivalent (SWE) from the FLDAS-Central Asia model is used to monitor water availability over Afghanistan.

Figures from: <https://ldas.gsfc.nasa.gov/fldas/models/central-asia>

McNally, A., et al., 2021, *A Central Asia Hydrologic Monitoring Dataset for Food and Water Security Applications in Afghanistan*. Earth System Science Data Discussions

Afghanistan Streamflow Monitoring and Forecasts



Streamflow from the FLDAS-Central Asia model identifies Afghanistan rivers with high and low flow, flood potential, and water availability for irrigation and hydroelectric power.

Links and Contact Information

Latest model products:

- FLDAS-Global: <https://ldas.gsfc.nasa.gov/ldas/models/global>
- FLDAS-Central Asia: <https://ldas.gsfc.nasa.gov/ldas/models/central-asia>
- FLDAS-Forecast: <https://ldas.gsfc.nasa.gov/ldas/models/forecast>

FEWS NET Land Data Assimilation System: <https://ldas.gsfc.nasa.gov/ldas>

Famine Early Warning Systems Network: <https://fews.net/>

NASA Land Information System Software Suite: <https://lis.gsfc.nasa.gov/>

NASA Center for Climate Simulation High Performance Computing Resources:
<https://www.nccs.nasa.gov/>

For more information: kimberly.slinski@nasa.gov