NASA Science Mission Directorate
Earth Science Division
Applied Sciences Program

Predicting Middle Eastern and African Seasonal Water Deficits using NASA Data and Models

Water Resources

PI Meeting 3 March 2015

Water Resources – Project Summary

- Title: Predicting Middle Eastern and African Seasonal Water Deficits using NASA Data and Models
- PI: Christa Peters-Lidard, NASA/GSFC
- Solicitation: A.45 (NNH13ZDA001N-WATER)
- Summary: Develop a seasonal water deficit forecasting system that is relevant for USAID and USACE activities in the Middle East and Africa based on skilled GEOS-5 and CFS seasonal forecasts, land state initialization via assimilation of AMSR-E/ASCAT/SMOS/SMAP soil moisture and GRACE terrestrial water storage through the Land Information System (LIS). These existing capabilities can be tuned and coordinated to maximize drought early warning for USAID/ FEWS NET and USACE applications.
- Geographic scope: Africa and the Middle East
- Earth observations / models / technologies applied: GEOS-5, CFS, AMSR-E/ASCAT/SMOS/SMAP soil moisture; GRACE TWS; CHIRPS precipitation; LIS framework

Project Partners

Role	Name(s)	Affiliation
Co-Investigators	Shahid Habib, Randy Koster Siegfried Schubert, Kristi Arsenault, Sujay Kumar, Bala Narapusetty, Grey Nearing, Amy McNally, Augusto Getirana; James Verdin Chris Funk Greg Husak, Shrad Shukla John Eylander, Jeanne Roningen Ben Zaitchik	NASA GSFC USGS EROS USGS EROS /UCSB UCSB USACE JHU

End-Users / Stakeholders

Role	Organization Name	Organization Type
End User	USACE	Federal agency
	ICBA (R. McDonnell)	International Center
Stakeholder	FEWS NET (G. Eilerts)	Multi-user DSS

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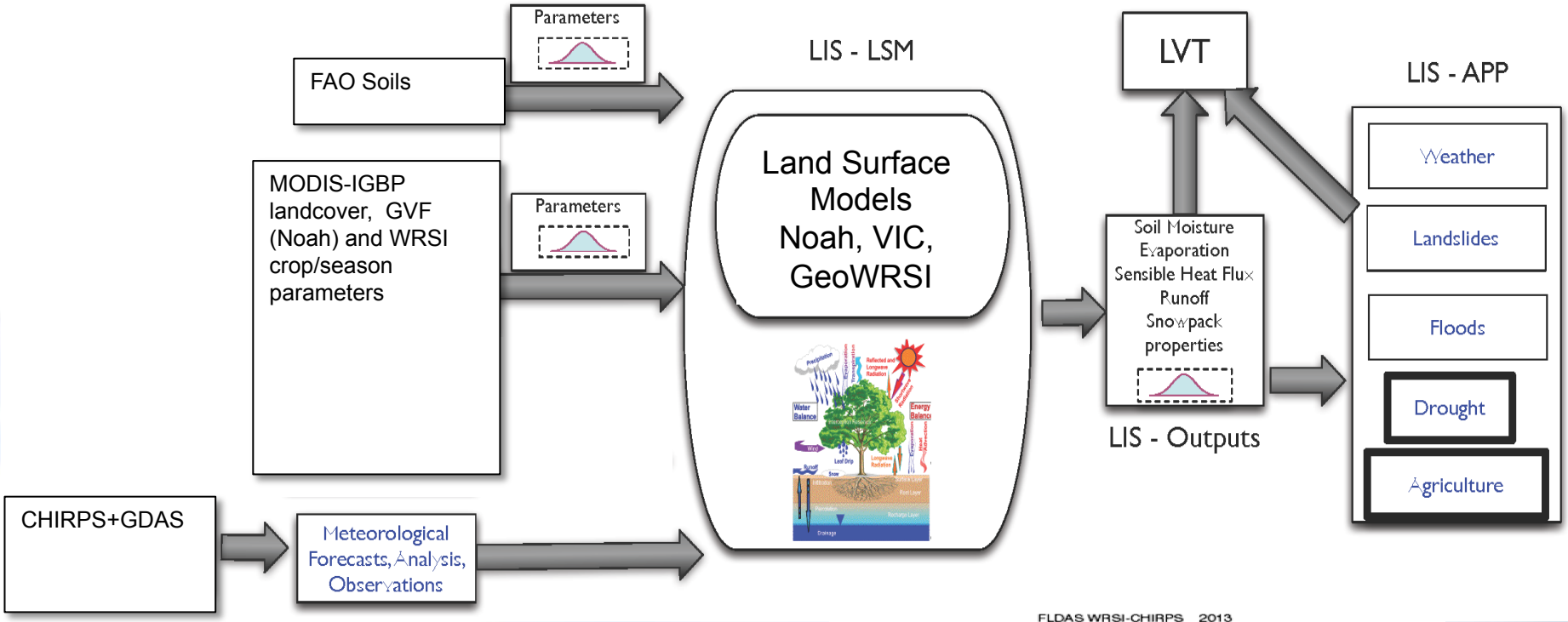
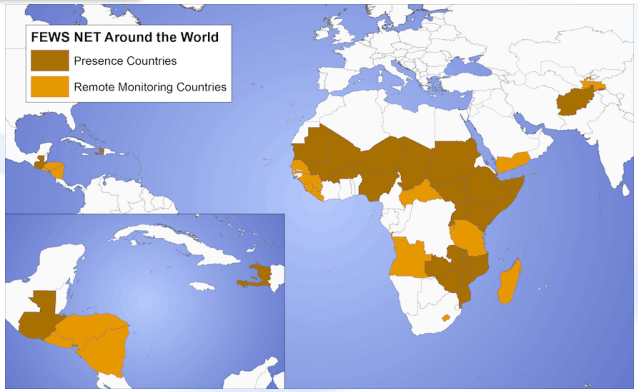
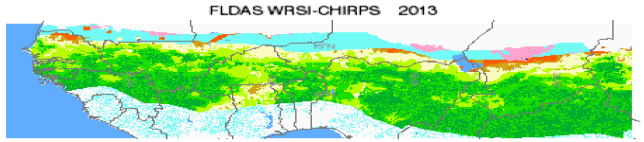
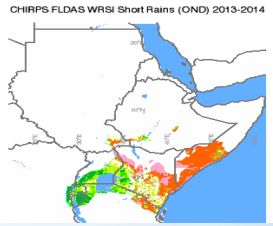
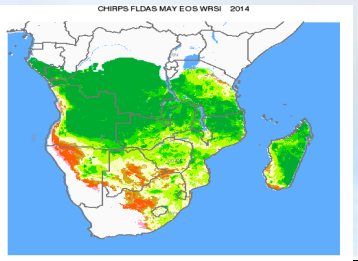
Current FEWS NET Land Data Assimilation System (FLDAS)



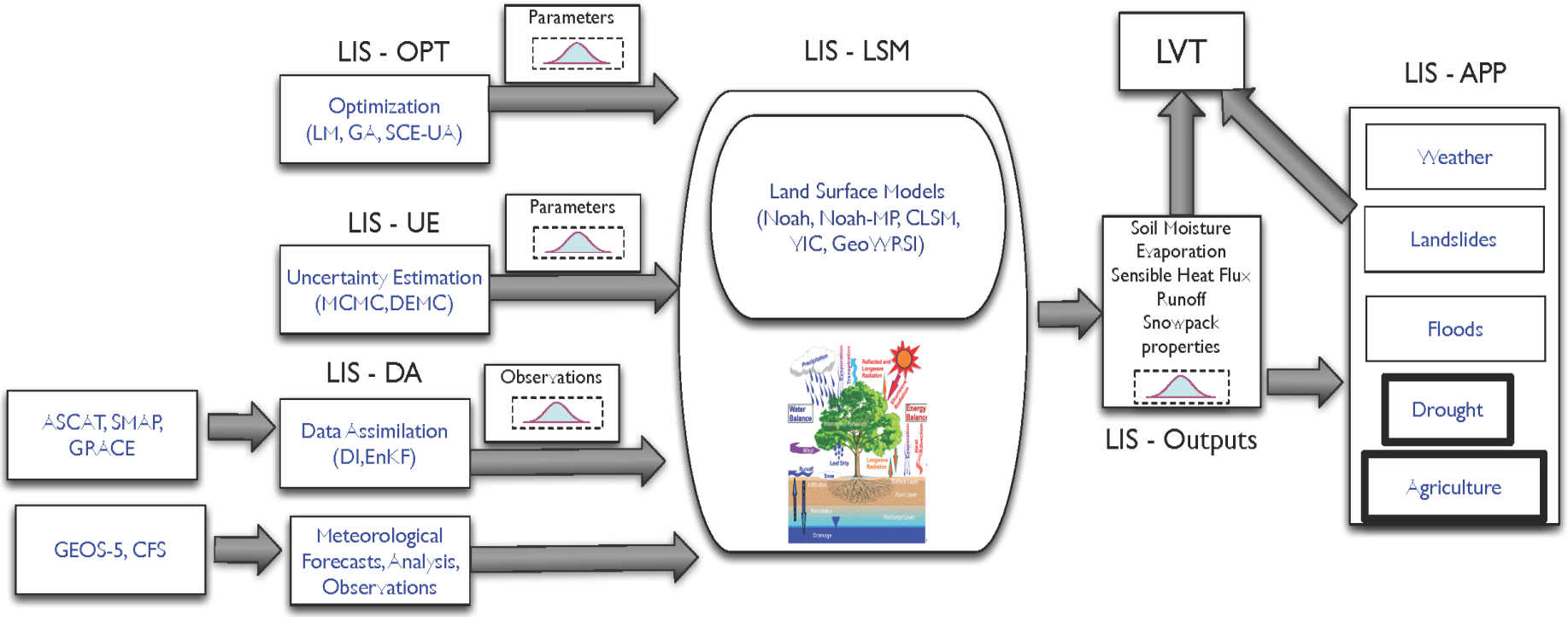








Forecasting for Africa and the Middle East (FAME)



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GEOS-5+LIS/CLSM forecasted April soil moisture ensemble mean

Initialized on Feb. 1

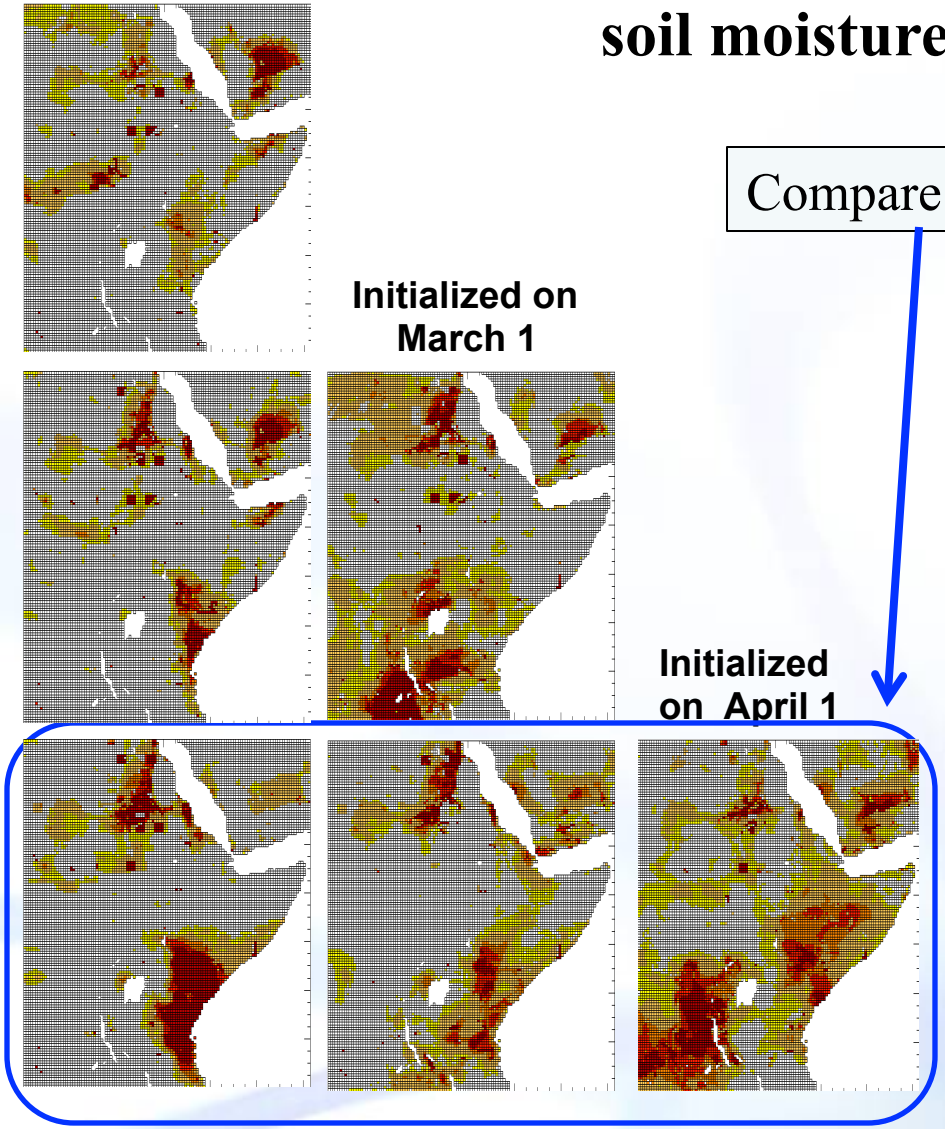
Initialized on March 1

Initialized on April 1

Forecasted Feb. SM

Forecasted March SM

Forecasted April SM

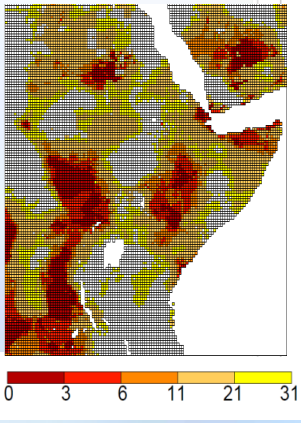


Compare these forecasts…

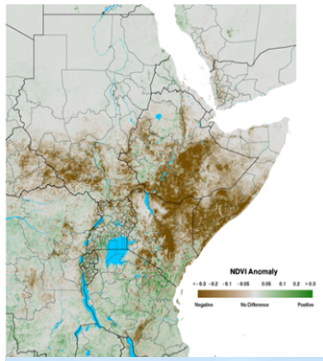
…with open loop results…

…and NDVI data

April 2011 SM percentile, OL



NDVI anomaly (veg. health), early May 2011



USGS/EROS

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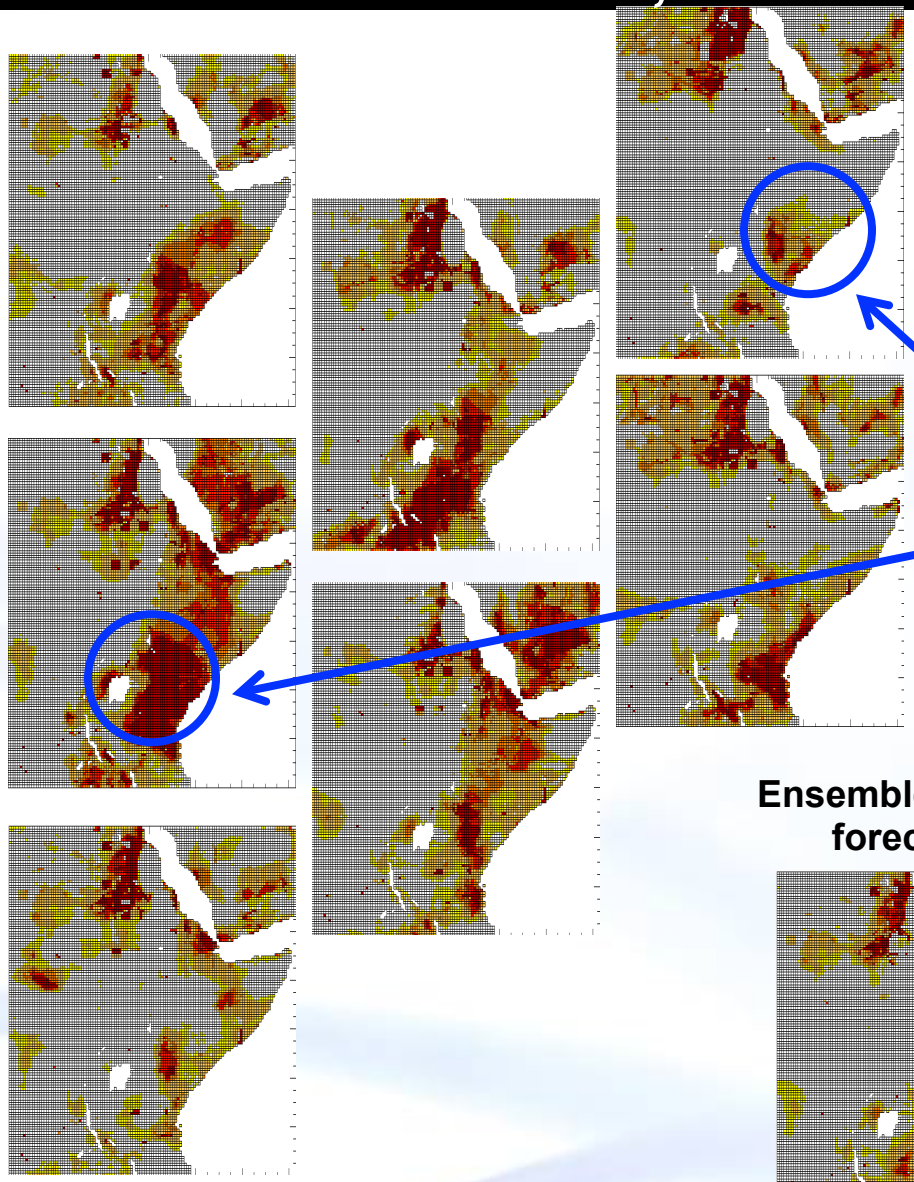
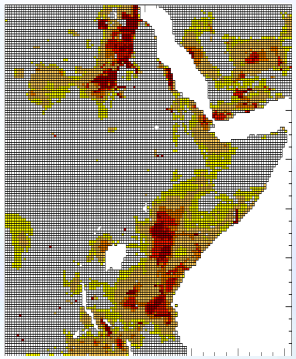


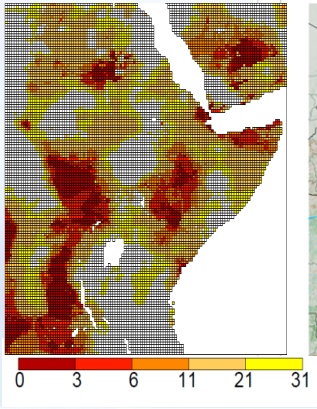
GEOS-5+LIS/CLSM Forecast results from OL initialization: April SM, individual ensemble members (all initialized on March 1)

Note that some ensemble members produce larger drought than others.

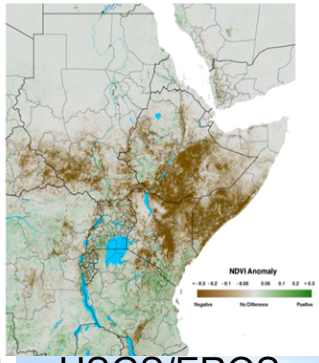
Ensemble mean forecast



April 2011 SM percentile, OL



NDVI anomaly (veg. health), early May 2011



USGS/EROS

Schedule

Milestone	2014	2015				2016				2017				2018			
	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	
Phase 1: Test SM and TWS DA and seasonal forecasts from GEOS-5 and CFS in FLDAS	■	■	■	■	■	■											
Phase 2: Evaluate the information content and contributions from GEOS-5 forecasts and NASA products for water deficit warning in African and Middle Eastern domains.						■	■	■	■	■							
Phase 3: Evaluate and demonstrate the forecasting system for crop production estimates.										■	■	■	■	■			
Phase 4: Transition FLDAS water deficit forecasting system to operational partners at USAID and USACE														■	■		