GEOGLOWS (and IGWCO) Advances

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On behalf of the GEOGLOWS Team

11th AOGEOSS AP Symposium
**Kyoto, Japan**
**October 25, 2018**

GEOGLOWS and the GEOSS Water Strategy

- The **GEOSS Water Strategy** renews the observational component of the community's efforts to communicate the needs of the Water community within the framework of GEOSS.
- **CEOS Water Strategy Implementation Study Team** (WSIST) prepared the CEOS Water Strategy to the GEOSS Water strategy recommendations.
- Working with other initiatives and organizations GEOGLOWS will implement the GEOSS water strategy recommendations.
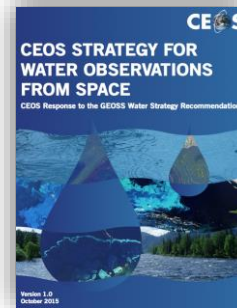
GEO Water Strategy
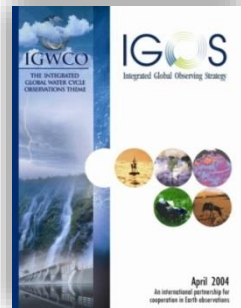
CEOS Response

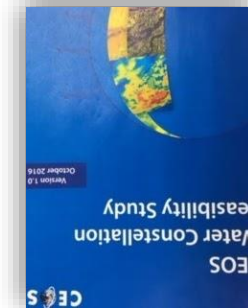IGOS Water Theme report
April 2004
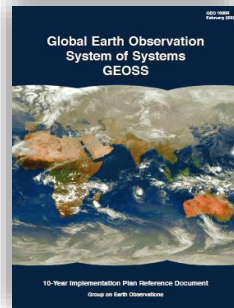
GEOSS 10 Year
Implementation Plan
February 2005
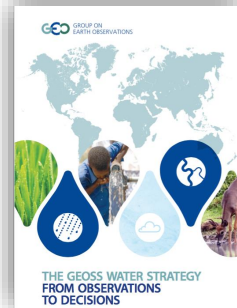
GEOSS Water Strategy
January 2014

CEOS Water Strategy
October 2015

CEOS Water Constellation
FS, October 2016

Why GEOGLOWS?

- **Water sustainability is a critical issue** in sustainable development and for the achievement of the SDGs.

- **Decision-making in water resources planning and management** can be supported with the improved use of earth observation data and associated analytical tools and services.

- **Poor awareness and use of the available and evolving data** (incl. from earth observation) **and analytical services** especially in the developing world.

- Strong need to improve **open, public-domain access** to critical data and analytical services

- **Need for improved partnerships** to improve quality of supply of services and connect to demand of end-users.

- GEOGLOWS can contribute to **modernized management of water resources to improve productivity and better manage climate risks**

- The amount of satellite based measurements are at any time, greater than any other measurement. **GEOGLOWS will promote the effective use of satellite data to contribute to water management.**

GEOGLOWS mission

To **connect** the demand for sound and timely environmental information to the supply of data and information about the Earth's water system and to explore the science needed to achieve the goals outlined in the initiative.

To **advocate** for broad, open data policies and for the realization of the right to access information

To **help** ensure that the data collected through national, regional and global observing systems is both made available in the public domain and applied to decision-making.

GEOGLOWS Policy Drivers

Global Data Products, Capacity Building, etc.

Validation Data, Regional projects, Regional Expertise

GEO GLOWS

and Regional Initiatives

Euro GEOSS

GEOGLOWS brings diverse regional water projects into a global framework for improving water sustainability

AfriGEOSS

AmeriGEOSS

A⬡GEOSS

GEOGLOWS and the harmonization of GEO Water Activities

GEO WETLANDS

GEO BON
Group on Earth Observations
Biodiversity Observation Network

GEO COLD REGIONS

DIAS
Data Integration & Analysis System

AquaWatch
The GEO Water Quality Community of Practice

GEOGLAM
Global Agricultural Monitoring

BLUE PLANET
Oceans and Society
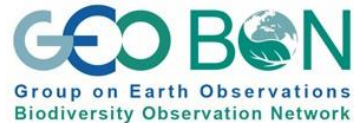
GDIS

EO4SDGs

GEOGLOWS Ambitions and how to proceed

The GEOGLOWS framework seeks collaboration and coordination facilitating the use of Earth Observations to address water shortages and excesses, as well as degraded water.

- Analyse the Essential Water Variables (EWVs)
- Enhance observational programs
- Implement systems for data and product dissemination
- Innovate ways to make more effective use of data through applications and research
- Promote and implement free and open data exchange and GEO principles of data management.

GEOGLOWS Components

1. Enhancing Global Water Sustainability	2. Minimizing Basin and Regional Risk	3. Essential Water Variable (EWV) Understanding
• Sustainable Development Goals • Water Scarcity and Access • Climate Change • Cold Regions	• Integrated Water Prediction (IWP) • Floods • Droughts • Transboundary Issues (IWRM) • Water-Energy-Food-Environment-Health Nexus • Climate Change Adaptation	• Water Quality • Water Use • Water Cycle Variables (Precipitation, Soil Moisture, Groundwater, Evapotranspiration, Stream Flow, Surface Water Storage (Includes Snow Pack))

4. Earth Observations, Integrated Data Products and Applications, and Tool Development

5. Data Sharing, Dissemination of Data, Information, Products, and Knowledge

6. User Engagement, Capacity Building and AmeriGEOSS

Working Groups responsible for Deliverables

A. Limaye & E. Beighley
Science, applications product development

Complete a study to **quantify global water** availability (and quality)
Develop **an Inventory of water related products**
Develop tools

G. Huffman
EWVs and observations

Review the descriptions of the EWVs in the Water Strategy and **make recommendations** on what additional information is needed for the EWVs in order to meet the requirements of **CEOS** and other interested groups.

J. Nelson
Data dissemination, portals & capacity building

Develop **global streamflow forecast system** based on the ECMWF/GloFAS system, Tethys streamflow prediction app, ESRI map services, and Cloud Services with World Bank Support - **This project is already in implementation with 9 pilot projects world-wide**

R. Alabaster
Socio-Economic issues and Policy linkages

Socio-economic database linked with the science data from GEOGLOWS.
Case study as a basis for capacity enhancement resources related to **SDG 6b** implementation.

EWV and Observations

Summary

Objectives
- Establish a minimum set of EWV related to priority policy frameworks and assess the status for each EWV
- Assess opportunities in applying citizen science and private source data to provide EWV data
- Promote continuity in observational systems and open access to data

Goal

Make high-quality (long, extensive, calibrated, homogeneous) key water datasets freely available and easily useable for water research, management, and policy application

Contribute to the design and planning of on-going EWV observation systems.

GEOGLOWS

EWV and Observations

Approach

Methodology

- The EWV status will be established through user and expert group surveys
- Non-traditional data sources will be explored by engagement with citizen science and data groups
- Observational system continuity and open data access will be pursued via white papers and advocacy to agencies

Steps

White paper on a review process has been submitted to the GEO Plenary

Initial survey of candidate variables will be undertaken

User consultation workshop will be held in Spring 2019

Water quantity variables will be developed in interim report

Assessment of water quality variables will be undertaken in collaboration with UNEP and Aquawatch plus others

Final report with implementation plans to be prepared for GEO Plenary in 2020.

GEOGLOWS

Global Streamflow Forecast

- ## Collaborative Effort
  - ### BYU, ECMWF, JRC, NASA (SERVIR, GEOGLOWS), Esri, World Bank, Many partner countries

- ## Service Oriented Architecture
  - ### Mapping Services
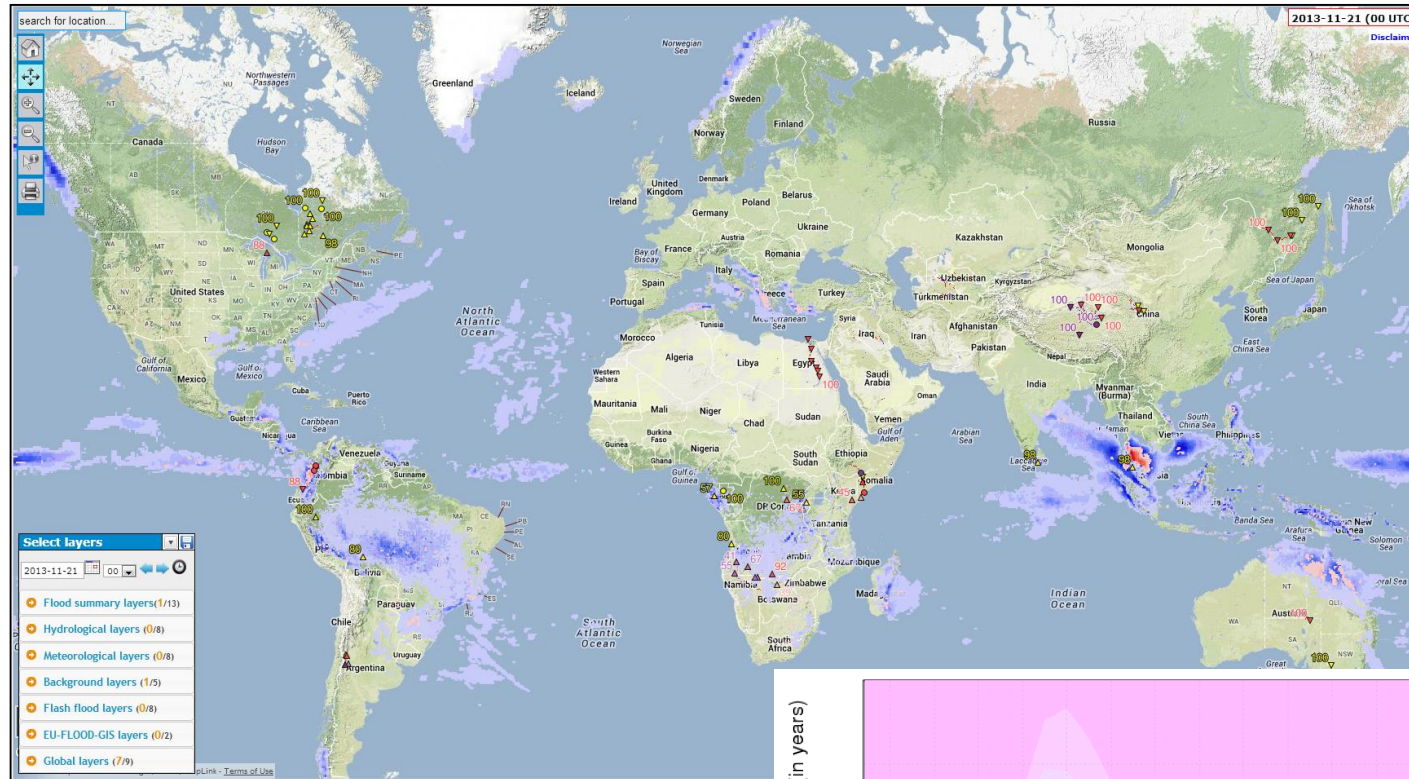 - ### Forecast Services

Pilots have begun with Developing Areas, but the possibility is to reach every stream globally
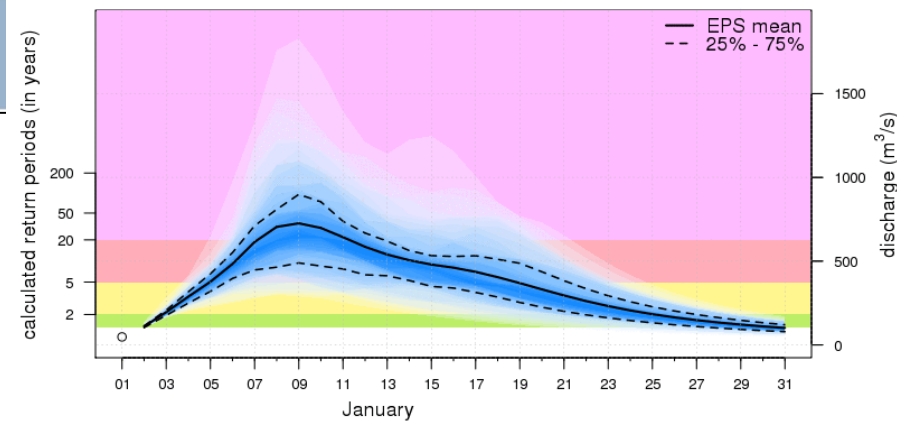**Pilots: Bangladesh, Nepal, Brazil, Colombia, Dominican Republic**

www.globalfloods.eu

Forecast Day	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
05/08/2017								2	2	4	4	4	6	4	4	4	4	4	4	4				
06/08/2017								2	2	2							4	6	8	12	12			
07/08/2017							2	20	41	65	80	86	88	86	80	69	63	51	49	51	49	41	39	
08/08/2017							100	100	100	100	100	100	100	100	100	100	100	100	100	96	82	73	63	
09/08/2017							100	100	100	100	100	100	100	100	100	100	100	100	100	94	92	86	78	71

Forecast frequency:
Updated daily

Forecast lead time:
Up to 30 days

Forecast variable:
River Flow

Forecast type:
Probabilistic

Forecast resolution:
Daily and 0.1 degree

Modelling system:
ENS + HTESSEL + Lisflood

Return period exceeded:
< 2 year (green)
> 2 year (yellow)
> 5 year (red)
> 20 year (purple)

GloFAS Development + Collaboration

- Continuous model improvements

- New products + Web improvements

- Increase the usability and local relevance

- Getting data: Real time + Archive (NetCDF) forecasts

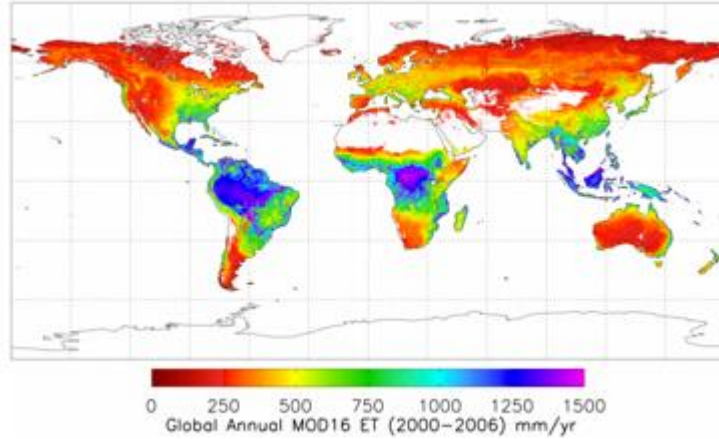- Providing data: Historic time series (calibration), real-time (more RP)

To achieve this we need **collaboration** with local centers/partners for data and local knowledge!
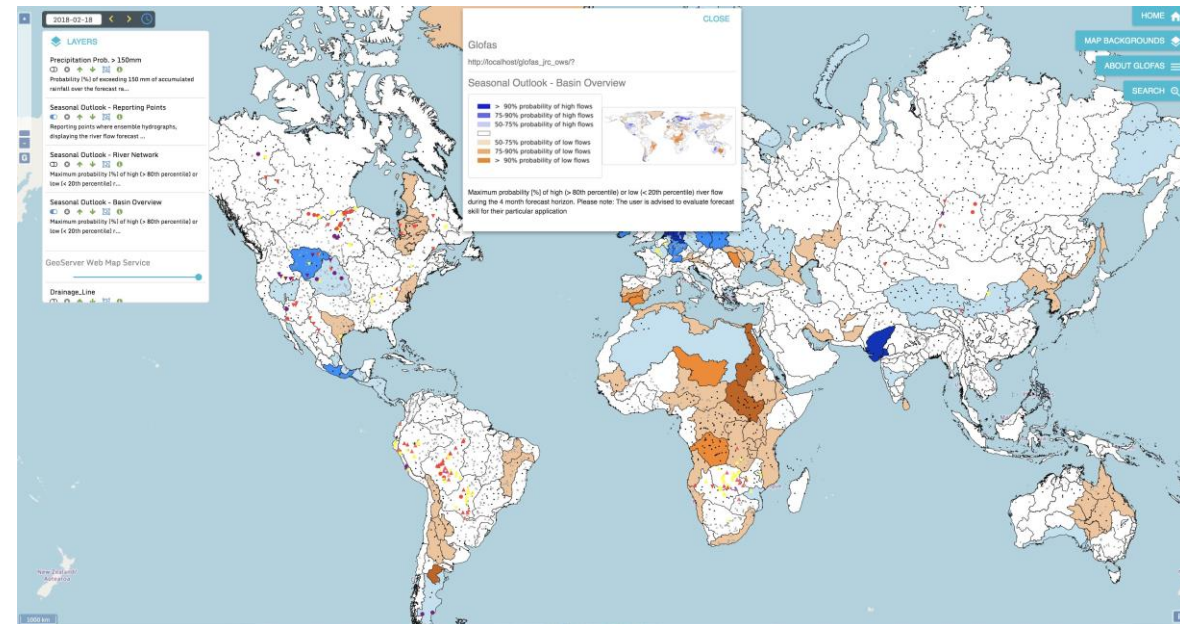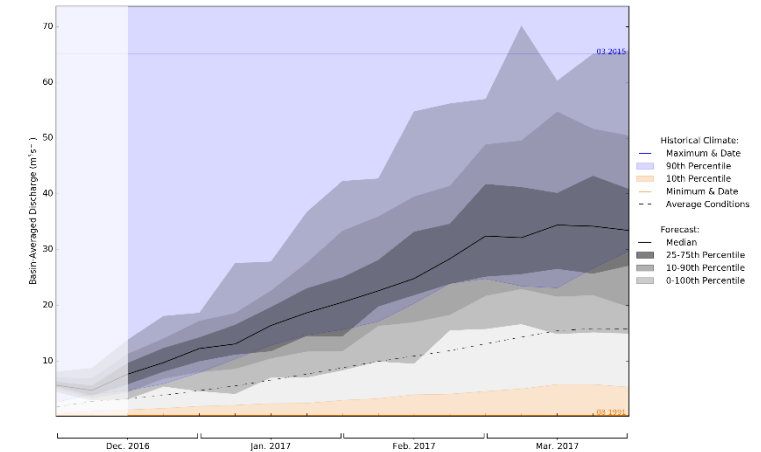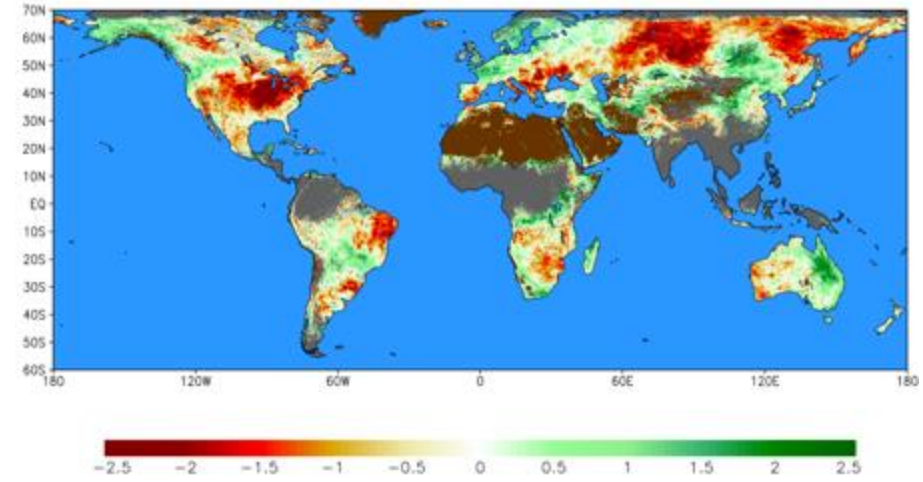
Contributions of Space Agencies to GEOGLOWS
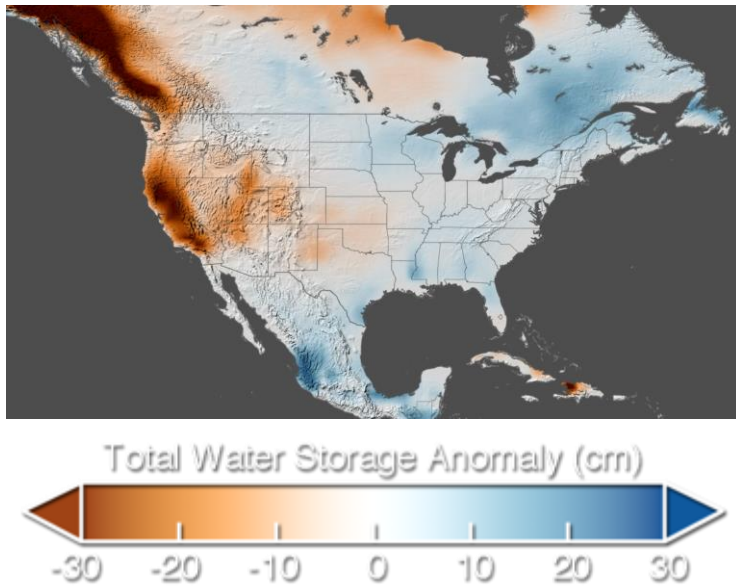
(Mainly from NASA and CNES)

Evapotranspiration (30 m – 1km)
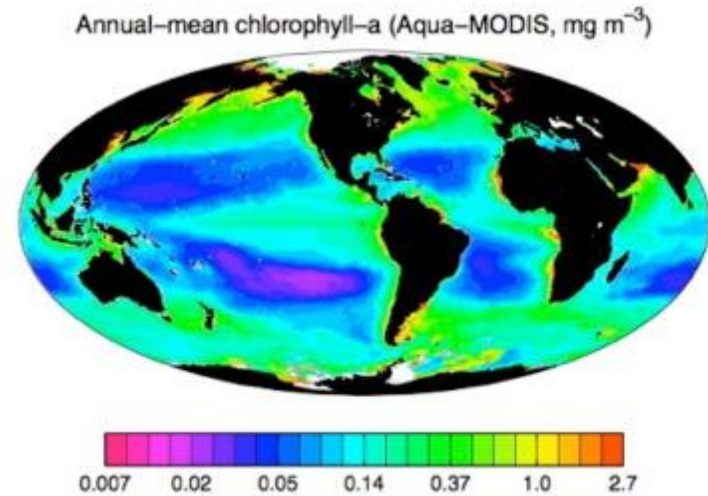

Global Annual MOD16 ET (2000–2006) mm/yr

Drought & Evaporative Stress (4 km)

Groundwater Anomalies (300 km)

Total Water Storage Anomaly (cm)

Chlorophyll-a (1 km)

Annual–mean chlorophyll–a (Aqua–MODIS, mg m^{-3})

10-day Near Real Time products with datum based on a single satellite overpass (1 day)

Global Reservoir and Lake Monitor: 10-day resoluti
Last Updated on: 9/30/2016

10-day Status products with datum based on a 9 year (1993-2001) mean

Global Reservoir and Lake Monitor: Lake Status
Last Updated on: 9/30/2016

Click here to add your Comments/Feedback

Dr. Charon Birkett, Univ of Maryland
http://www.pecad.fas.usda.gov/cropexplorer/gl
obal_reservoir/Default.aspx

GPS satellite

Jason-3

Orbit   Altimeter

Microwave radiometer
measuring water vapour

Range

Laser   Doris
station   station

Ocean surface
topography   Satellite
                          altitude   Geoid

Ocean floor   Sea surface
                                                     height

Ellipsoid

Lake Powell Height Variations
Height variations referenced to TOPEX 1993-2002 mean level

Mosul Dam,
Iraq

2006 2008 2010 2012 2014 2016

Version TPJO.1.3
Last valid elevation: 15 June, 2016

*** Jason-1 Interim GDR 20hz altimetry
*** OSTM Interim GDR 20hz altimetry (ice retracker)
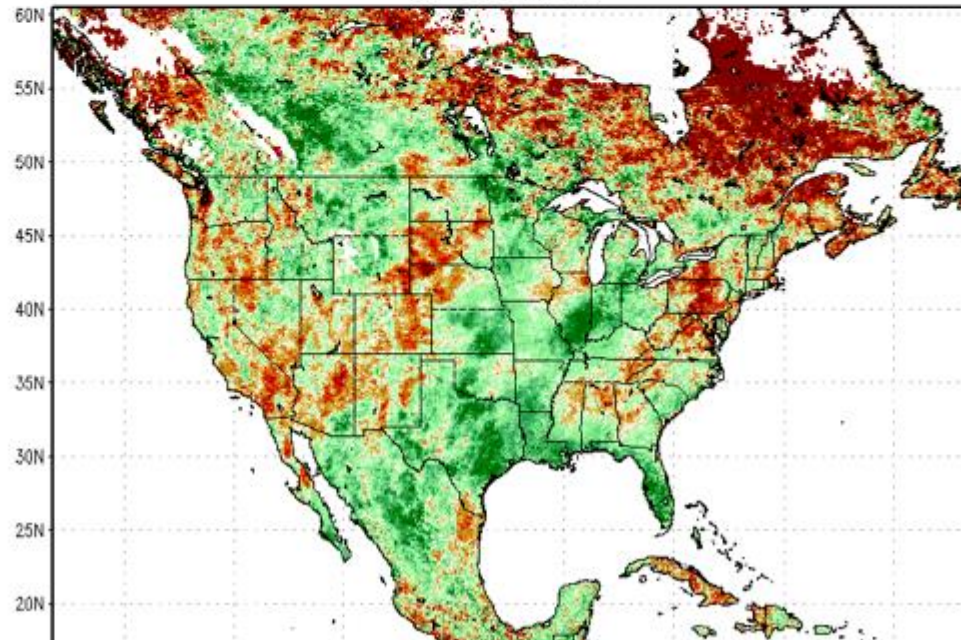
GOES

Suomi NPP

Chris Hain, NOAA/UMD
http://www.star.nesdis.noaa.gov/smcd/emb/droughtMon/products_droughtMon.php

Space Agency participation in GEOGLOWS

1. Enhancing Global Water Sustainability	2. Minimizing Basin and Regional Risk N1	3. Essential Water Variable (EWV) Understanding
 • Sustainable Development Goals • Water Scarcity and Access • Climate Change • Cold Regions (C4)	• Integrated Water Prediction (IWP) • Floods (N2; C2) • Droughts (N2, C1) • Transboundary Issues (IWRM) (N4: C8) • Water-Energy-Food-Environment-Health Nexus (N6; C1) • Climate Change Adaptation	• Water Quality (N1; C4) • Water Use • Water Cycle Variables (N3; C8) (Precipitation, Soil Moisture, Groundwater, Evapotranspiration, Stream Flow, Surface Water Storage (Includes Snow Pack))

4. Earth Observations, Integrated Data Products and Applications, and Tool Development (NASA – 2)

5. Data Sharing, Dissemination of Data, Information, Products, and Knowledge

6. User Engagement, Capacity Building and AmeriGEOSS (NASA -1)

➔ **These efforts included the satellite aspects of water observations through CEOS and space agencies**

IGWCO Community of Practice

The Integrated Global Water Cycle Observations CoP

- Provides a framework for guiding decisions

- Promotes strategies

- Coordinates & facilitates the inputs

- Fosters the development of tools, applications & systems

- Supports the plans of the International in-situ data centers

How can we best develop AWCI/GEOGLOWS Interactions?

Suggestions:
1) Launch joint pilots in the A-P region
2) Develop joint initiatives related to water and SDGs (SDG 6 and others)
3) Collaborate on projects for NASA and other calls for proposals
4) Participate in the evaluation of EWVs

Your suggestions?

GEOGLOWS Theme/Sub-theme	NASA	CNES
Enhancing Global Water Sustainability		
Sustainable Development Goals		
Water Scarcity and Access		
Climate		
Cold regions		F. Rémy, F. Garestier, A. Kouraev, E. Berthier
Minimizing Basin and Regional Risk	V. Lakshmi	
Integrated Water Prediction		
Floods	J. Nelson, S. Unninayar	A. Durand, D. McKey
Droughts	A. AghaKouchak, C. Hain	E. Frapport
Integrated Water Resource Management	J. Jacobs, Day, B. Kustas, F. Melton, H. Lee,	S. Gascoin, A. Boone, J. Tomasella, A. Albitar, C. Ottlé, N. Philpippon, P. Lemauge, F. Paya,
W-E-F-Environment-Health Nexus	J. Bolten, P. Guillevic, J. Huntington, D. Ames, K. Rittger, R. Lawford	S. Corgne
Climate Adaptation		
Essential Water Variables		
Water Quality	C. Lee	J-M. Martinez, T. Tormos, C. Verpoorter, L. Kergoat
Water use		