



NASA contributions in Earth science

research, applications, and capacity building for water cycle science and resource management in Asia and Africa

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*NASA Earth Science Division
Applied Sciences Program*

GEOS Joint Asia – Africa Water
Cycle Symposium
November 25-27, 2013



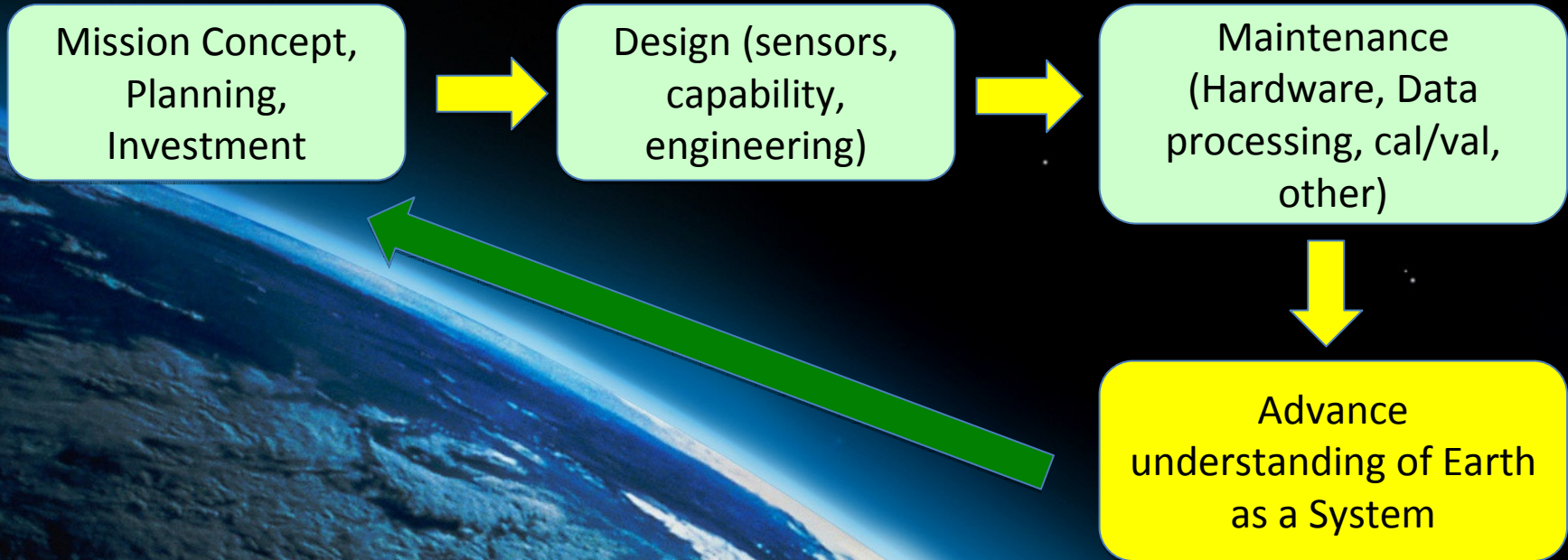
NASA Earth Science Division (ESD) leads a program of breakthrough research that advances knowledge on the most important scientific questions about Earth as a system.

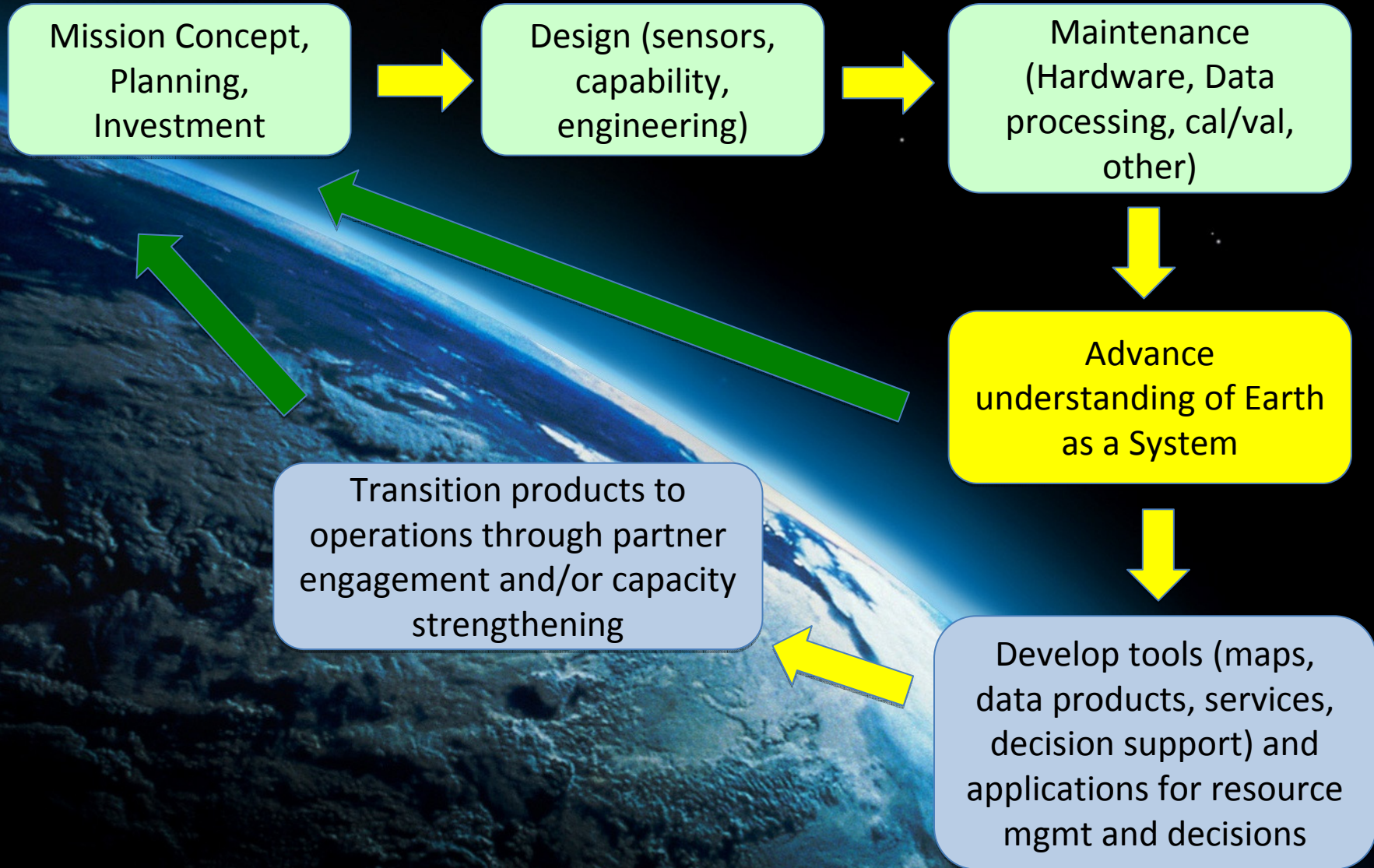




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Applied Sciences Program (within ESD) works to maximize the benefit of these breakthroughs, by developing decision support tools and information products for end users (resource managers) and strengthening capacity to use them.







From Research to Operations and Capacity

Water cycle science, applications in NASA Earth science

Drought Monitoring

Agriculture: Water Delivery and Irrigation

Flood Monitoring, Forecasting & Assessment

Water-Energy-Food-Ecology Nexus

Tools and Applications for Water Resources and Disaster Assessment

Developing tools to fully utilize advances in WEC science that can transition to operations

Coastal Applications

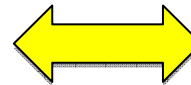
SERVIR

DEVELOP Program

Applied Remote Sensing Training

Capacity Building Program

Partnering with end users to strengthen capacity to utilize tools and Earth observations



Water and Energy Cycle Science

What processes drive the cycle of water and energy on Earth?

Precipitation (TRMM/GPM)

Groundwater Variability (GRACE)

Soil Moisture Assessment (SMOS/AMSR-E/SMAP)

Water Quality / Freshwater Availability (Landsat/SWOT)



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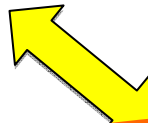
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Research and Analysis

(R&A)

Precipitation (TRMM/IMER) / Groundwater Variability (GRACE)

Soil Moisture Assessment (SMOS/AMSR-E/SMAP)

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Carbon Cycle and Ecosystems

Land Cover Land Use Change

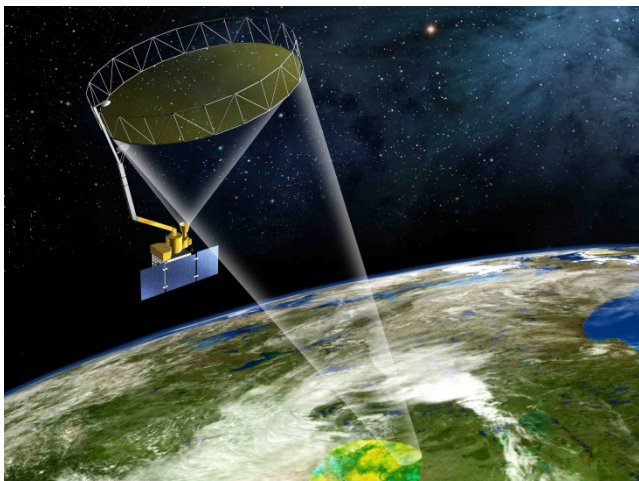
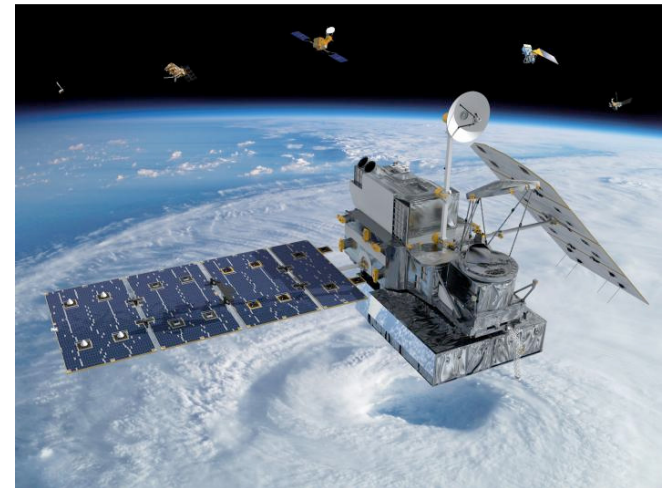
Cryosphere

WATER SATELLITE MISSIONS

(Launching in 2014)

The Global Precipitation Measurement (GPM) Mission (en route to Japan)

- International network of satellites that provide the next-generation global observations of rain and snow
- Planned Launch of Core Observatory for 2014



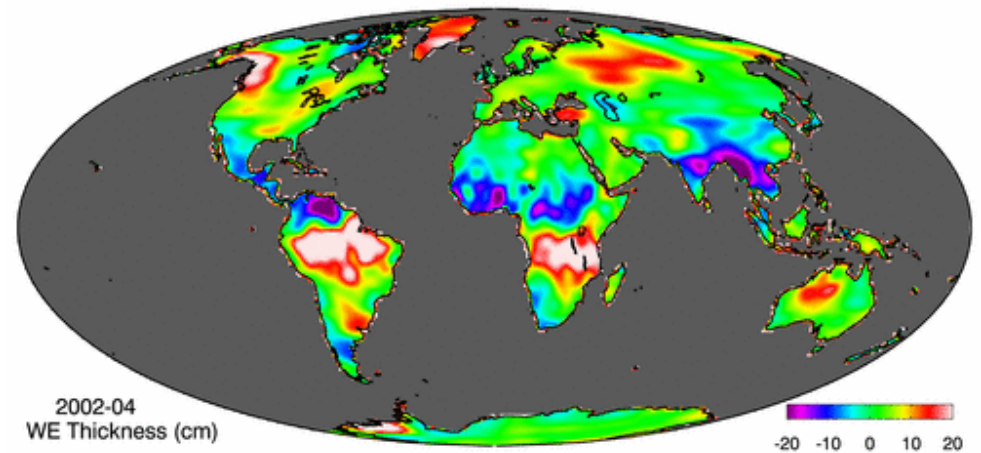
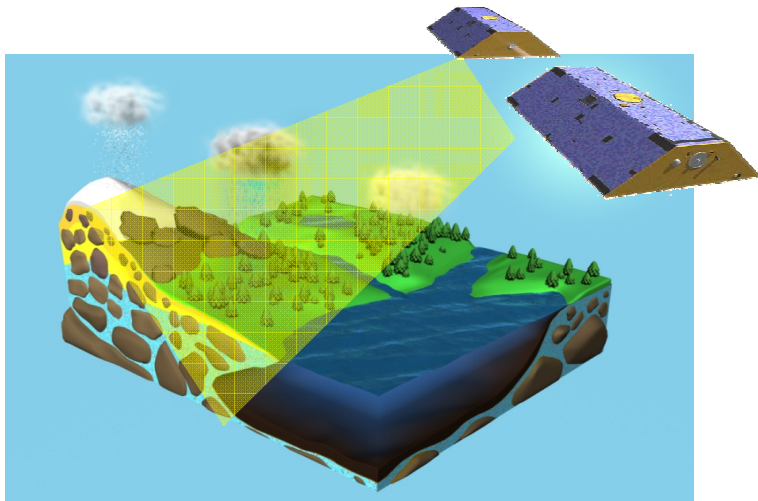
The Soil Moisture Active Passive (SMAP) Mission

- Global observations of mapped soil moisture and freeze/thaw data with unprecedented accuracy, resolution, and coverage
- Planned Launch for 2014



GRACE Derived Terrestrial Water Storage Variations

GRACE measures changes in total terrestrial water storage, including groundwater, soil moisture, snow, and surface water.

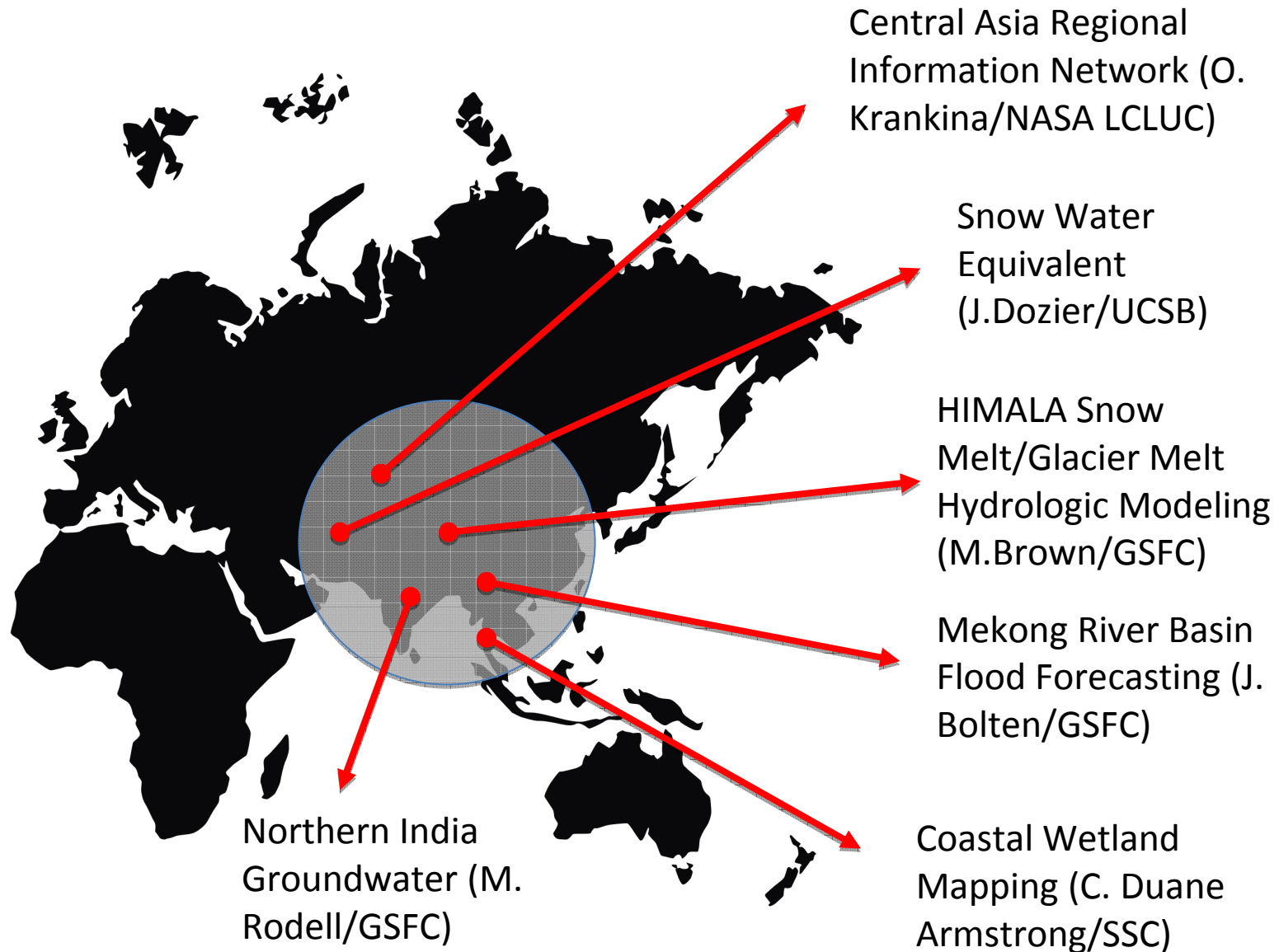


Animation of monthly GRACE terrestrial water storage anomaly fields. A water storage anomaly is defined here as a deviation from the long-term mean total terrestrial water storage at each location.

- Used for monitoring critical ground water depletion in India (irrigation) and the Middle East (irrigation and drought)
- Downscaled GRACE using land surface modeling for soil moisture and ground water loss (to 25 km grid)



Applications and Research: Asia



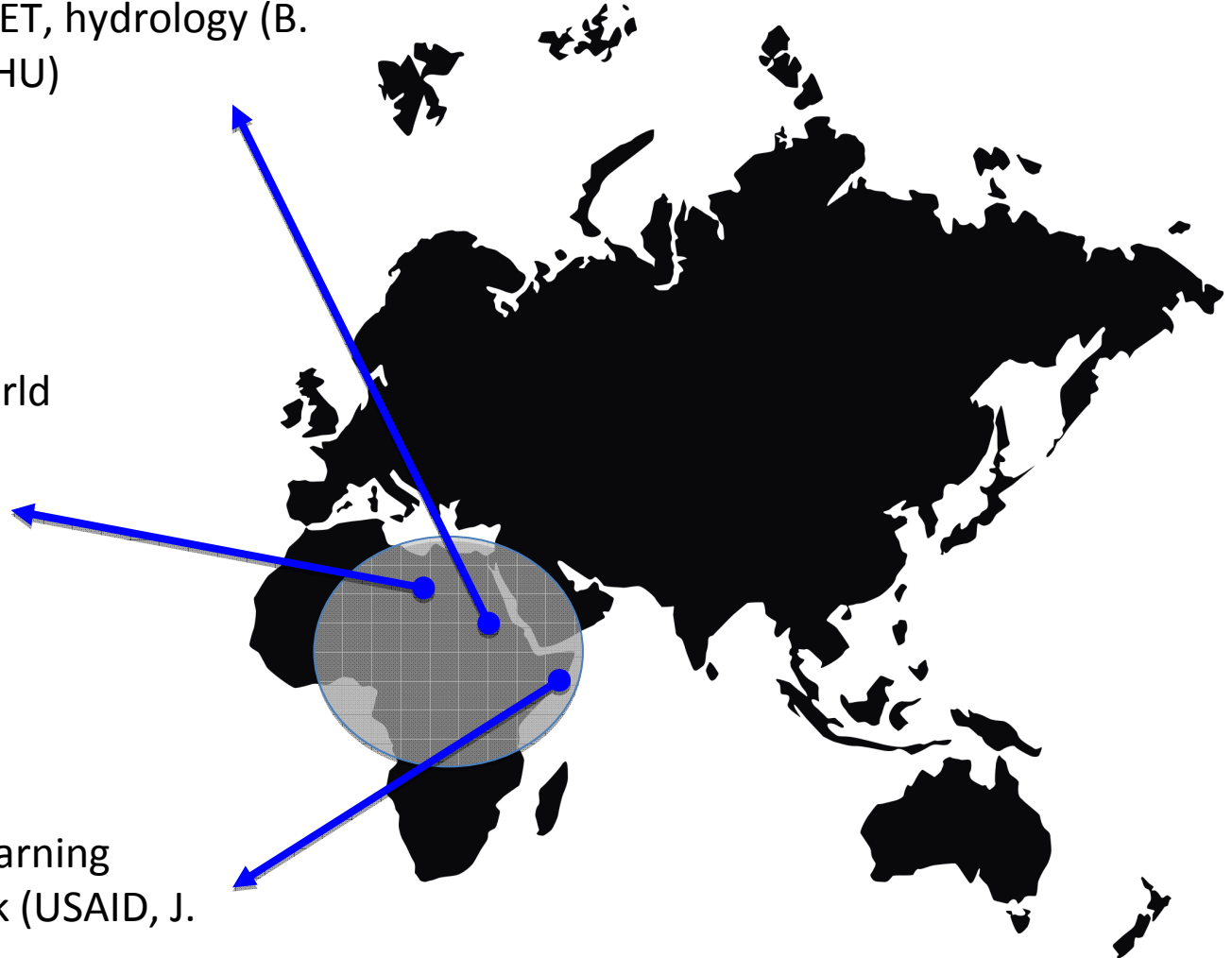


Applications and Research: Africa

Nile Basin with land cover mapping, ET, hydrology (B. Zaitchik/JHU)

MENA WISP (w/ World Bank and USAID, S. Habib/GSFC)

Famine Early Warning System Network (USAID, J. Verdin/USGS)





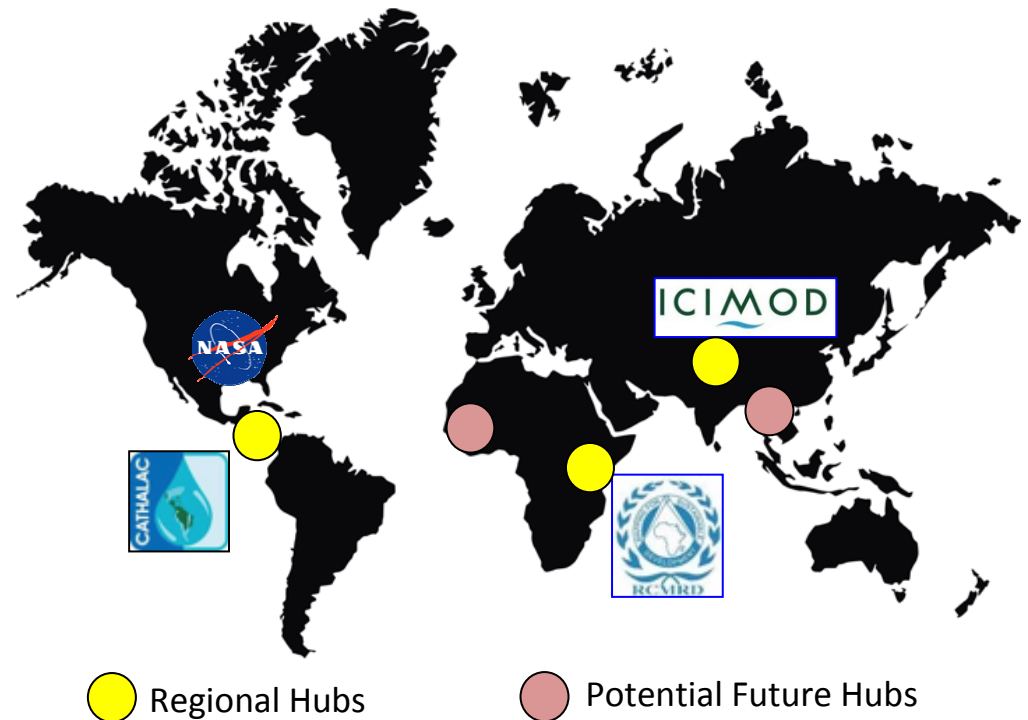
Capacity Building and Applications: SERVIR



A NASA-USAID partnership to **improve environmental management and resilience to climate change** by strengthening the capacity of governments and other key stakeholders to integrate Earth observation information and geospatial technologies into development decision-making

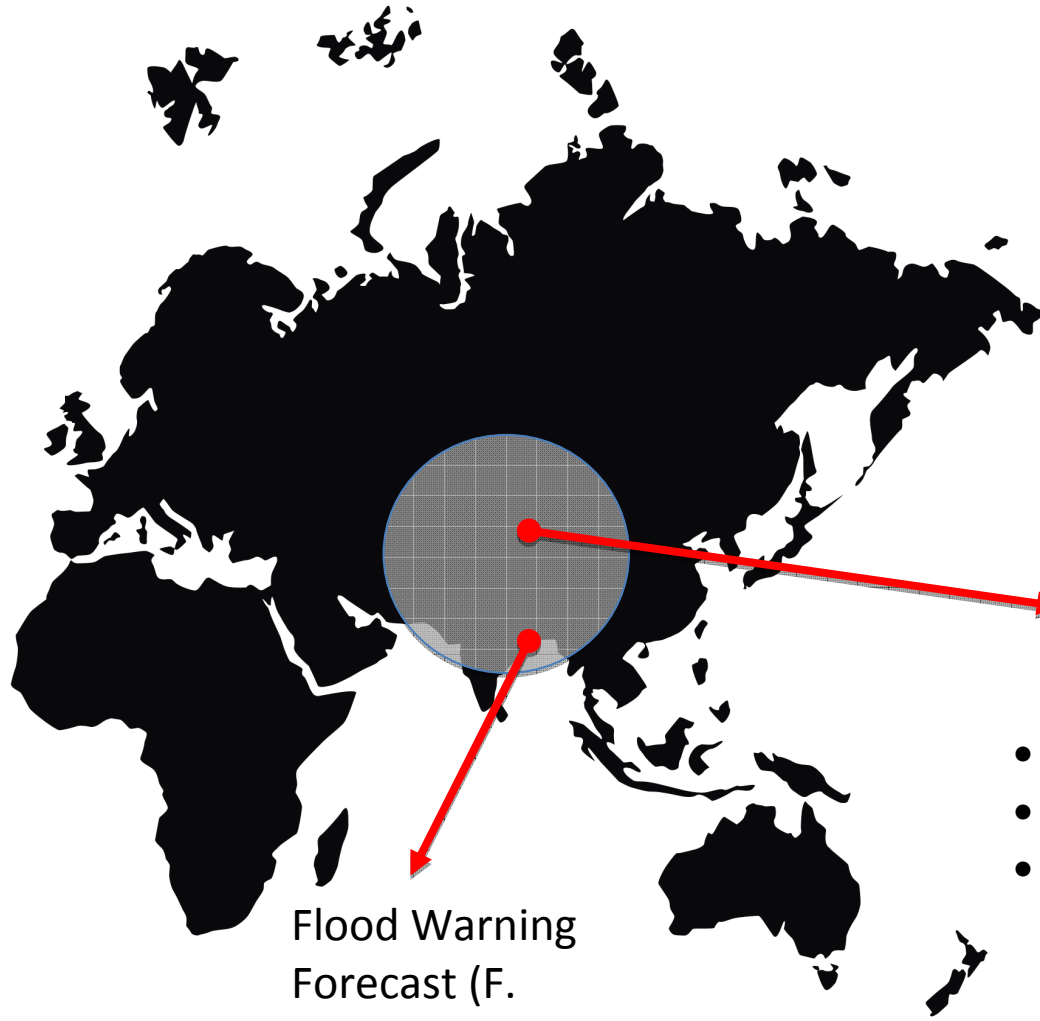


Administrator Rajiv Shah of USAID and Administrator Charlie Bolden come together to sign an MOU for the partnership.





SERVIR-Hindu Kush Himalaya



SERVIR hub hosted at regional institution



Glacier/Alpine Hazards
(J. Kargel/Univ. Arizona
)

Flood Warning
Forecast (F.
Hossain/Tenn.Tech)

- Long term partnerships w/ hubs
- End user needs
- Mapping Demand with Supply



SERVIR-East Africa



Int. Flood Risk, Climate,
Human Health Tool (P.
Ceccato/Columbia-IRI)

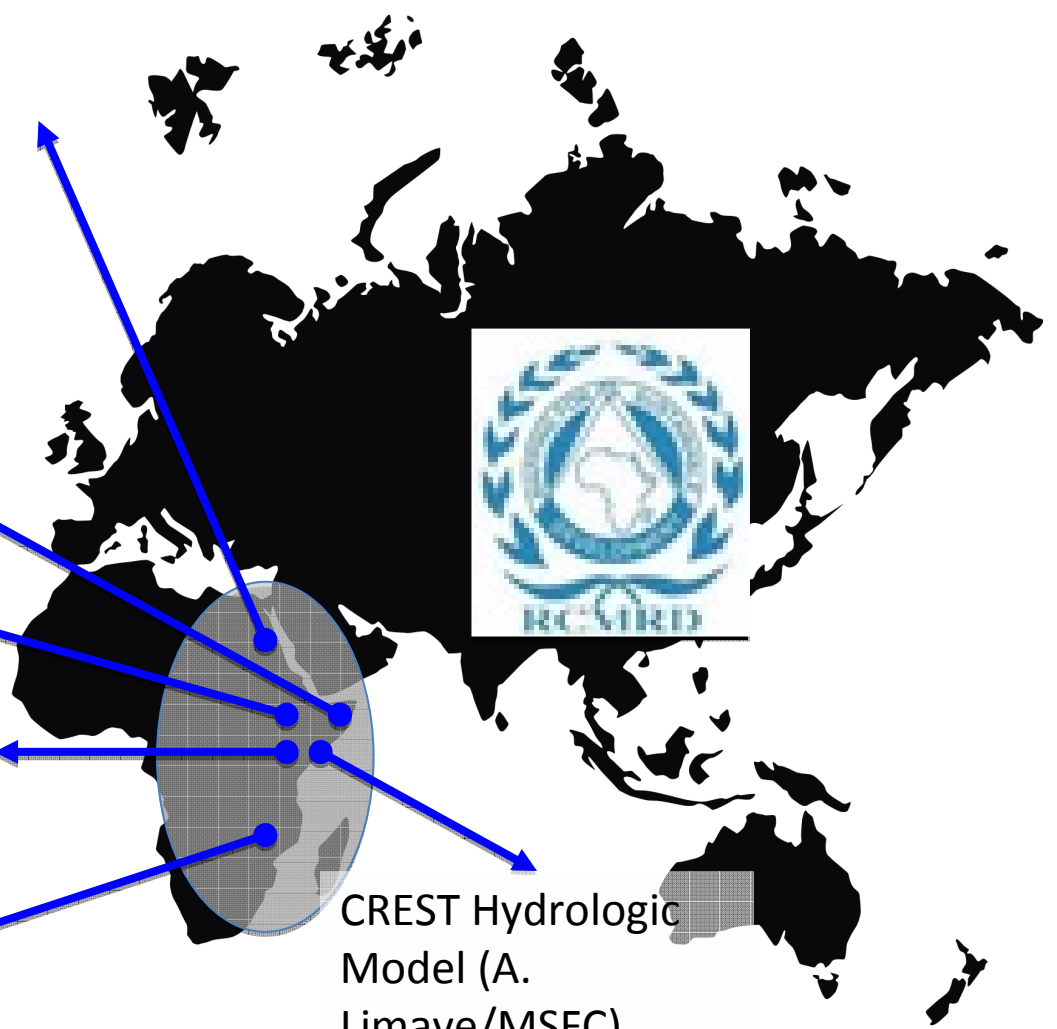
Drought/Horn of Africa
(J. Verdin/USGS)

Ag/Drought
Prediction
(S. Granger/JPL)

Frost Mapping Tool
(C. Albers/MSFC)

Hydrologic Model (J.
Valdes, U. AZ)

CREST Hydrologic
Model (A.
Limaye/MSFC)





Water oriented future missions and considerations

Surface Water and Ocean Topography (SWOT) Mission – 2020, improving freshwater availability component of Global Water Budget



Specific needs/activities that can benefit from GEO coordination

CoreH2O concept for ESA not selected, but there is an important need to resolve remote sensing measurements/estimates of snow falling and fallen snow (ground).

Multi-sensor, A-train science.

Synchronizing missions to overlay various types of data/variables (e.g. GPM + SMAP,) and coordinating this across other space agencies.

Important of in situ networks and datasets. Continuing to work within the GEO community to improve access to these networks.



Recent partnership activity



WORLD BANK

Workshops, joint funding for projects, collaboration on use of remote sensing in data-scarce regions.



USAID
FROM THE AMERICAN PEOPLE

SERVIR, FEWSNET, and other.



Members of IWWG having monthly meetings, discussing and coordinating USG strategy regarding global water Issues.



U.S. WATER PARTNERSHIP

Working together for a water secure world.

U.S. Water Partnership helps US expertise across USG, private sector coordinate. Through USWP, we are working towards partnerships with World Resources Institute and Skoll Global Threats.



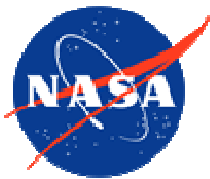
Upcoming opportunities/events



PEER Water – Funding Opportunity for non-U.S. based researchers to partner with NASA Applied Sciences PIs on water challenges using Earth observations



Securing Water for Food - Grand Challenge for Development (open RFA right now)



NASA Applied Sciences
Water Resources Applications Area
Solicitation to be released in 2013



USG Capacity Building Workshop
NASA Headquarters, December 4, 2013



Water Resources Management and Remote Sensing
Town Halls (US GEO Water strategy/contributions to GEO)

Thank you for your attention.

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