UMD EO Research in Support of SDGs

Fernando Miralles-Wilhelm

Cooperative Institute for Climate and Satellites

CEOS Meeting on SDGs in Washington DC

March 9, 2017

A bit about us…

- We are a research “Cooperative Institute” consortium headquartered at the University of Maryland.
- We work on research problems in areas related to weather, water, climate and ecosystems, with a strong focus on EOs and earth system models.
- 160 scientists in areas that span disciplines of natural and social sciences, engineering, agriculture, public health, public policy.
- Our research funding comes primarily from NOAA, NASA, also USDA, DOE, World Bank, IADB, USAID, others.
- Increasingly doing work with international organizations on SDG related activities.

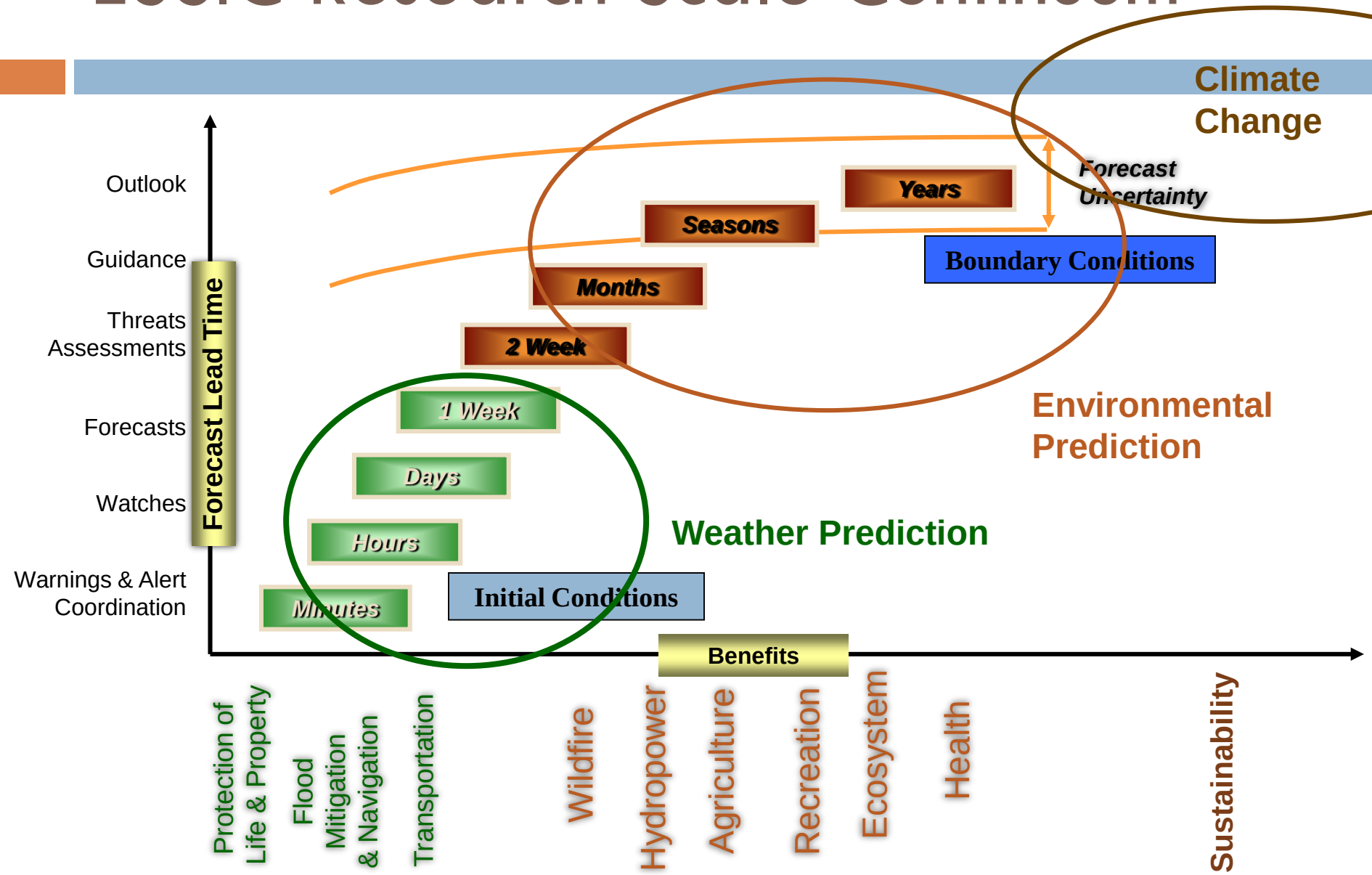
CICS Consortium

Grand Challenge: Prediction of the Earth System

GOALS:

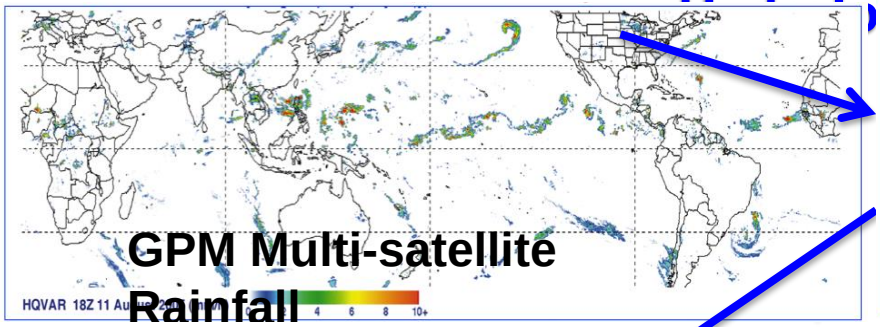
- Deliver knowledge to respond to environmental change
- Engage a new generation of researchers
- Transition to the full range of sciences another disciplines

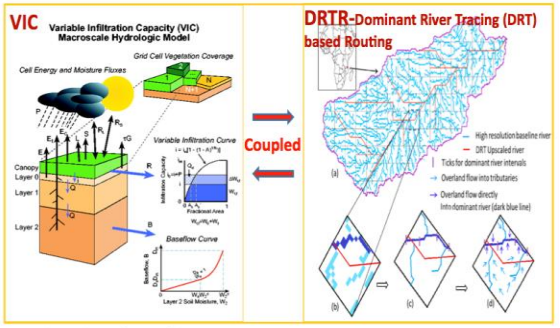
ESSIC Research Scale Continuum



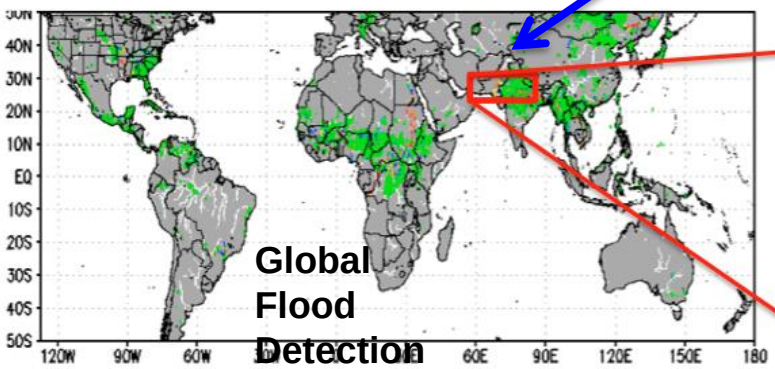
Global Flood Monitoring System (GFMS)

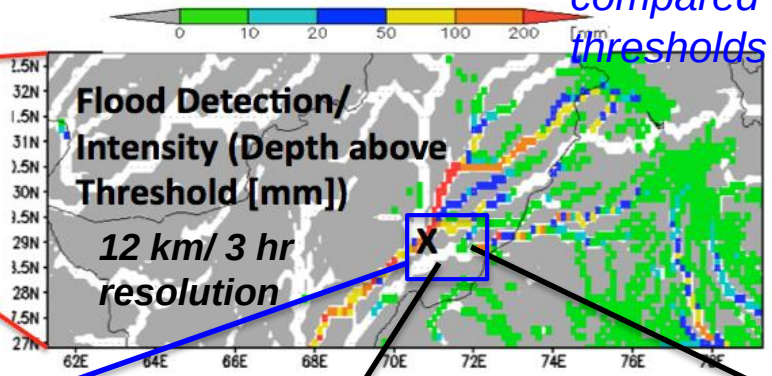
Global Real-time Flood Calculations Using Satellite Rainfall and



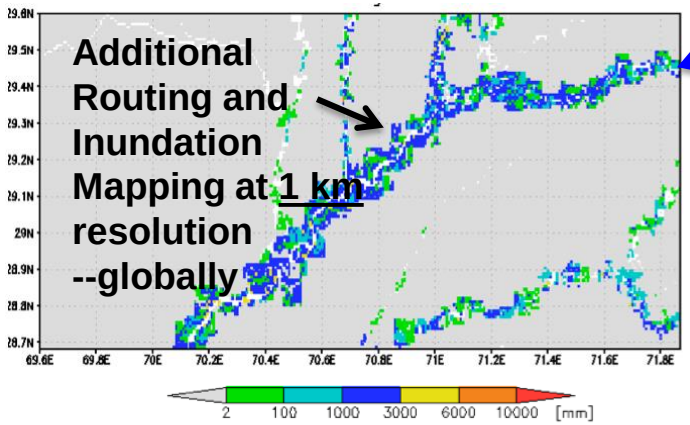


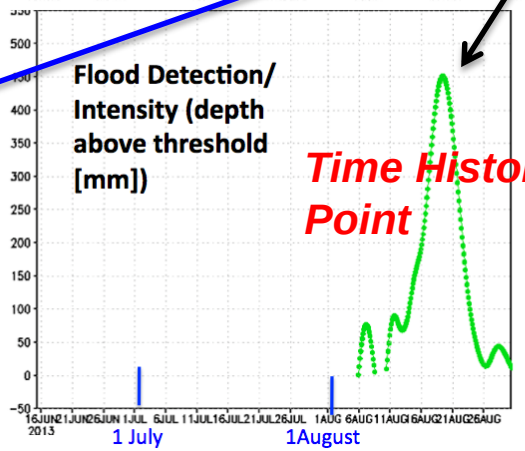
TRMM/GPM rainfall into land surface and routing models for water depth and stream flow calculations compared to flood thresholds

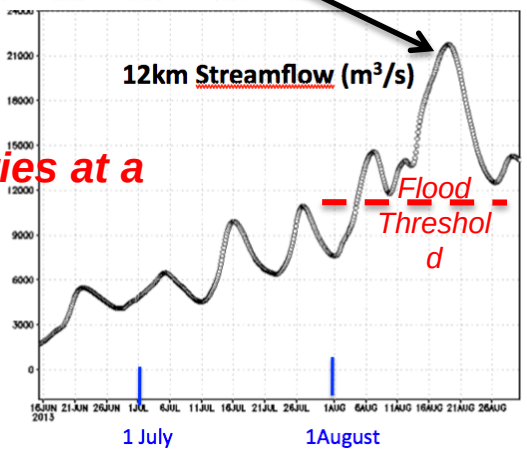




Indus River basin





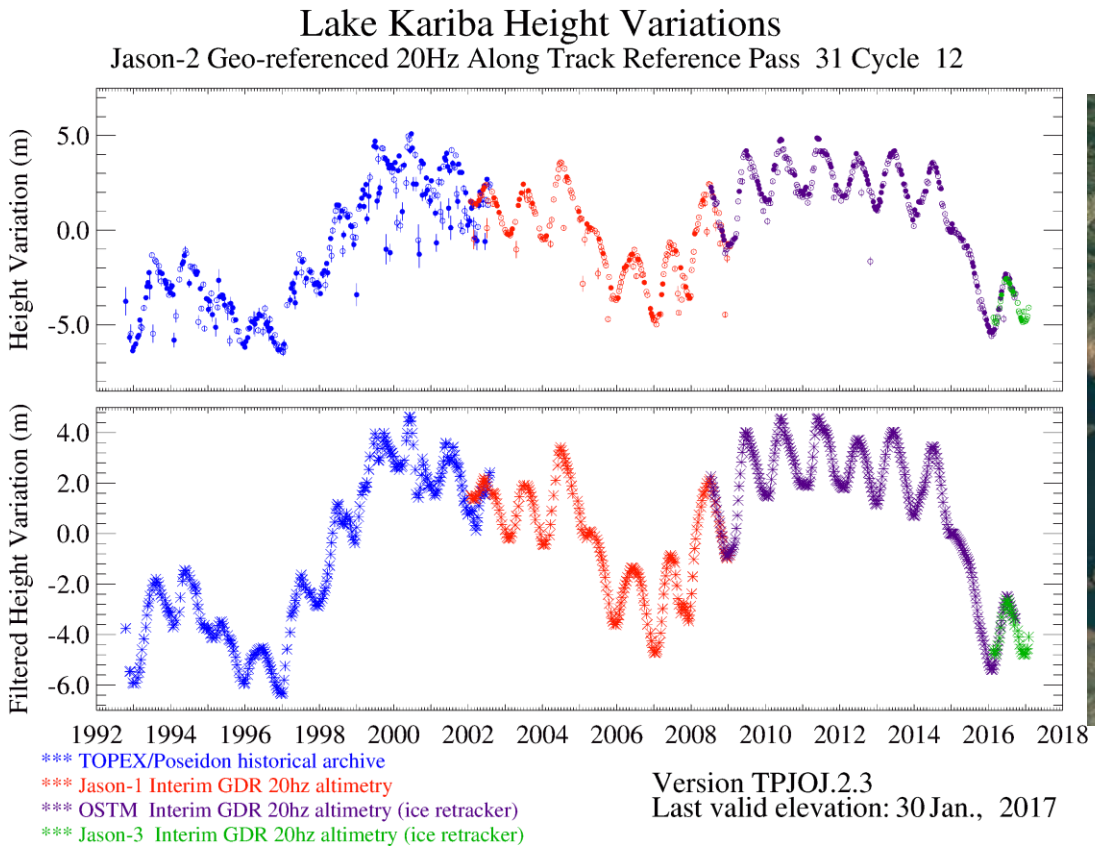


http://flood.umd.edu/

The Global Reservoir and Lake Monitor (G-REALM)

A NASA/USDA funded operational program delivering surface water level products from satellite radar altimeters.

The integration of the new NASA/CNES Jason-3 data set into the G-REALM system.



USDA

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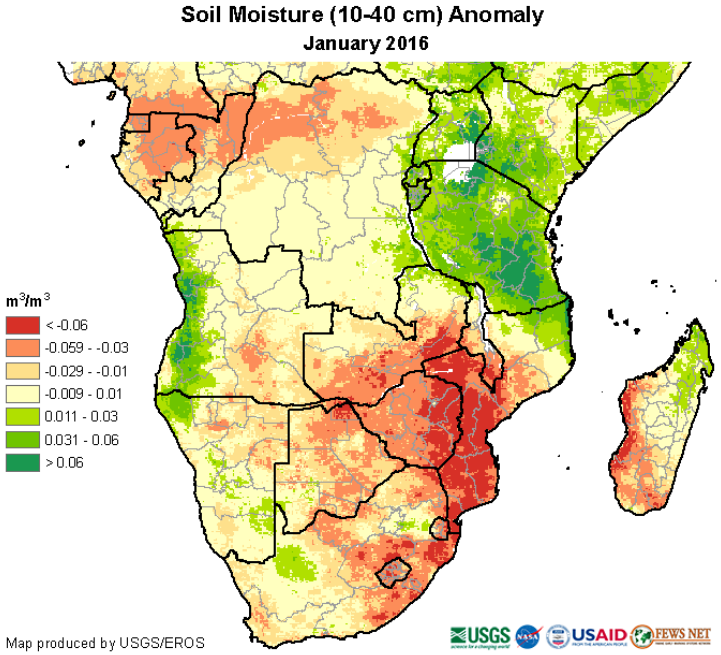
NASA

Famine Early Warning Decision Support with NASA's Land Information System (LIS)

The Famine Early Warning Systems Network (FEWS NET) uses NASA's Land Information System (LIS) to monitor agricultural and water resources in Africa. The strong 2015/16 El Niño exacerbated drought conditions in Southern Africa (lower left), negatively impacting livestock, crops and food security (lower right).



"Zimbabwe declares 'state of disaster' due to drought: More than quarter of population face food shortages as country hit by severe drought, with cattle dying and crops destroyed"

-The Guardian, 5 February 2016

Early warning systems help optimize the distribution of limited humanitarian aid resources. NASA satellite datasets are used to corroborate modeled estimates of quantities such as soil moisture. FEWS NET, USAID and USGS use these datasets to create visualizations that meet the needs of the humanitarian community.

NASA

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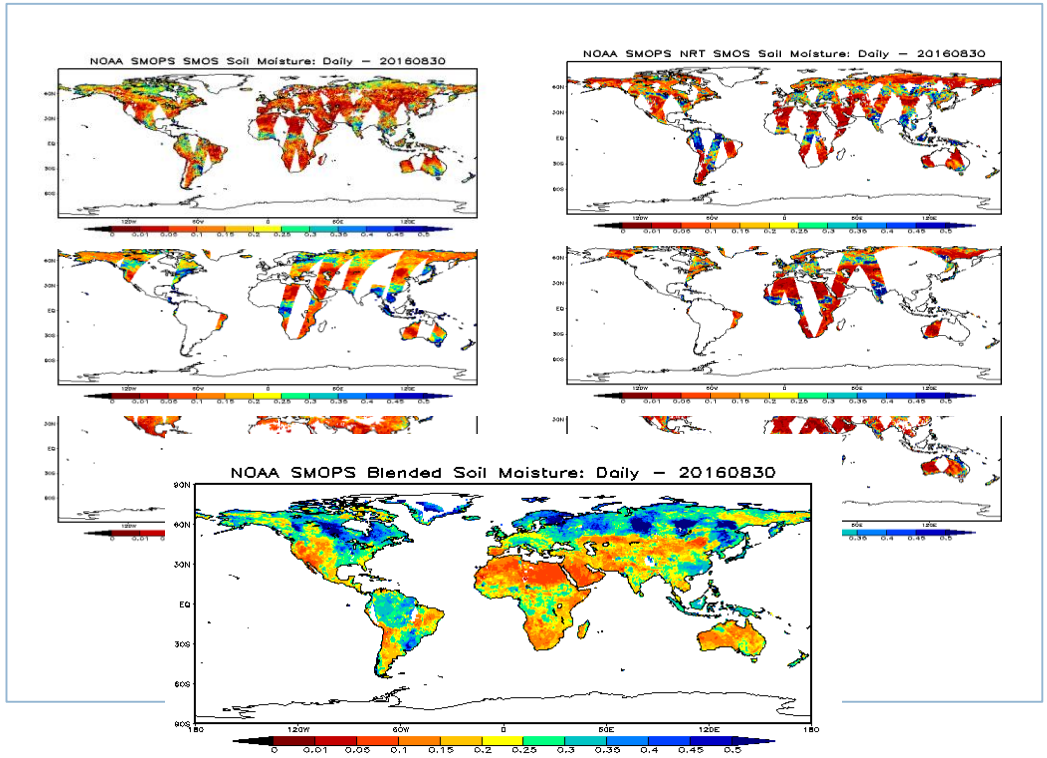
Research to Operations
NOAA Soil Moisture Operational Product System (SMOPS)
Jicheng Liu and Xiwu Zhan

SMOPS:

- Provides near real-time 6-hour and daily global soil moisture products for operational use
- Provides a blended soil moisture layer merged form soil moisture retrievals from all available products

Results

- Operationally running since 2013
- Current operational version: SMOPS V2.0
- Will be upgraded to V3.0 in March, 2017
- SMOPS Version 3.0 ingests soil moisture products from SMOS, ASCAT-A, ASCAT-B, GMI, AMSR2 and SMAP



Data Stewardship

Participate in the continued development, maintenance, and enhancement of the World Ocean Database and Atlas

cics-md
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NCEI
NOAA NATIONAL CENTERS FOR ENVIRONMENTAL INFORMATION

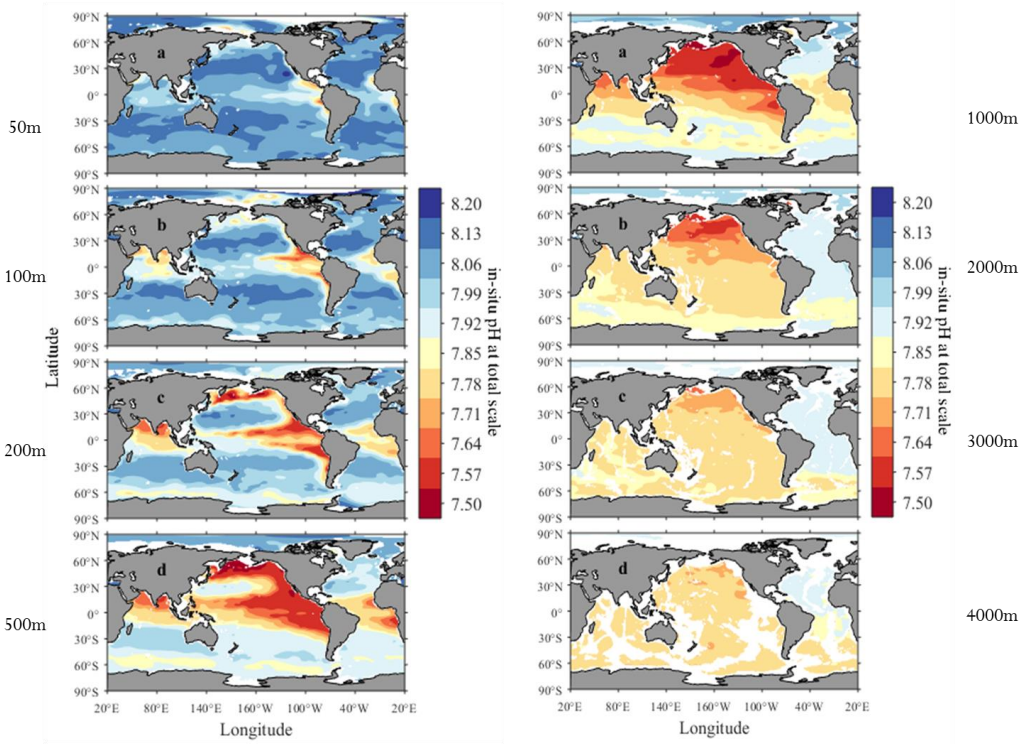
NCEI Center for Coasts, Oceans and Geophysics (CCOG)

Objectives

To understand the global distribution of pH in the global ocean -and its controlling mechanisms.

Results

- Mapping of the global pH distribution in the surface and subsurface ocean.
- Discussion of the mechanisms controlling pH in the global oceans.
- Provision of regional multiple linear regression equations for people to calculate pH from T, S, and Oxygen.
- Calculation of monthly pH climatologies using World Ocean Atlas data of Oxygen.



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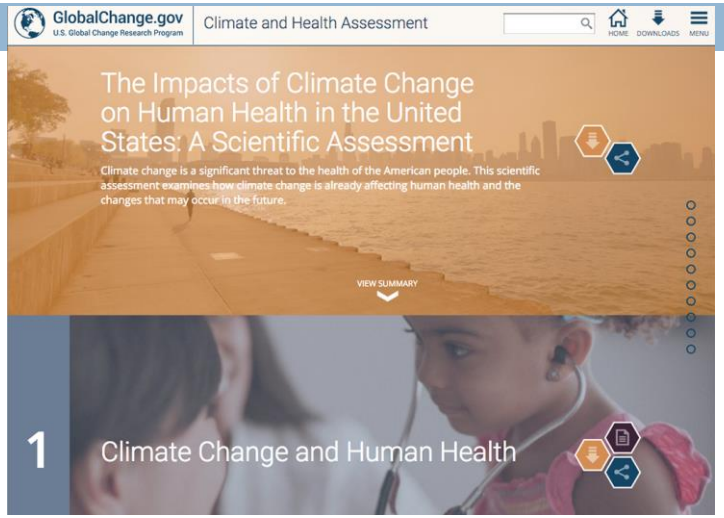
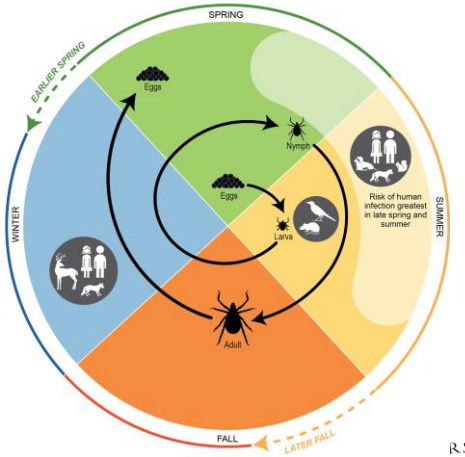
Climate and Health

- Project and process management, building on 2014 NCA experience
- Science and modeling support
- Contributing authors
- Editorial support: Communicating science clearly, accurately
- Visual communications: Infographics and improving scientific figures, designing PDF layouts & supplemental materials
- Report released on April 4, 2016

☐ health2016.globalchange.gov



Life Cycle of Blacklegged Ticks, Ixodes scapularis



Rise in reindeer deaths in the Arctic linked with loss of sea ice and associated extreme weather

B. Forbes[1], T. Kumplula[2], N. Meschtyb[1], R. Laptander[1], M. Macias-Fauria[3], P. Zetterberg[2], M. Verdonen[2],A. Skarin[4], K.-Y. Kim[5], **L. Boisvert[6]**, J. Stroeve[7] and A. Bartsch[8]

[1]Univ. of Lapland, [2]Univ. E. Finland, [3]Oxford Univ., [4]Swedish Univ., [5]Seoul Nat. Univ., **[6]ESSIC & NASA GSFC**, [7]NSIDC, [8]Univ. Austria

Fig 1.

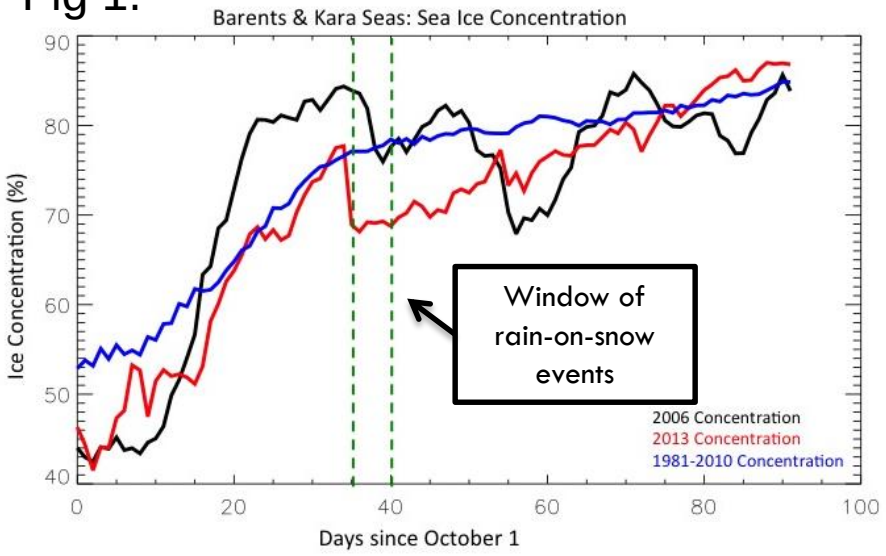


Fig 2.

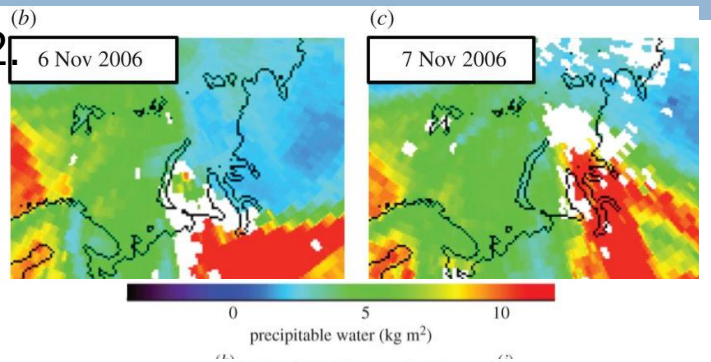
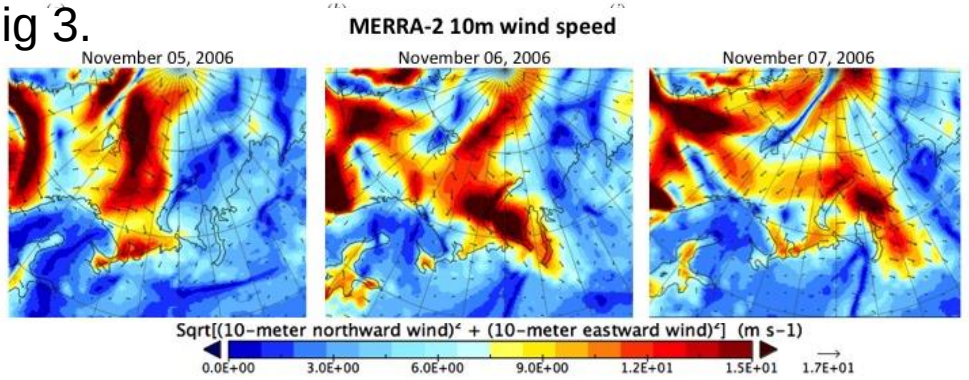


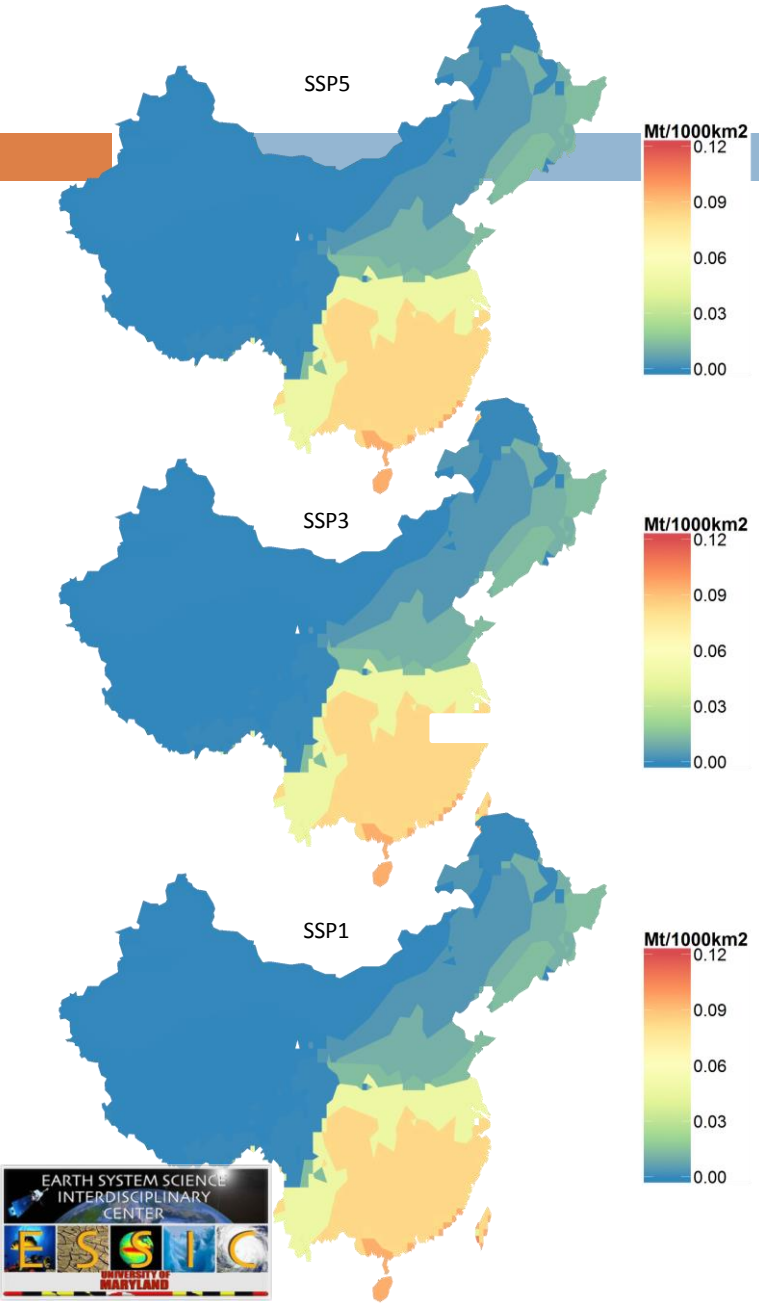
Fig 3.



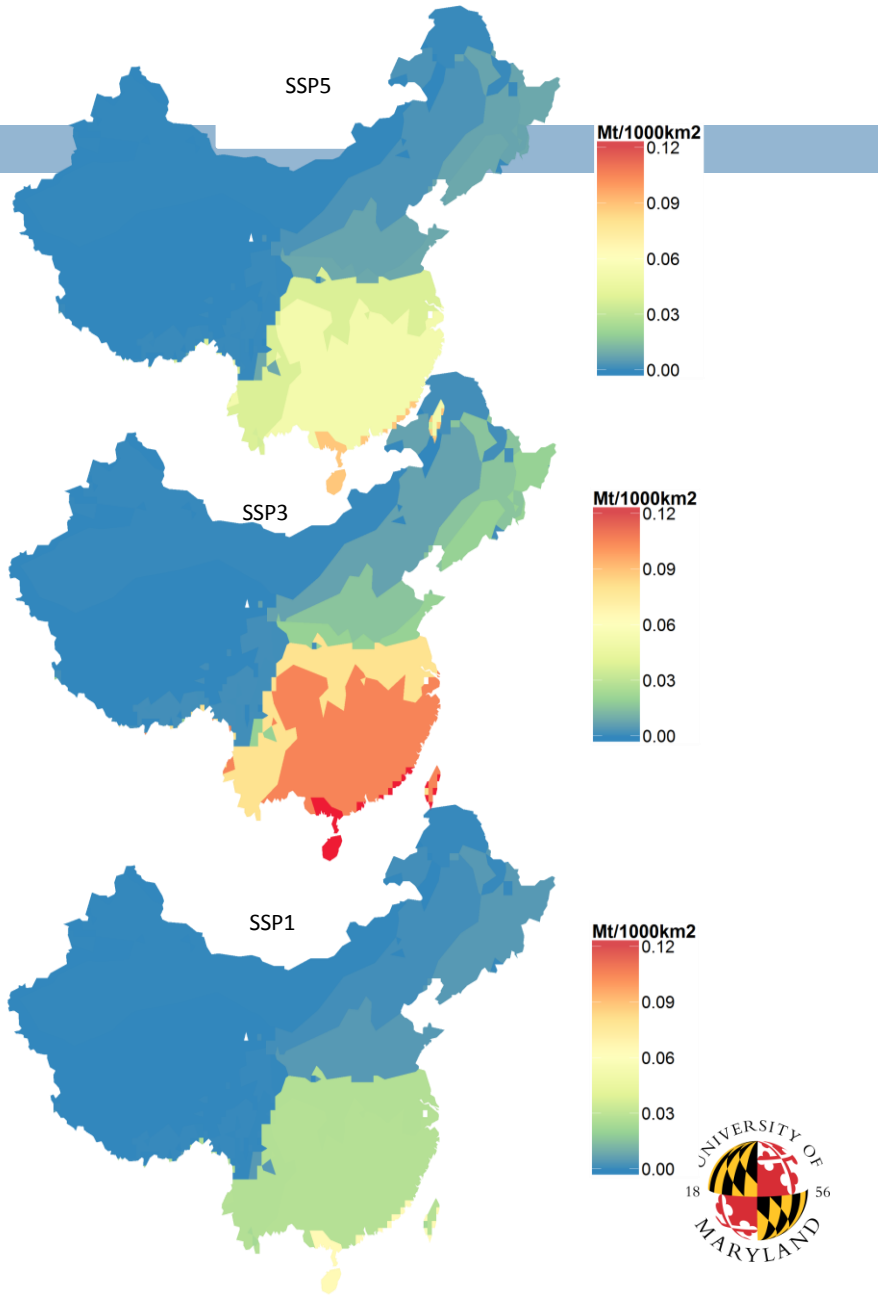
Two major rain-on-snow(ROS) events during November 2006 & 2013 led to massive winter reindeer mortality episodes in the Yamal Peninsula. The rain saturates the snowpack and when it refreezes creates a hard crust that reindeers cannot penetrate to eat. During these ROS events, the sea ice concentration in the Barents & Kara seas decreased rapidly (Fig 1), leading to more water vapor & a warmer atmosphere (Fig. 2, AIRS precipitable water), which is transported over the peninsula via winds (Fig. 3, MERRA2 winds), enabling these ROS events to occur.

Arctic warming ➔ Sea ice decline ➔ increased evaporation ➔ increased precipitation and winter temperatures ➔ rain-on-snow events ➔ reindeer mortality ➔ strain on social-ecological systems.

Rice Production (2010)



Rice Production (2050)



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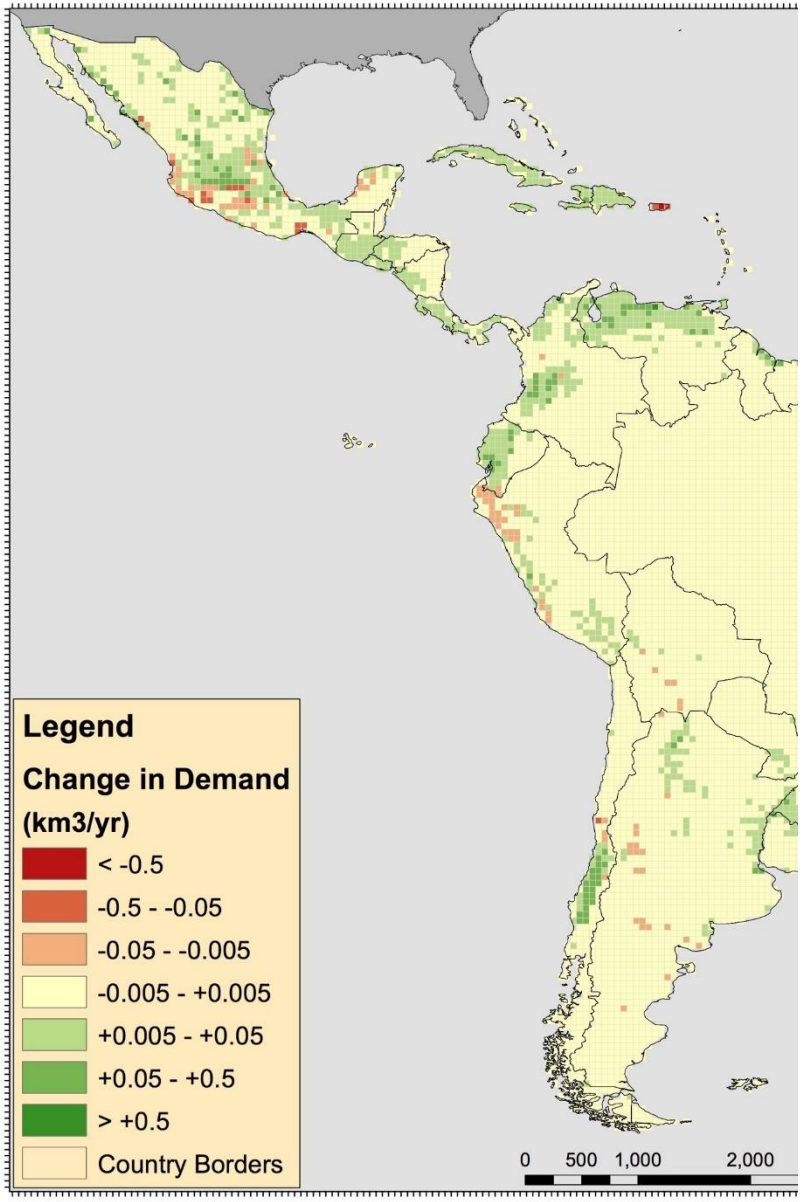
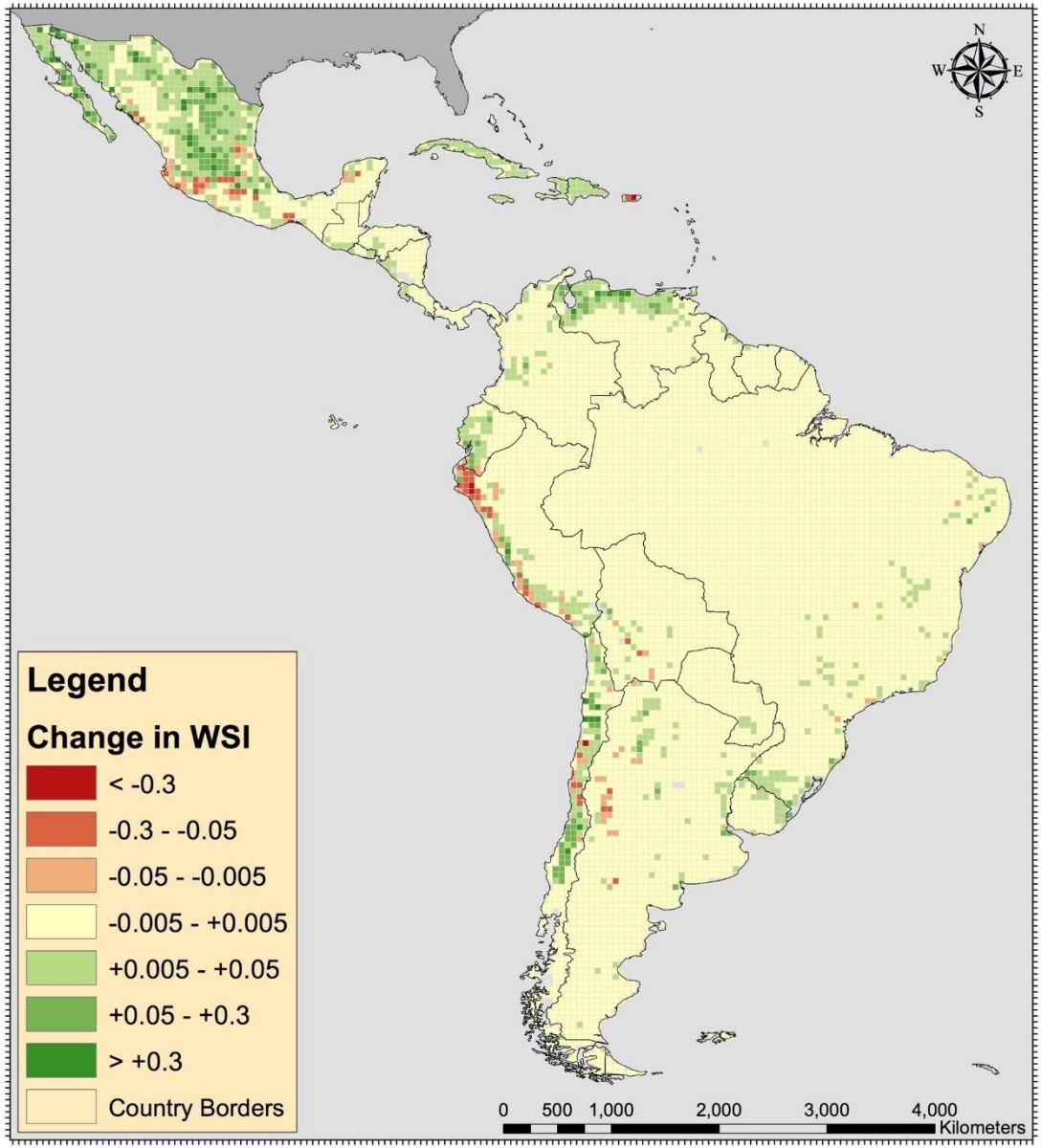
Change in Water Demand (km^3/y) for the Latin America and Caribbean (LA

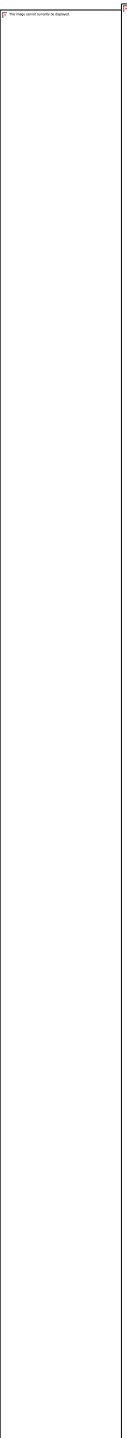
Year: 2050
Scenarios: SSP3 vs. SSP1



Change in Water Scarcity Index (WSI) for the Latin America and Caribbean (LAC) Region

Year: 2050
Scenarios: SSP3 vs. SSP1

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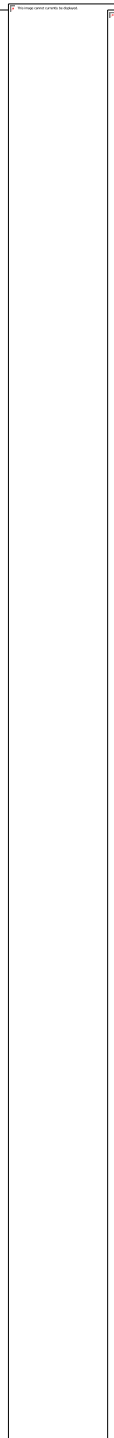
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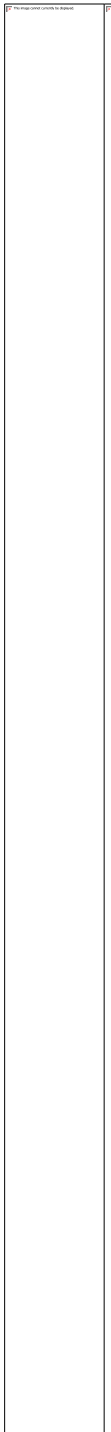
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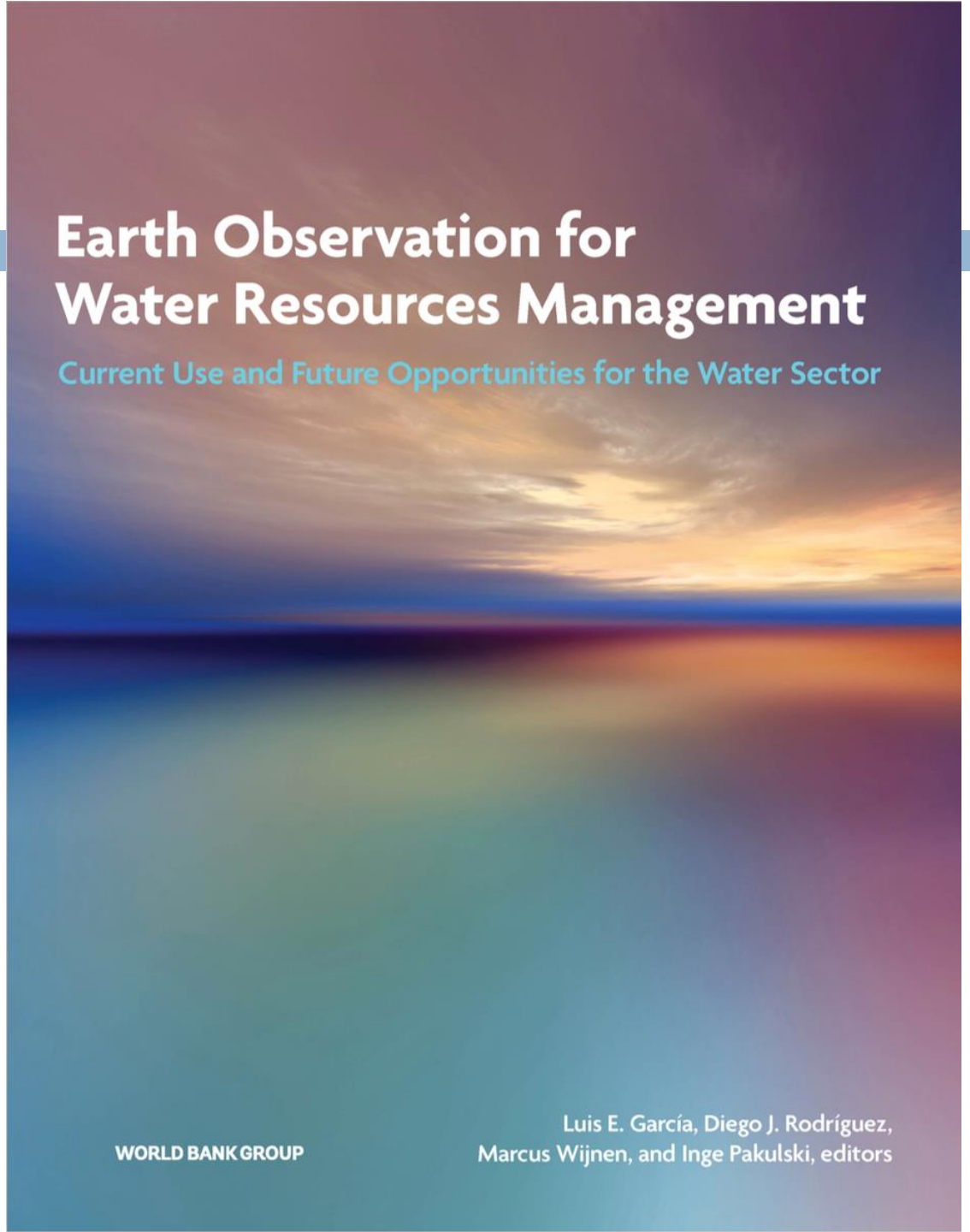
Earth Observation for
Water Resources Management
Current Use and Future Opportunities for the Water Sector
WORLD BANK GROUP
Luis E. García, Diego J. Rodríguez,
Marcus Wijnen, and Inge Pakulski, editors

Growth in SDG Space Through Partnerships

- A very large and diverse collection of EO scientists located within 5 miles of UMD
- Work with international organizations in greater DC area: World Bank, IADB), as well as many collaborations abroad: GEWEX (GPCP, GDAP), GSICS, GODAE, JASMIN, IOC, ESA/EUMETSAT, EU-IMPRESSIONS
- Started to work with private investment banking (BlackRock), NGOs (TNC, WRI), private industry (Pepsi, Skoll)
- Some in-kind collaboration examples: Brazil-Maryland exchange on water quality in bay environments (Chesapeake-Guanabara)

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A few things I would think about moving forward

- 17 SDGs, need to ”match” EO use to some of them, being strategic, create a few successful case study application stories, need quick hits.
- Some resistance will be found in governments (“official data”); need country buy-in.
- Besides SDGs, there are other global efforts (NDCs, SSPs, water-energy-food nexus), look for synergies.
- Not just data, but SDG-focused data products and outlets.
- Make the economic case! I cannot stress this enough…