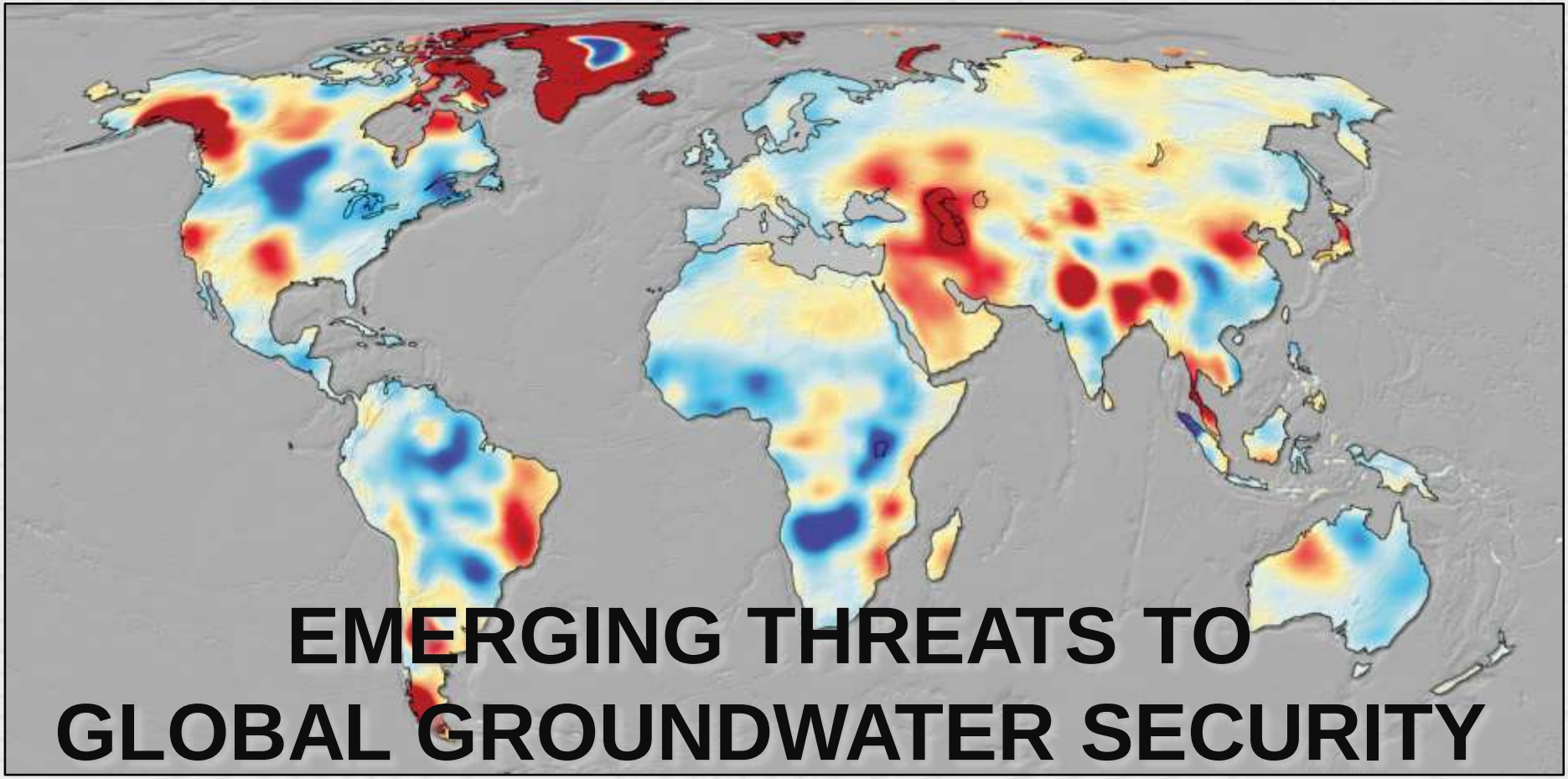
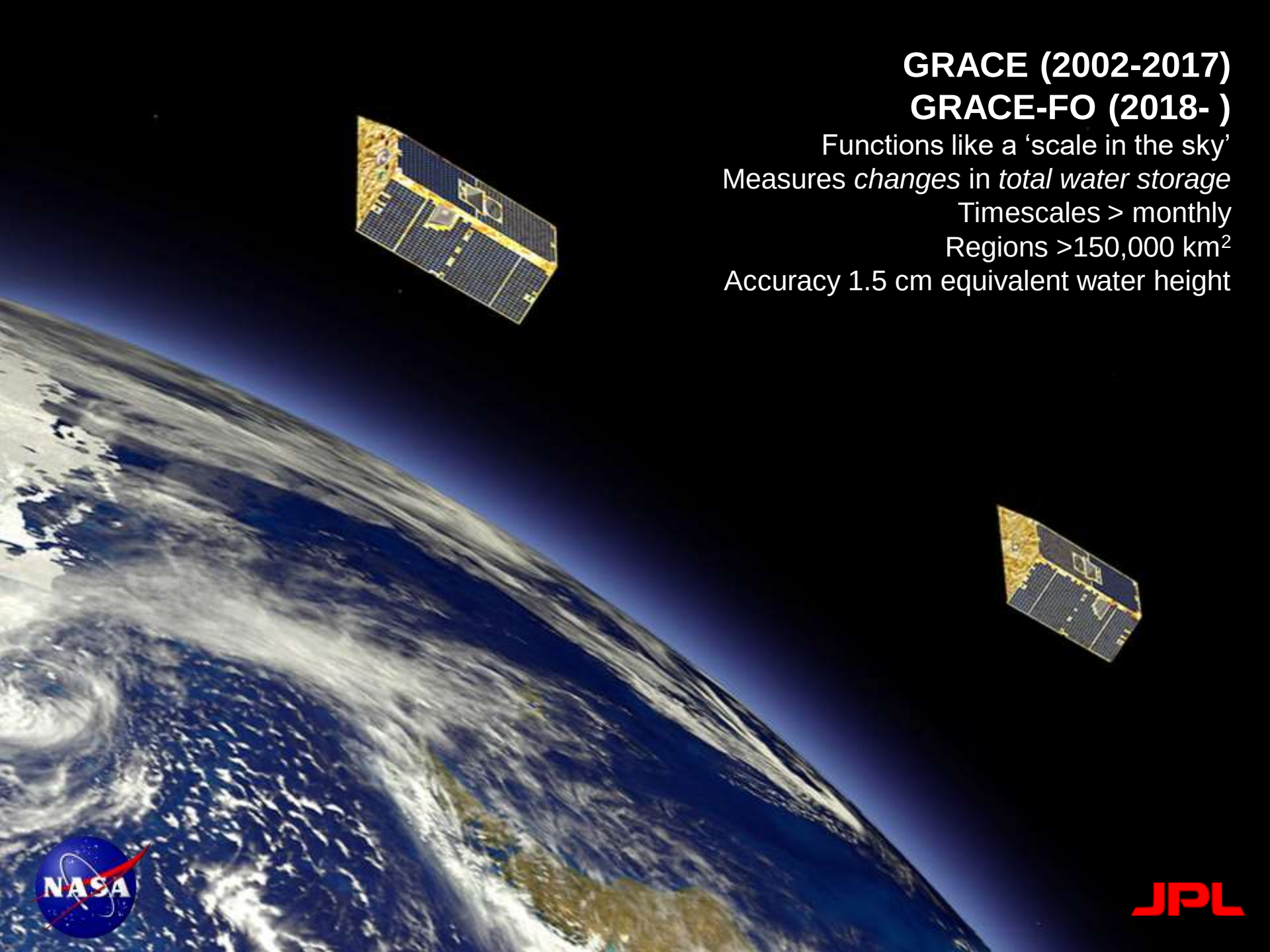


EMERGING THREATS TO GLOBAL GROUNDWATER SECURITY AS VIEWED FROM SPACE

JAY FAMIGLIETTI

Global Institute for Water Security
University of Saskatchewan

IWRA Online Conference 2020, Virtual Presentation, October 28, 2020



GRACE (2002-2017)
GRACE-FO (2018-)

Functions like a ‘scale in the sky’

Measures *changes* in *total water storage*

Timescales > monthly

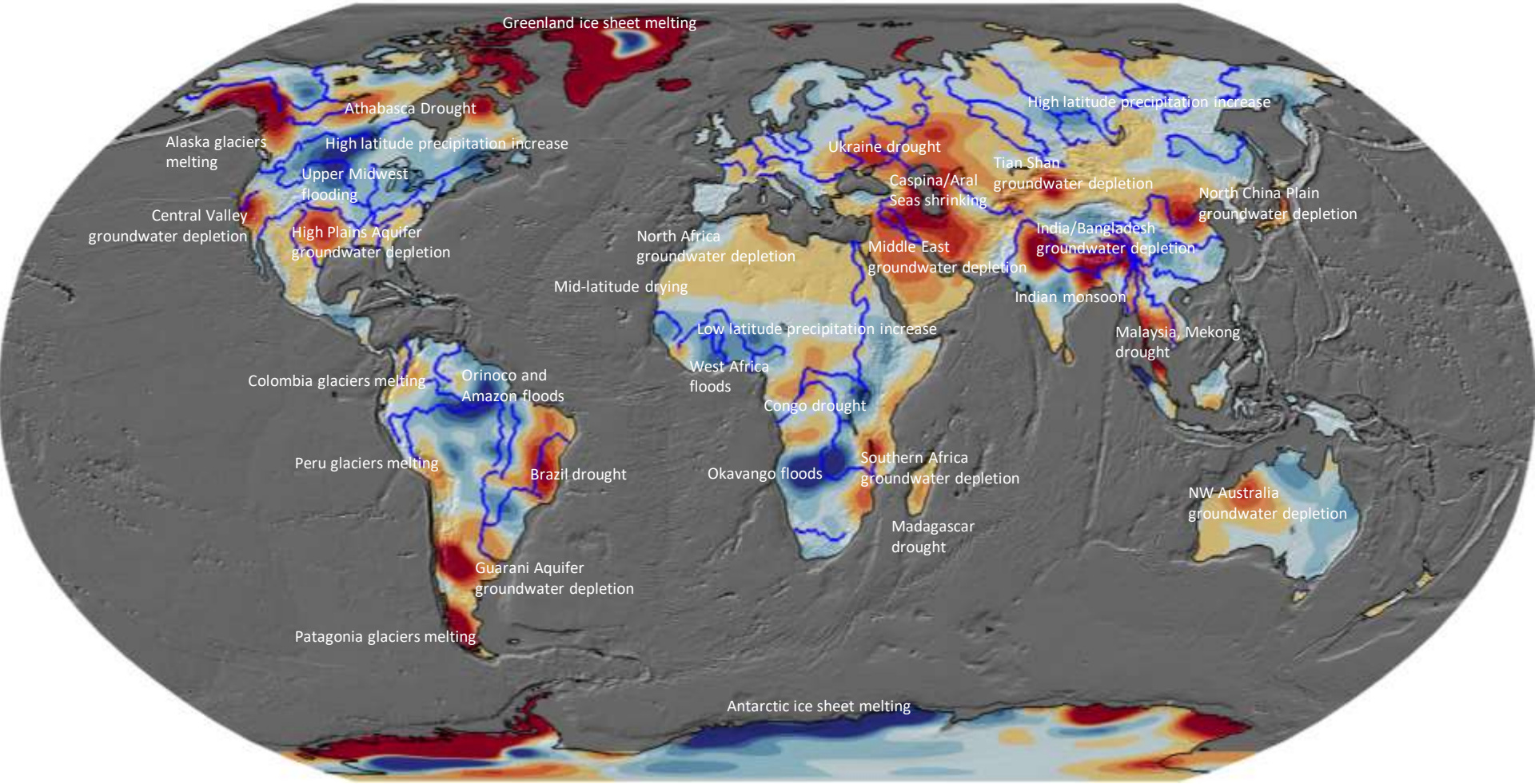
Regions >150,000 km^2

Accuracy 1.5 cm equivalent water height

GRACE-FO Launch, May 22, 2018
Vandenberg Air Force Base, Lompoc, California, USA

Changing freshwater availability from GRACE (2002-2017)

Rodell, Famiglietti et al., 2018, Nature, Emerging Trends in Global Freshwater Availability



nature climate change

29 October 2014

opinion & comment

COMMENTARY:

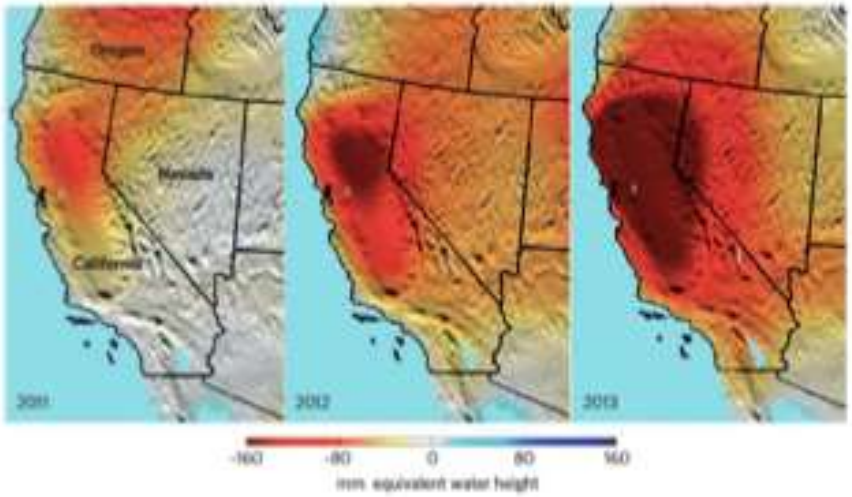
The global groundwater crisis

J. S. Famiglietti

Groundwater depletion the world over poses a far greater threat to global water security than is currently acknowledged.

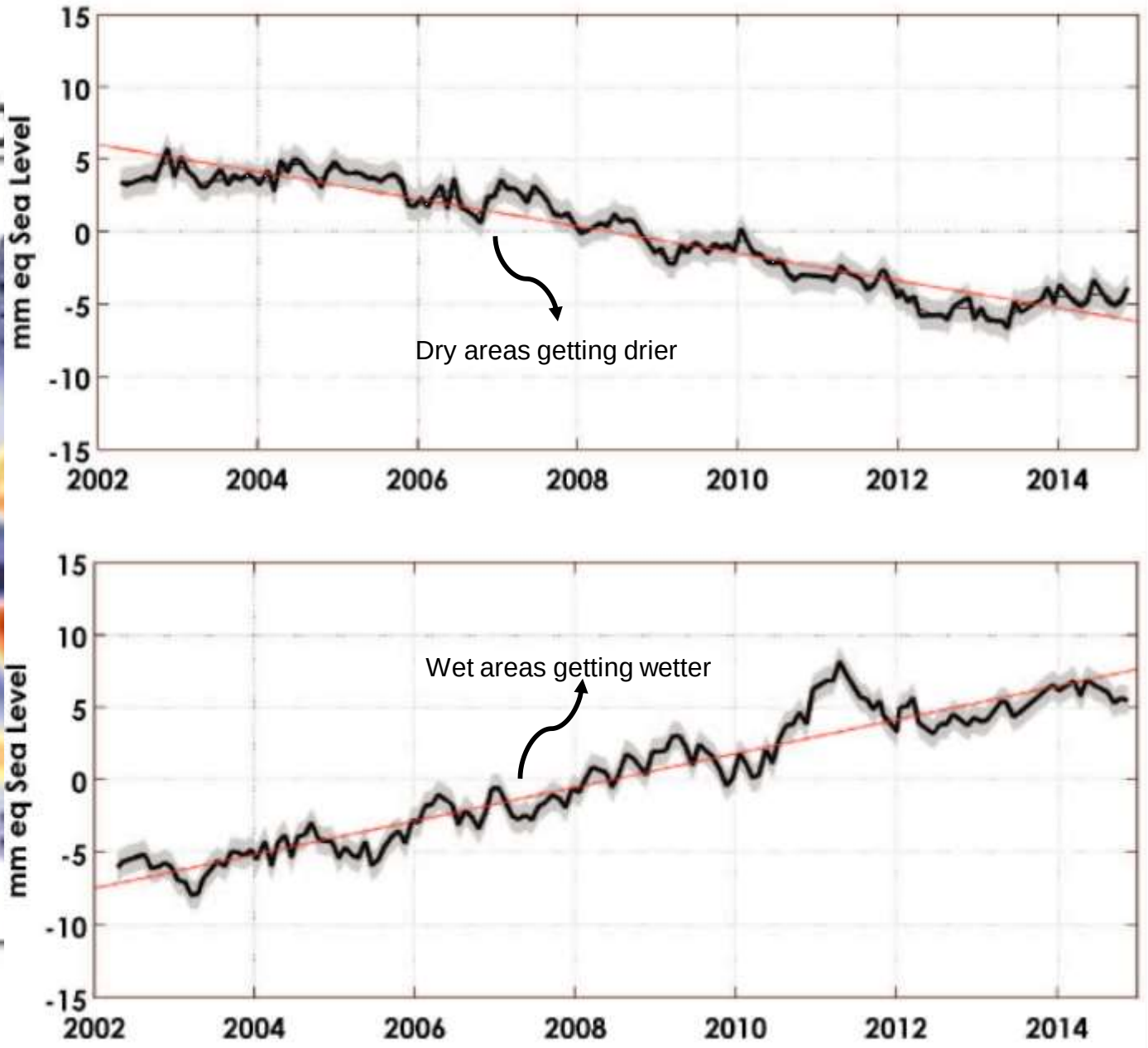
Groundwater — the water stored beneath Earth's surface in soil and porous rock aquifers — accounts for as much as 33% of total water withdrawals worldwide[1]. Over two billion people rely on groundwater as their primary water source[2], while half or more of the irrigation water used to grow the world's food is supplied from underground sources[3].

Groundwater also acts as the key strategic reserve in times of drought[4], in particular during prolonged events such as those in progress across the western United States (Fig. 1), northeastern Brazil and Australia. Like money in the bank, groundwater sustains societies through the lean times of little incoming rain and snow. Hence, without a sustainable groundwater reserve, global water security is at far greater risk than is currently recognized.



Precip

DJF

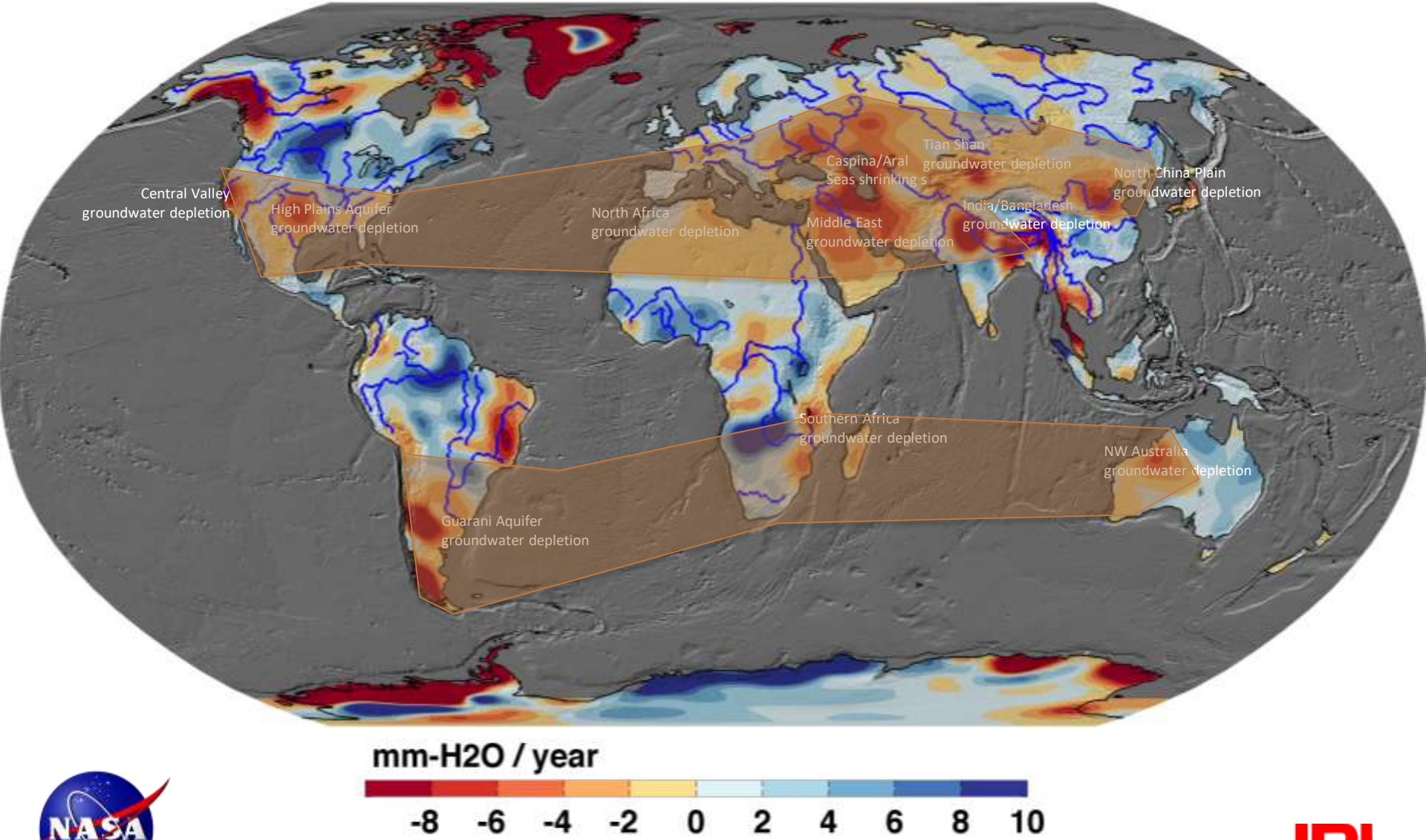


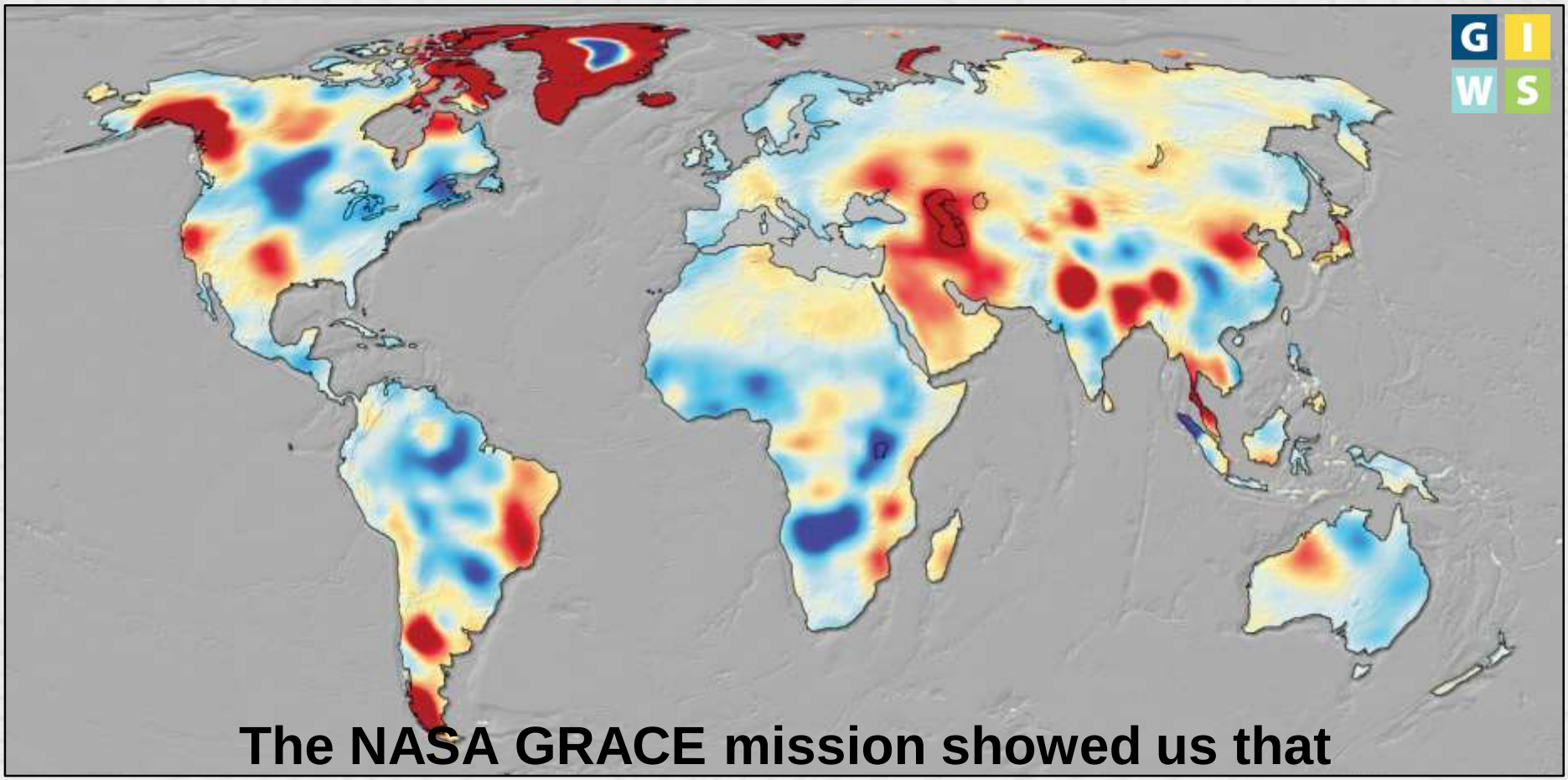
igure 10.9, 2007

Reager et al., A decade of sea level rise slowed by climate-driven hydrology, Science, 2016

Changing freshwater availability from GRACE (2002-2017)

Rodell, Famiglietti et al., 2018, Nature, Emerging Trends in Global Freshwater Availability





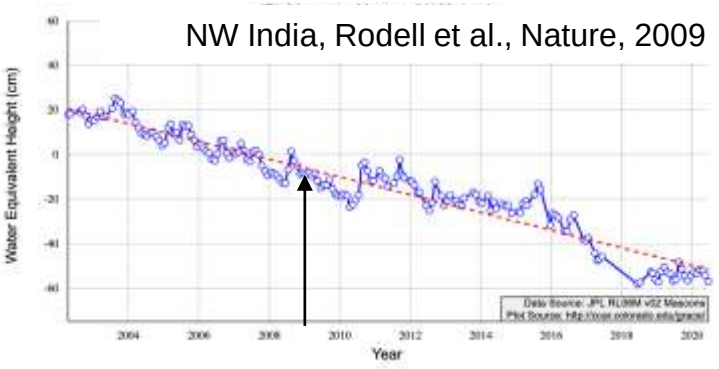
The NASA GRACE mission showed us that

The human fingerprint on the freshwater landscape - through climate change, ice melt, changing extremes, and groundwater depletion - is a dominant force that is dramatically changing patterns of water availability.

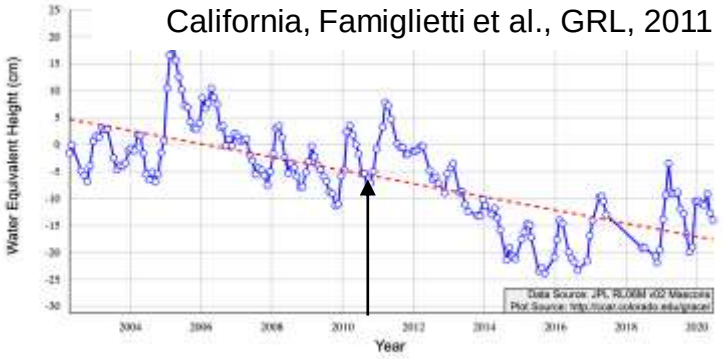
This change – and with it, major threats to water and food security -- is happening far more rapidly than most people realize.

GRACE-FO is showing us…
that things are not improving

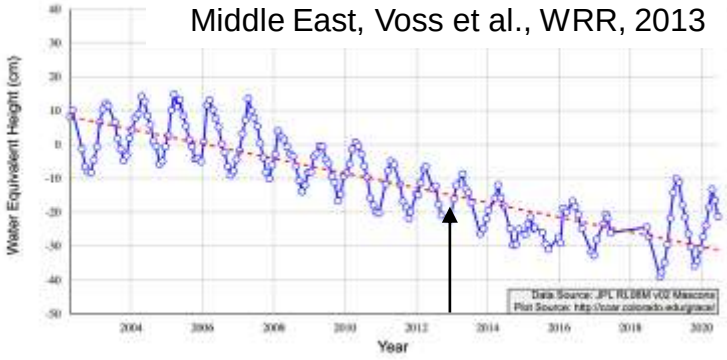
NW India, Rodell et al., Nature, 2009



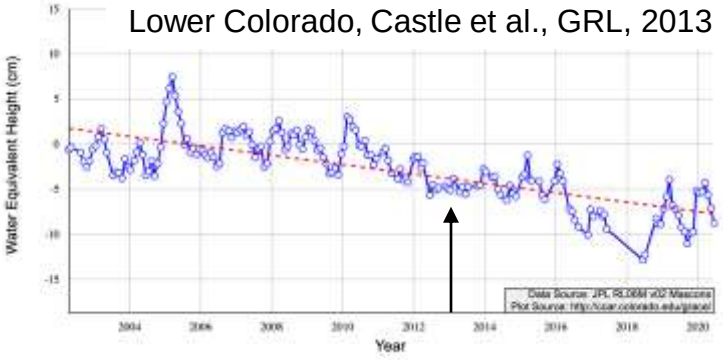
California, Famiglietti et al., GRL, 2011



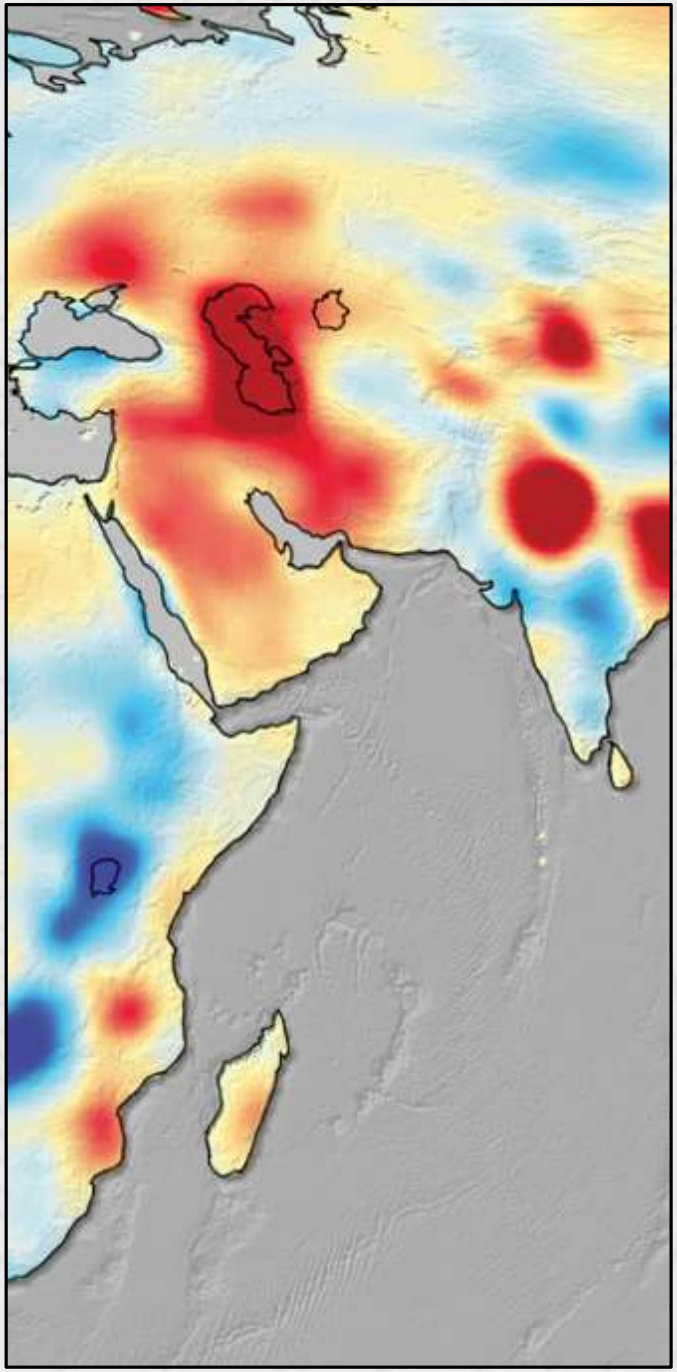
Middle East, Voss et al., WRR, 2013



Lower Colorado, Castle et al., GRL, 2013



and the GRACE-based maps in Richey et al. [2015] and Rodell et al. [2018] look largely the same today



Implications

Food producing regions in a state of ‘chronic water scarcity.’

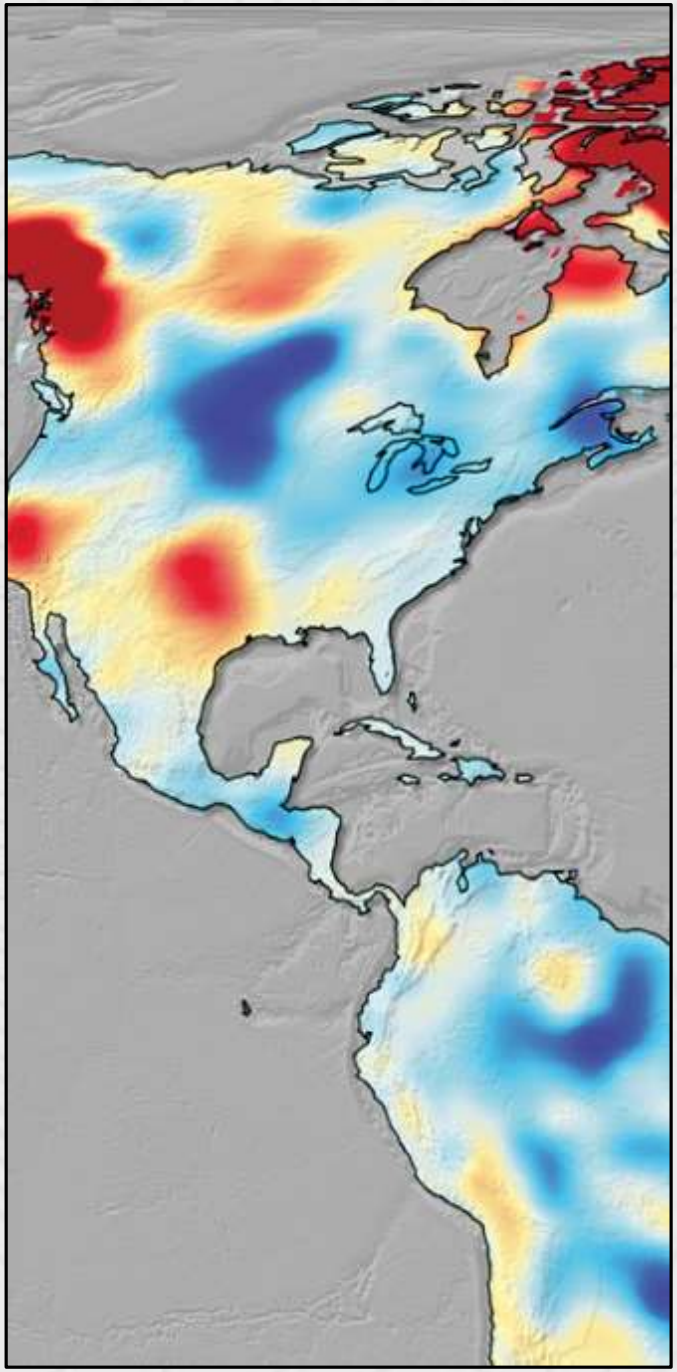
Distinct classes of water ‘haves and have nots’ are emerging

Hydrogeological exploration of the world’s major aquifers

Groundwater is a critical element of national and international water supplies

Regional groundwater problems require regional solutions

http://www.groundwatergovernance.org/



More Information

Twitter
@jayfamiglietti

GIWS
https://water.usask.ca

Let’s Talk About Water podcast
https://letstalkaboutwater.ca