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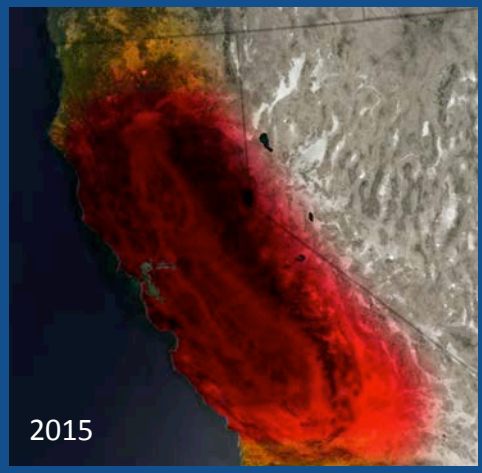
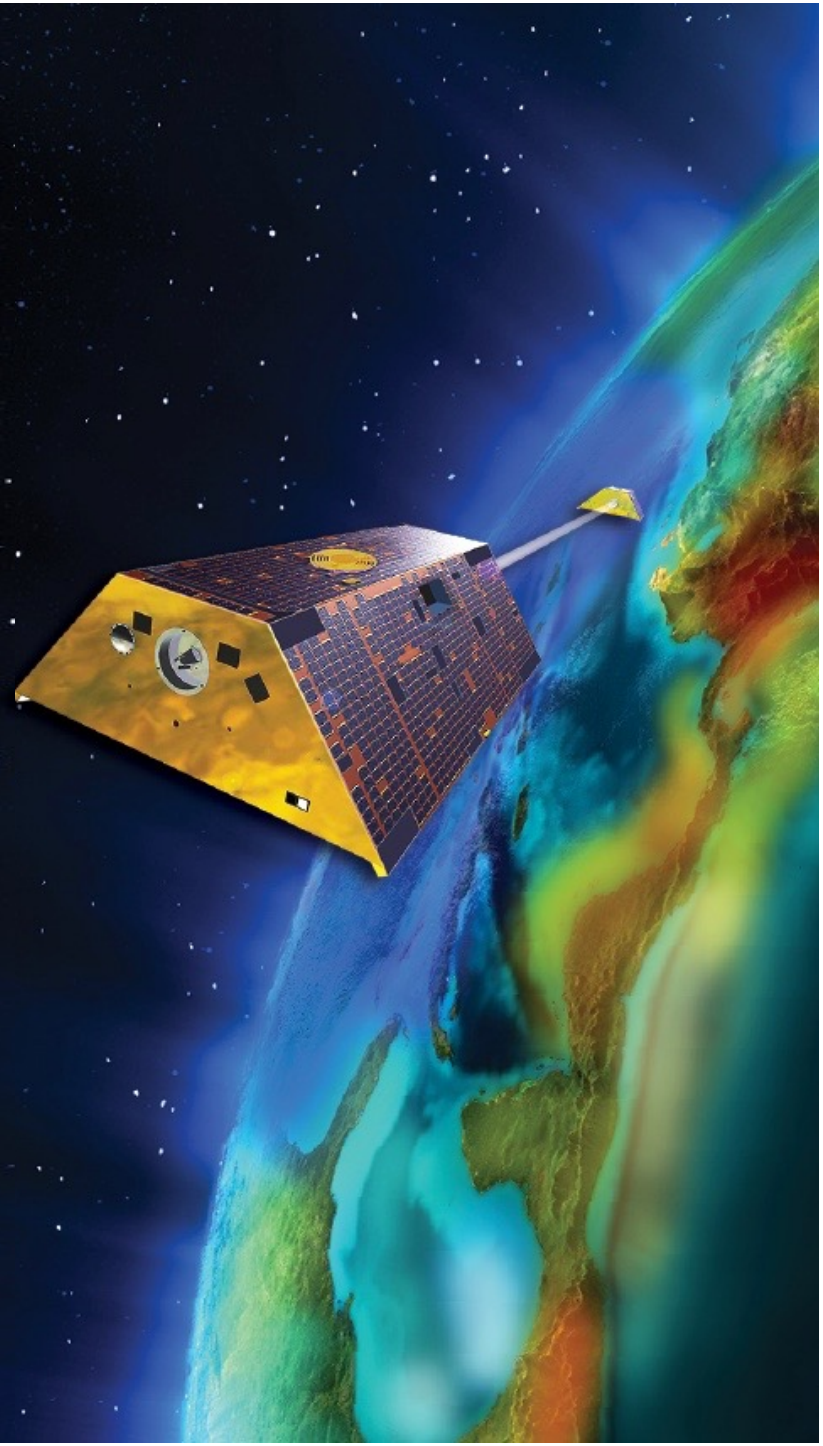
From Drought to Recovery in California: Insights Using GRACE, Models and In Situ Observations

GSTM
University of Texas at Austin
October 12, 2017



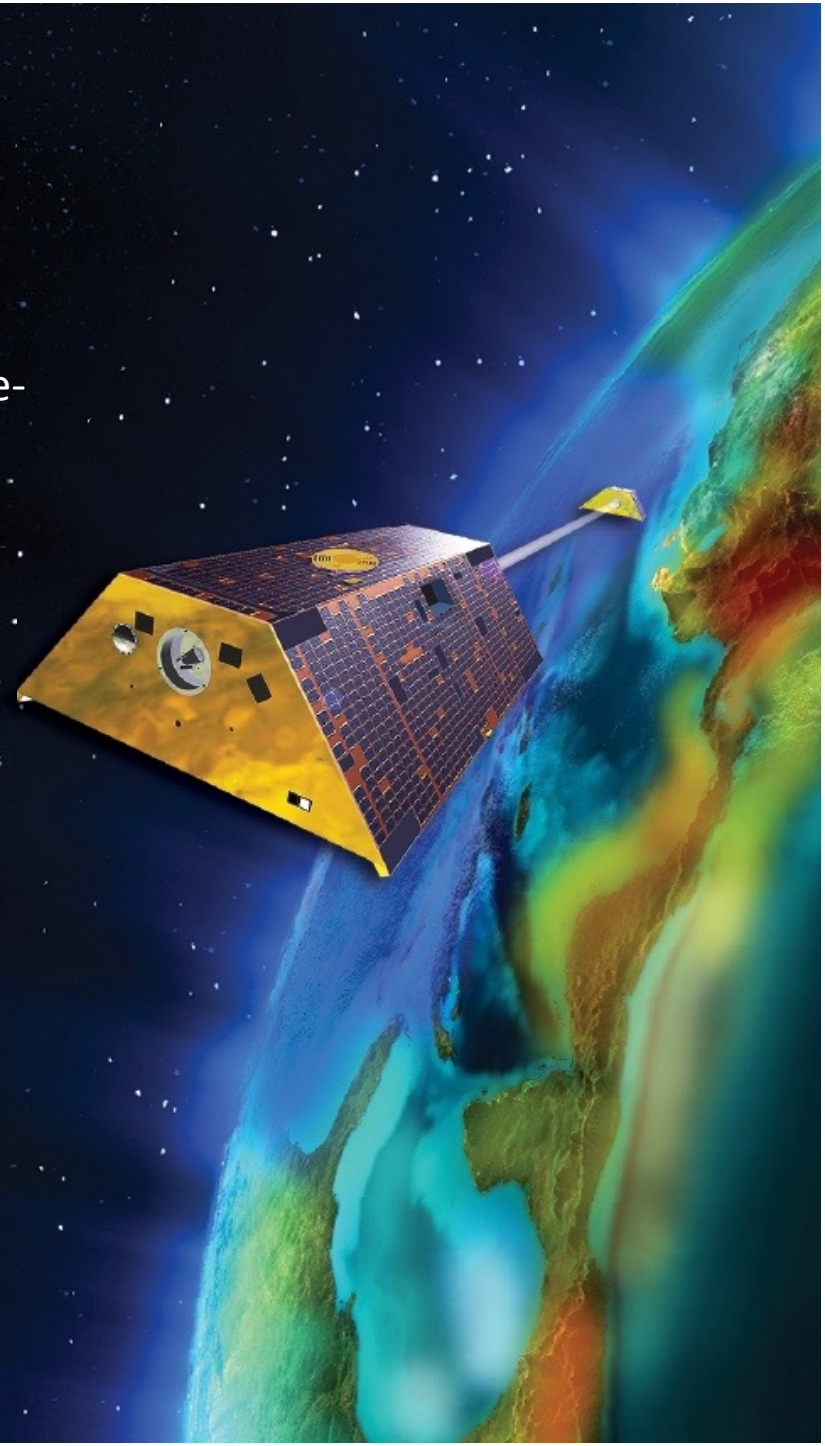
- I'm not going to talk about the California drought today
- Instead I thought our time would be better utilized by reflecting upon what we can do as a Science Team to better prepare for GRACE-FO Hydrology
- In short, I really just wanted an excuse to show this next slide

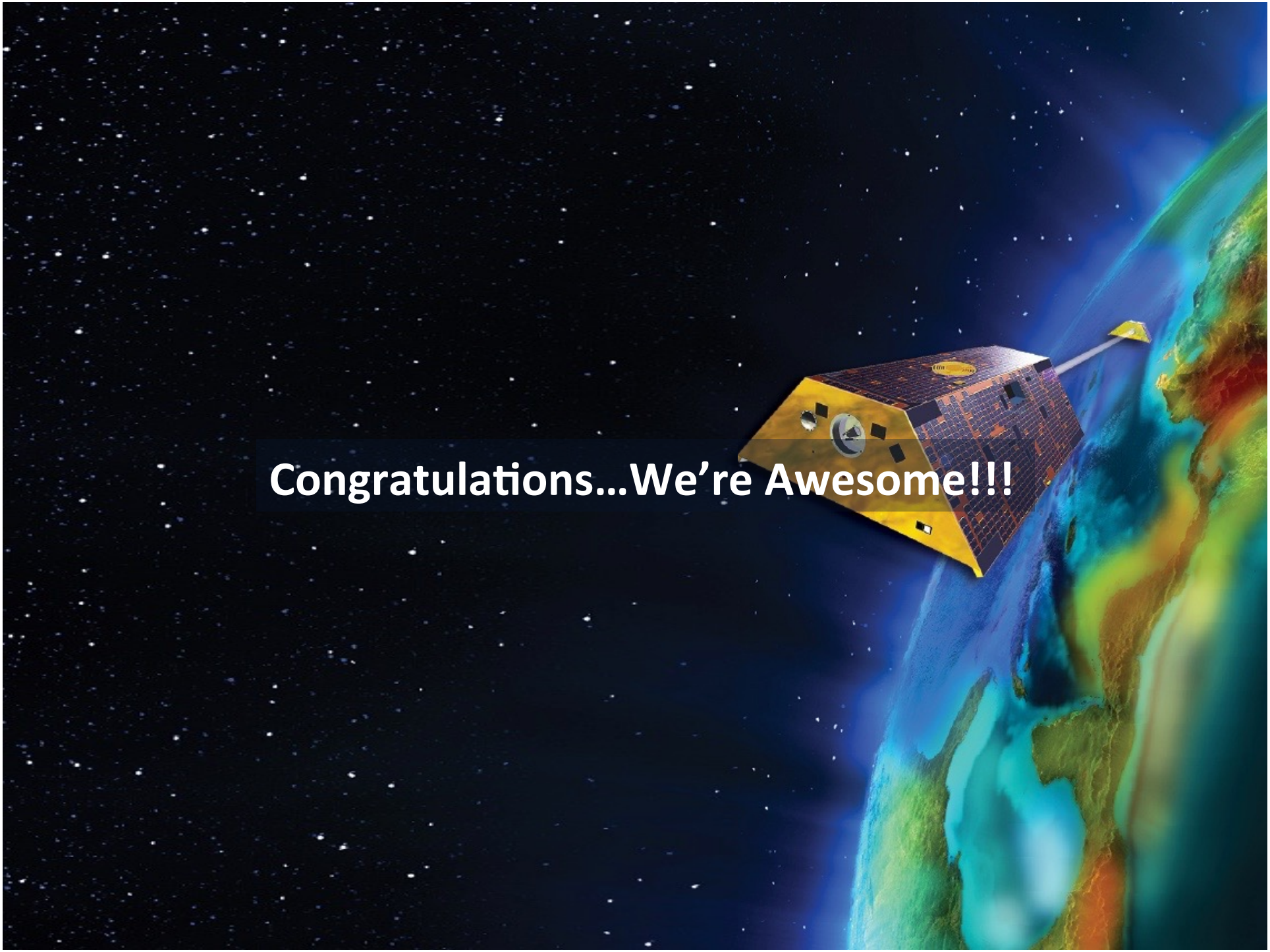


Food for Thought

Taking Stock

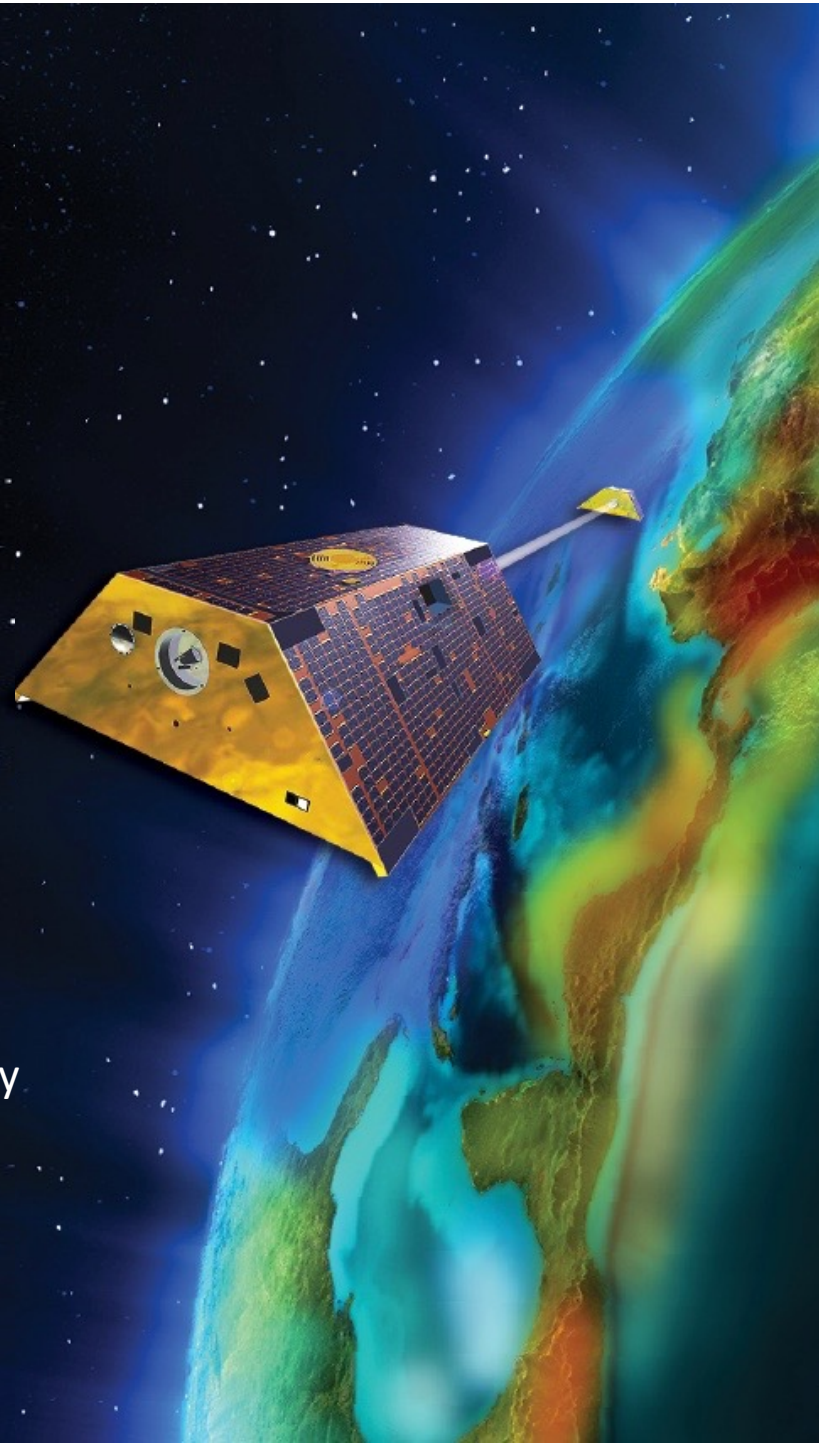
- We have accomplished some great things over the last 20 or more years (including pre-launch research)
- We have a global picture of freshwater availability that we never had, and we can watch it change over time
- We now understand the timing of land-ocean-atmosphere-ice water mass changes and we can use these to address societally relevant problems like water cycle acceleration and sea level rise
- We can better understand the dynamics of regional flooding and drought in a more holistic fashion, that was not previously possible




Congratulations…We're Awesome!!!

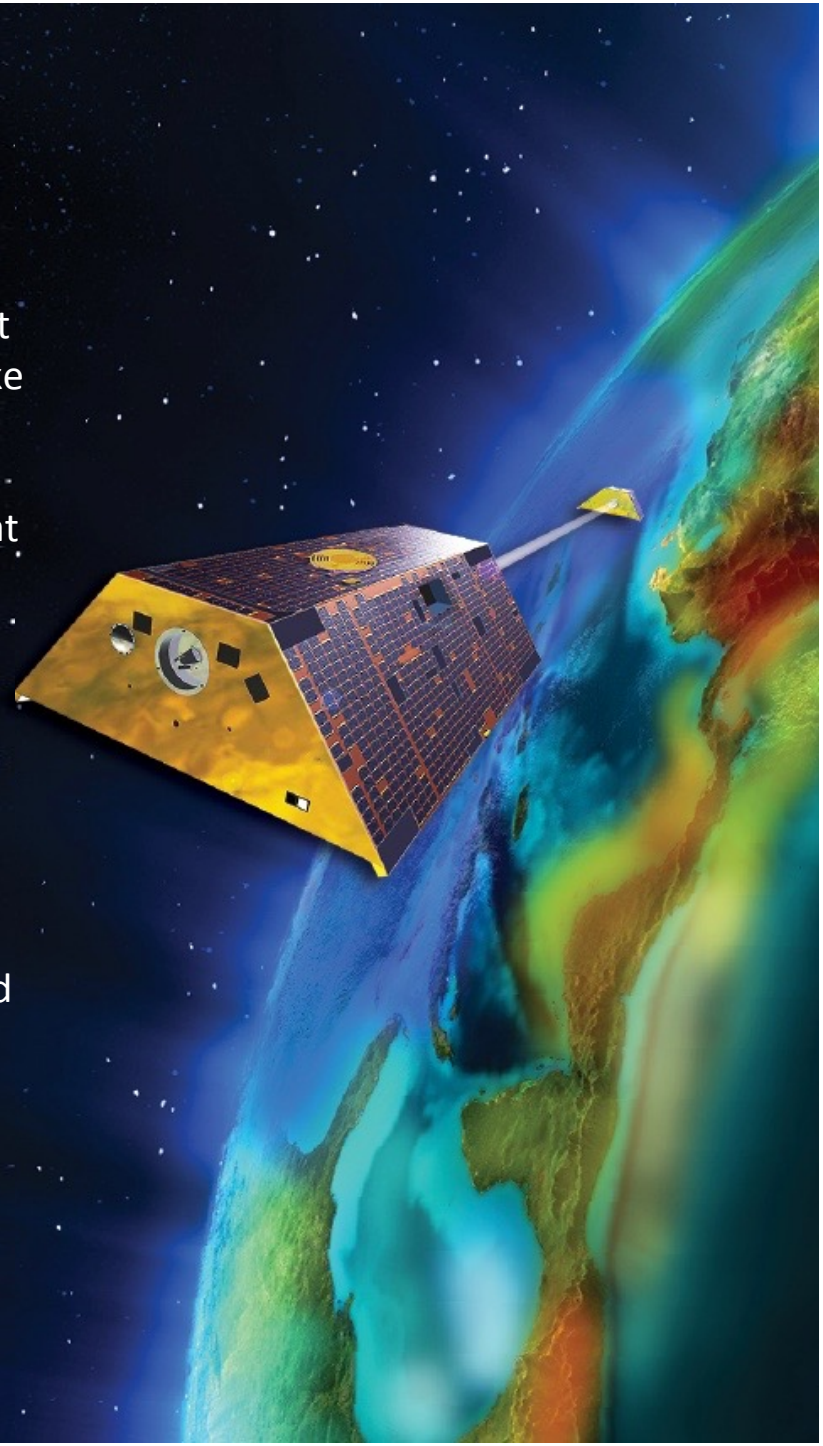
Moving Forward

- We are some lessons learned over these past couple of decades?
- Do we have a clear set of GRACE-FO hydrology goals?
- Are there strategic targets in water science and applications?
- What are some science and engineering needs?
- How can we better prepare the hydrologic community to use GRACE-FO data effectively and better support a GRACE NGGM?



Lessons Learned

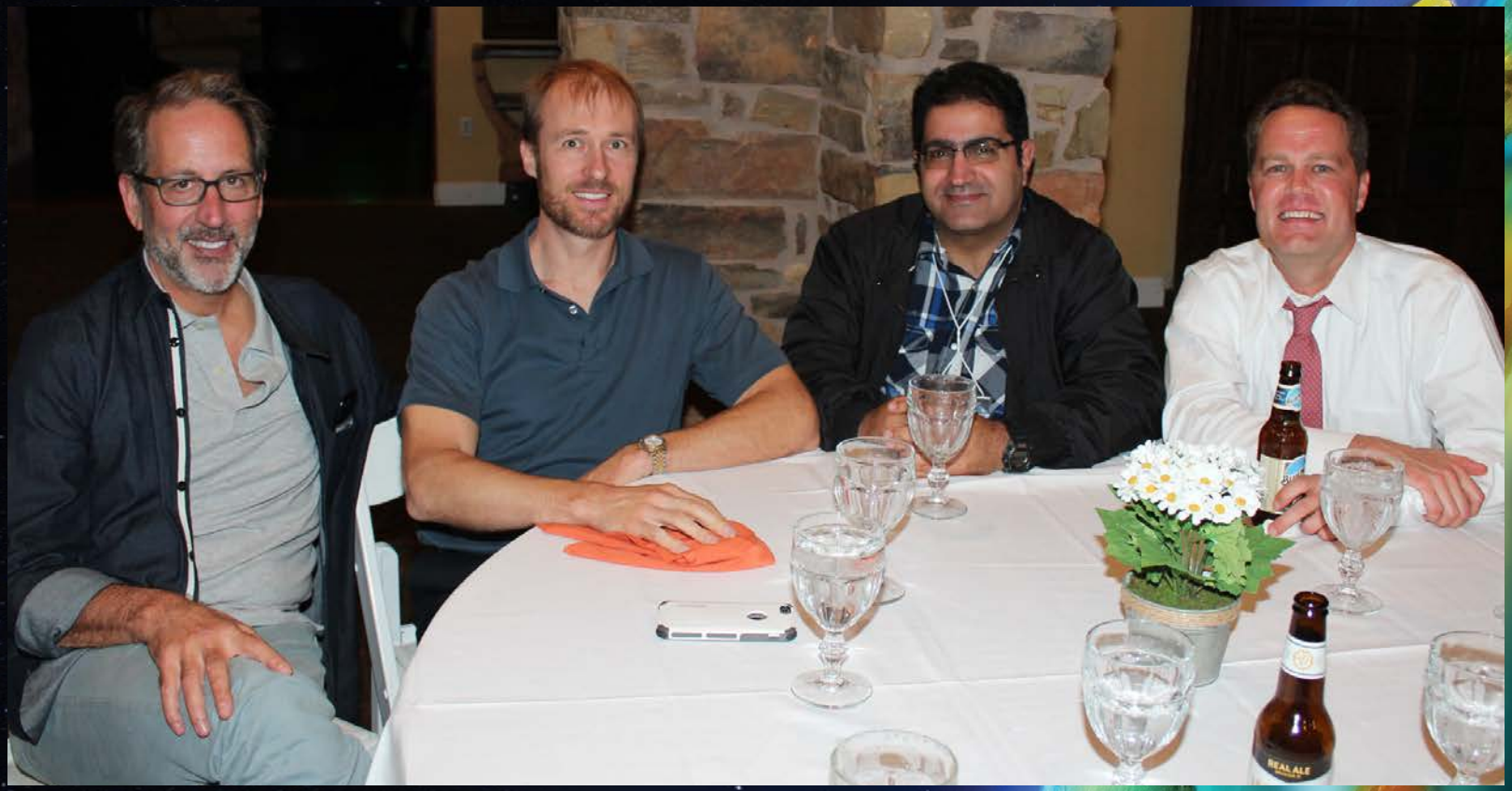
- The data have been, and perhaps still are, difficult to use and understand. This limited GRACE uptake in hydrology, at least initially
- Professional jealousy is an unfortunate reality that rises to high levels. We need to accept this and strategize on how to manage it
- GRACE results have been great for informing the public and federal officials. We have had far less traction at the 'mid-level' of state water authorities and decision makers
- We held some successful workshops early on, and we probably should have continued organizing them
- It is critical that we do not oversell GRACE/FO hydrology capabilities



GRACE-FO Hydrology Goals?

- Should we have them?
- For example, perhaps we'd like to
  - Engage a broader swath of the hydrologic and related communities

“Out of the way people…these are
CARD CARRYING HYDROLOGISTS!!!...
And they’re all we’ve got”

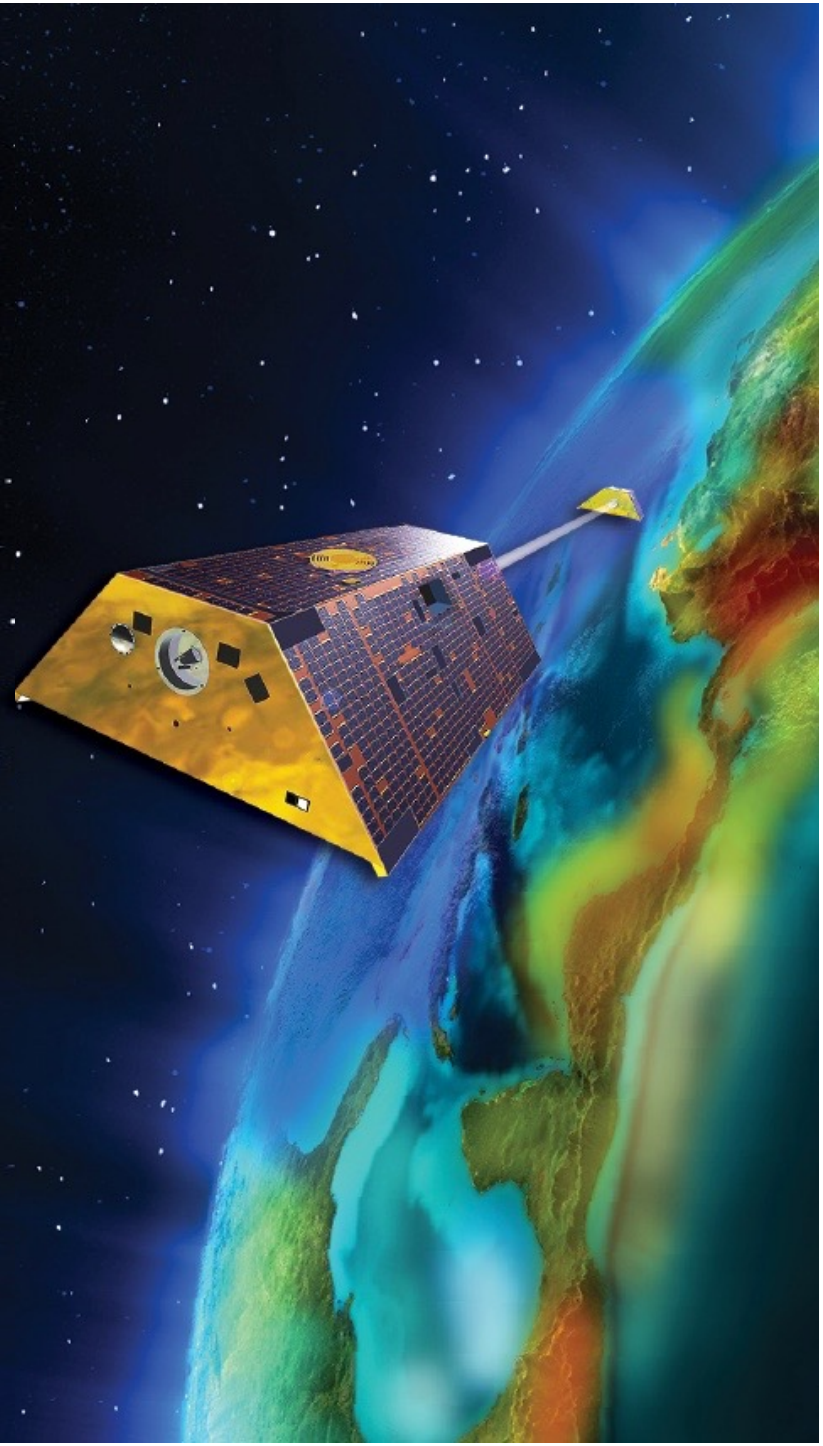


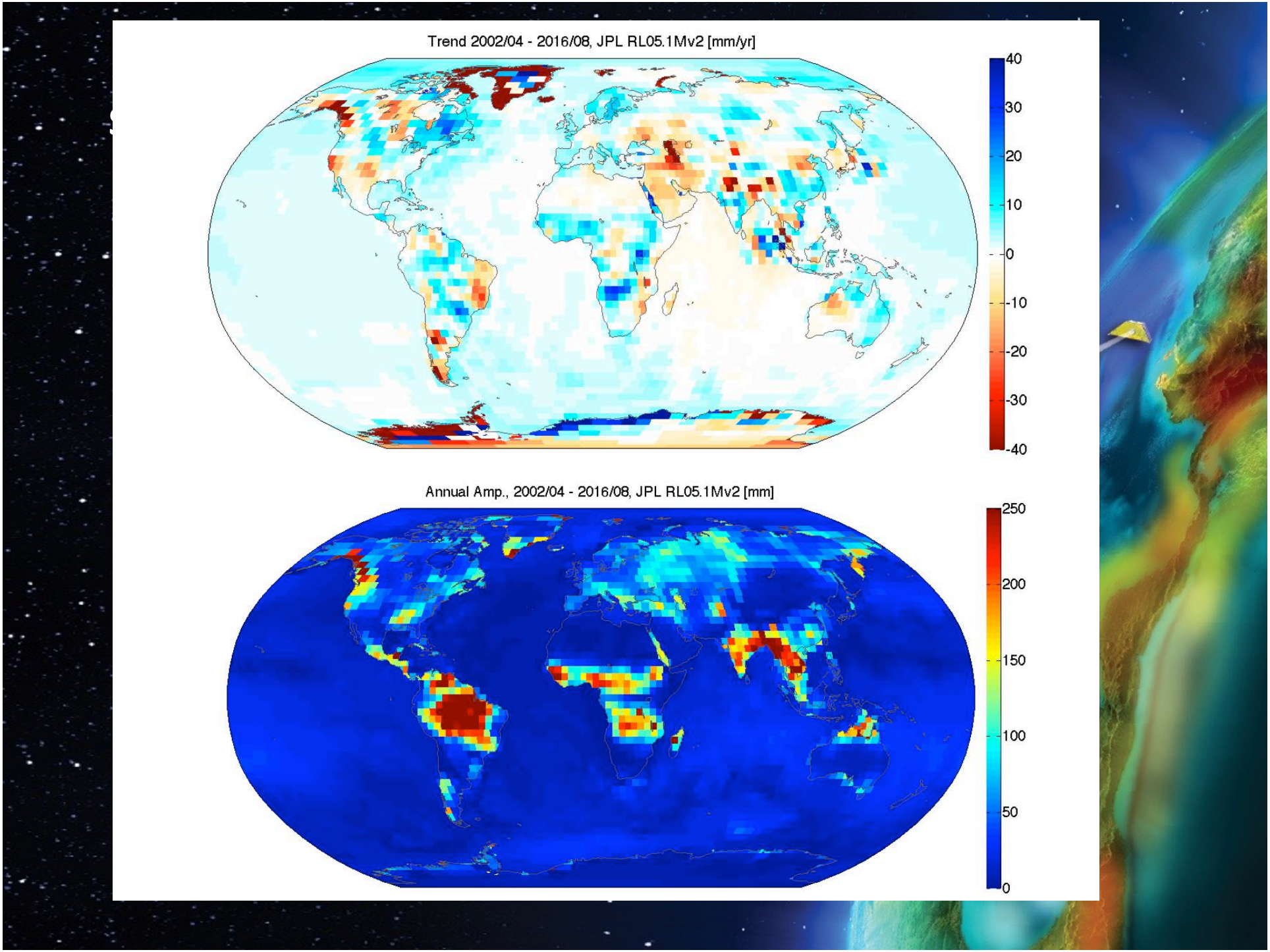
GRACE-FO Hydrology Goals?

- Should we have them?
- For example, perhaps we'd like to
  - Engage a broader swath of the hydrologic and related communities
  - Set latency goals based on targeted applications
  - Achieve agreed upon milestones for downscaled products, including data assimilation and also the use of GPS and InSAR
  - Hold science workshops at fixed intervals
  - Hold training workshops at fixed intervals
  - Strategize towards socializing GRACE-FO and NGGM as being in part, hydrology missions

Strategic Targets?

- 'Operationalize' research results
  - Flooding, Drought, Evapotranspiration, River Discharge, Basin Storage Changes, Groundwater Storage Changes
- Retrospective reananalyis of GRACE hydrology?
- Inclusion in State of the Climate and NDMC/NADM are great examples.
  - Are there others?
- Are there key stakeholders like the NDMC we should think about?




Trend 2002/04 - 2016/08, JPL RL05.1Mv2 [mm/yr]
40
30
20
10
0
-10
-20
-30
-40
Annual Amp., 2002/04 - 2016/08, JPL RL05.1Mv2 [mm]
250
200
150
100
50
0

Preparing the broader hydrologic community for GRACE-FO and better supporting a GRACE NGGM

- Science workshops, user workshops, easily accessible and usable data products
- Begin socializing GRACE NGGM to more card carriers
  - e.g. workshop on a NGGM hydrology capabilities to get buy-in from broader group
- More promotion of the emergence of hydrogeodesy as a distinct field
- More research funding never hurts