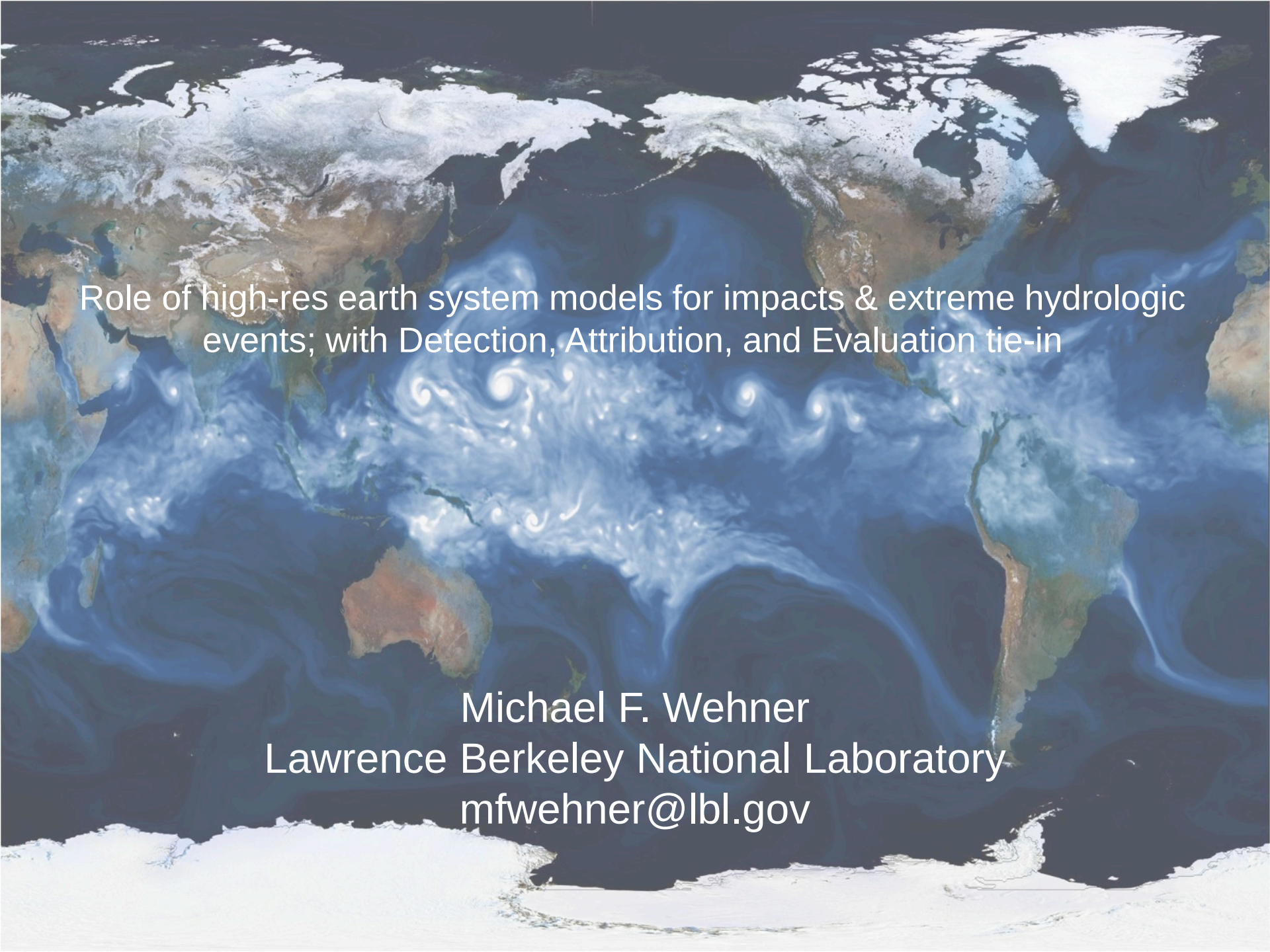

Role of high-res earth system models for impacts & extreme hydrologic events; with Detection, Attribution, and Evaluation tie-in

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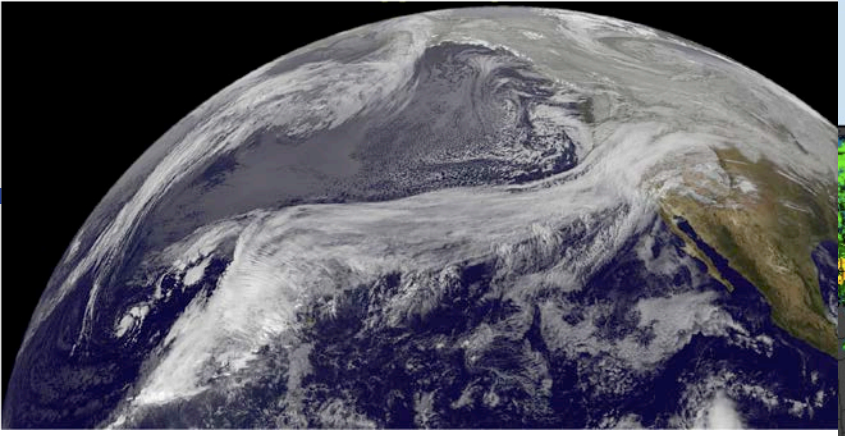
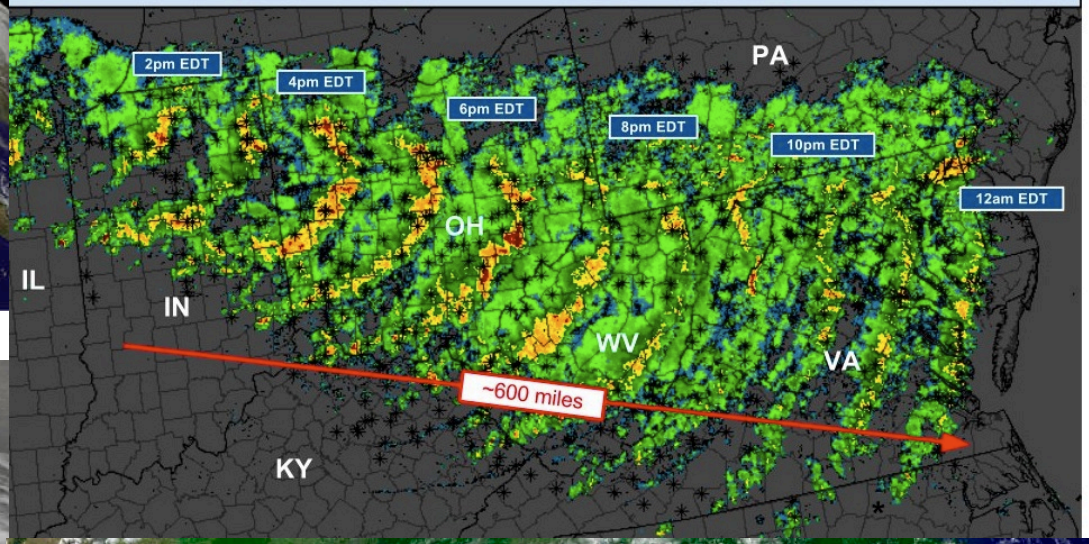
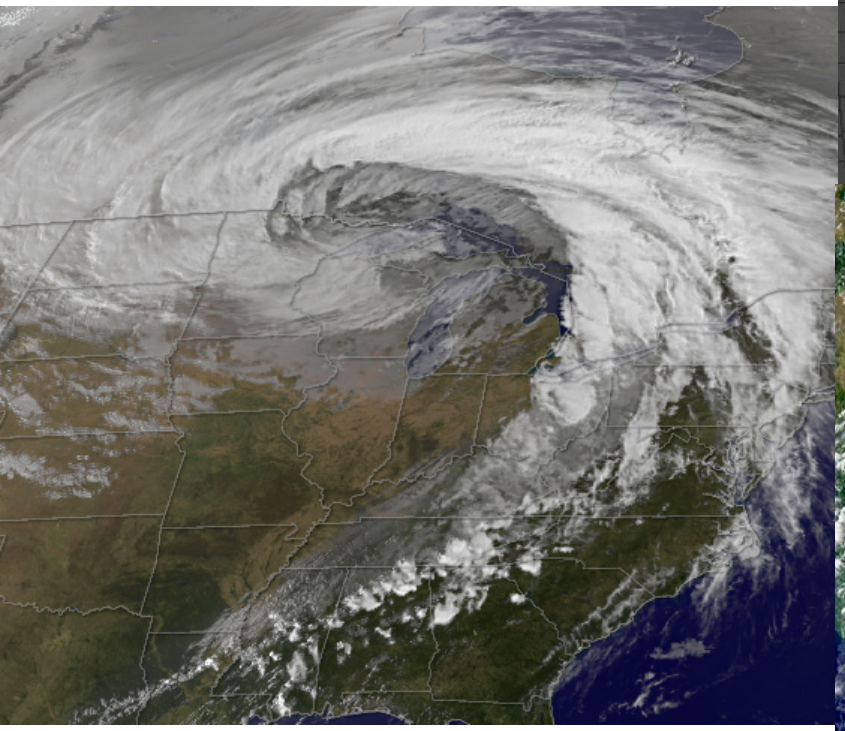
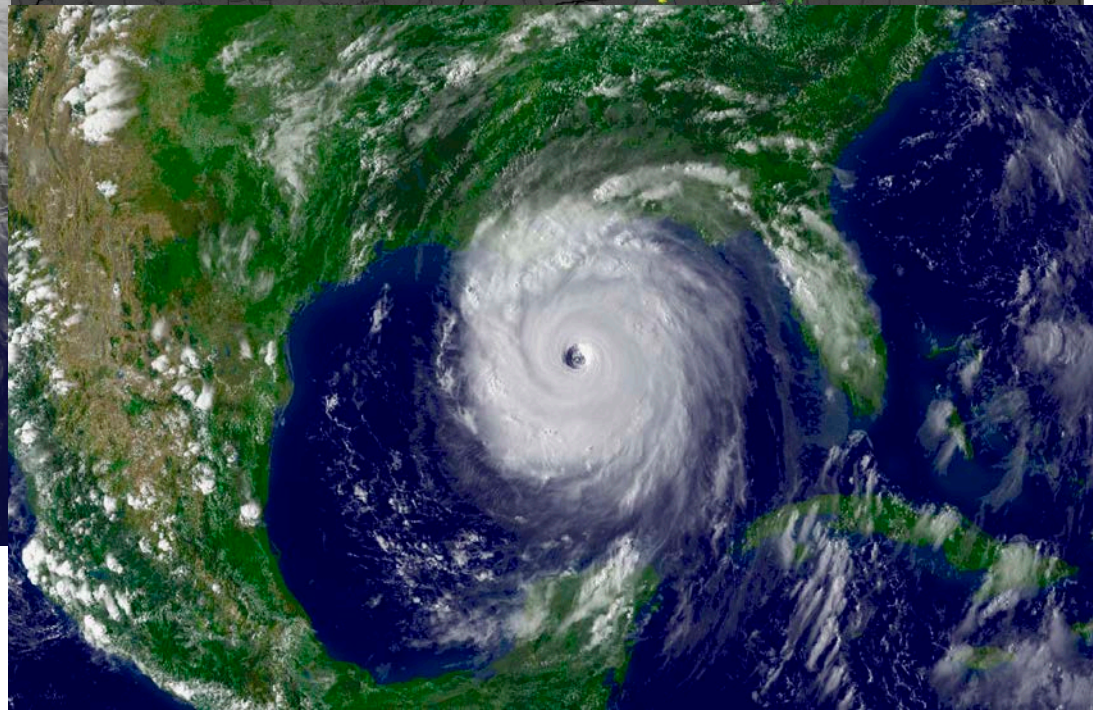


June 29, 2012 Midwest to East Coast Derecho
Radar Imagery Composite Summary 18-04 UTC
~600 miles in 10 hours / Average Speed ~60 mph







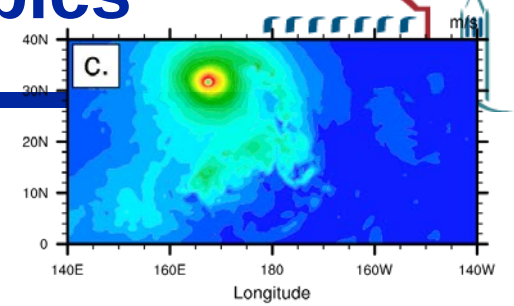
High impact hydrological events

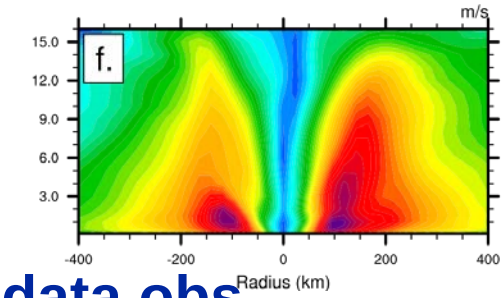
- **Droughts**
  - **We must accurately simulate blocking event statistics**
  - **Russia 2010,Texas 2011, Midwest US 2012**
    - **Multivariate, compound events**
    - **ENSO plays a role**
    - **Pakistani floods 2010, UK "rubbish summer" 2012**
      - May be associated with the same circulation changes that caused the droughts
      - More generally, what large scale circulation features and teleconnections are associated with extreme weather?
- **High resolution models are required to accurately simulate blocking in weather prediction.**

High impact hydrological events

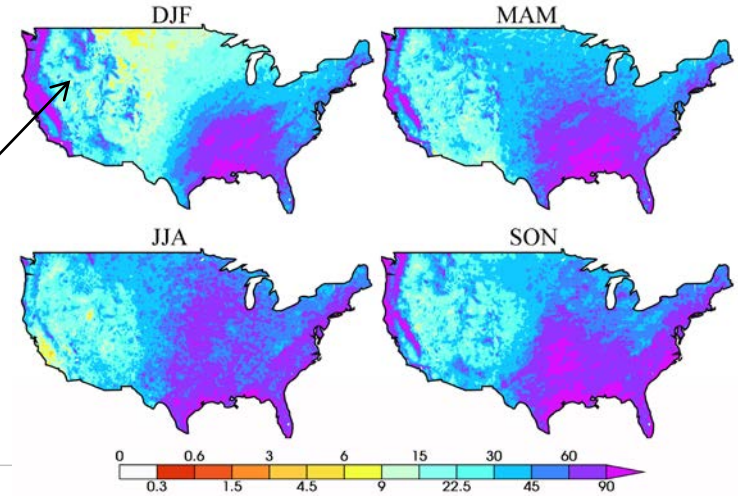
- Extreme storms
  - Hurricanes and tropical cyclones
  - Extratropical cyclones
  - Atmospheric rivers
  - Mesoscale convective systems
- High resolution *global* atmospheric models can produce more realistic weather
  - Critical for extreme precipitation!
    - Grids must be <50km, preferably 25km
    - Can’t address extreme precipitation parameterization problems until you get to this range.

Validation discussion topics





- Idealized test problems
  - Reed-Jablonowski hurricane
    - Tests both dynamics and physics
  - Need more like this!
- Extreme precipitation statistics
  - Gridded daily precipitation from station data obs.
  - Ditch the Frich indices. Go EV.
  - Fully time dependent Extreme Value stats with covariates (like ENSO, AO, etc.)



UW dataset
With PRISM

Discussion topics

- **Experimental designs for event attribution**
  - **World that was and the world that wasn't**
    - **AMIP-style with removal of the anthropogenic bits**
    - **50 member ensembles**
      - Current state of the art is confined to seasonal events like heat wave/droughts and large river flooding.
      - Is this enough for extreme storms?
      - integration length vs. ensemble size
- **What role can regional models play when we can run global models at 25km?**
- **What can we use variable resolution global models for?**

Thank you!

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