CDRs and the Energy Industry

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1 Cooperative Institute for Climate and Satellites cics.nc

2 Chesapeake ENERGY

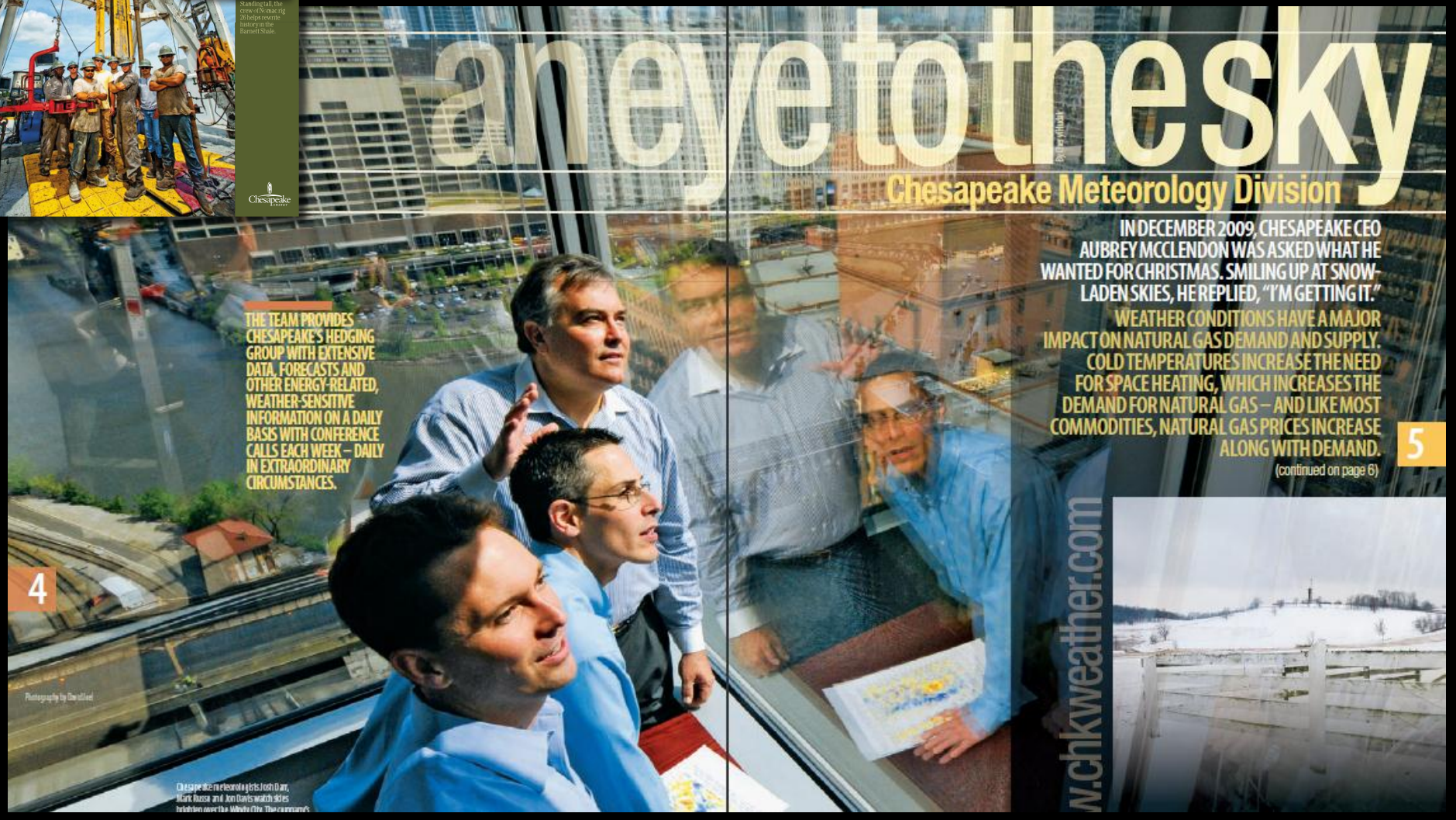
3 EarthRisk Technologies

Summary

- Energy Industry needs 10–30 day forecasts
- Statistical models based on tropical convection can beat dynamical models at those lead times
- Homogenized datasets, like CDRs, are critical for training statistical models
- CDRs like OLR and UTWV can identify that convection
- monitor.cicsnc.org/mjo/ serves those data to hundreds of users every month

CDR Users


ThePlay
Summer 2010
Standing tall, the crew of Ensign rig 26 helps rewrite history in the Barnett Shale.
Chesapeake


an eye to the sky
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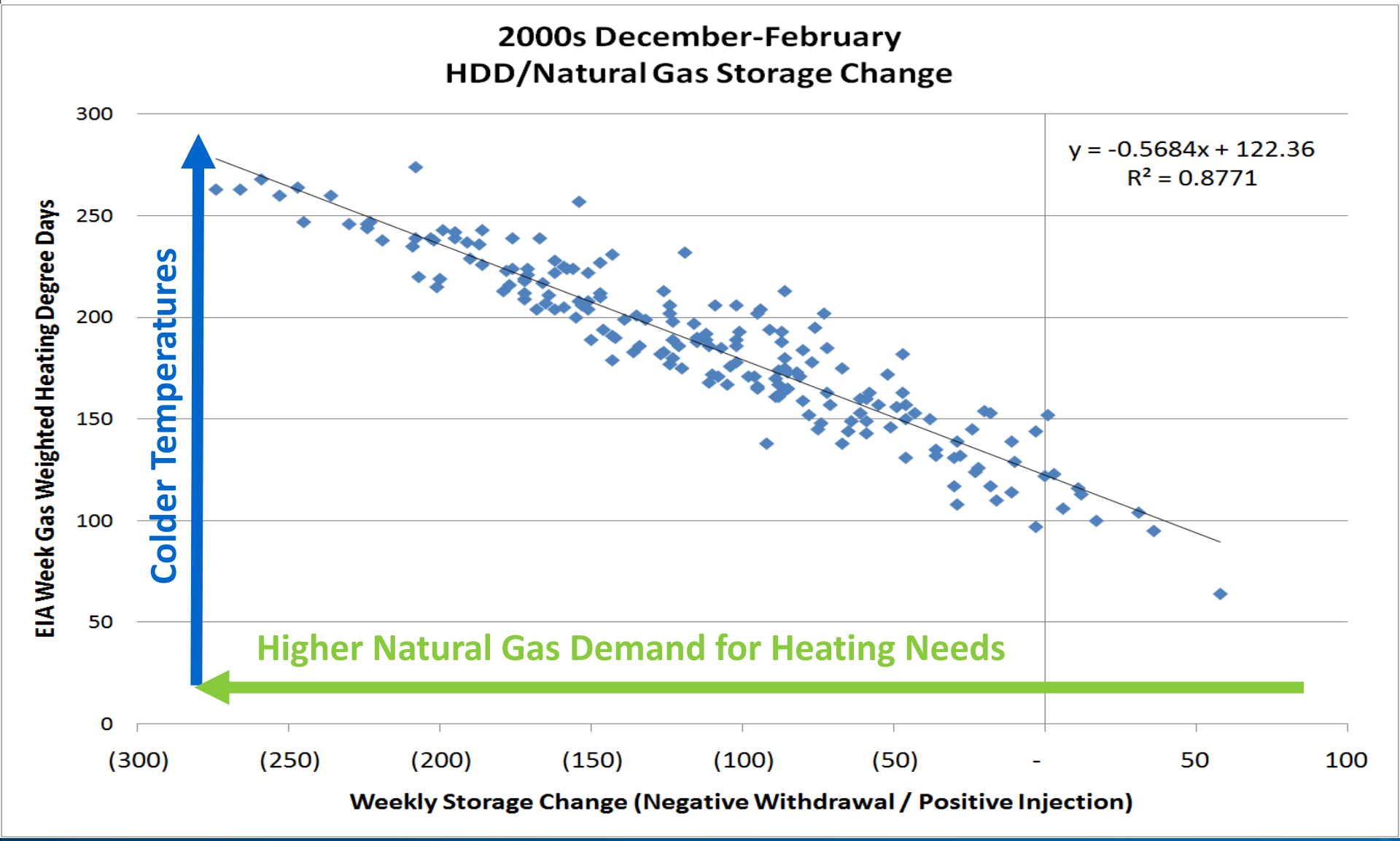
4
w.chkweather.com

Heating Demand Vs. Temperatures



The Chesapeake Weather Team

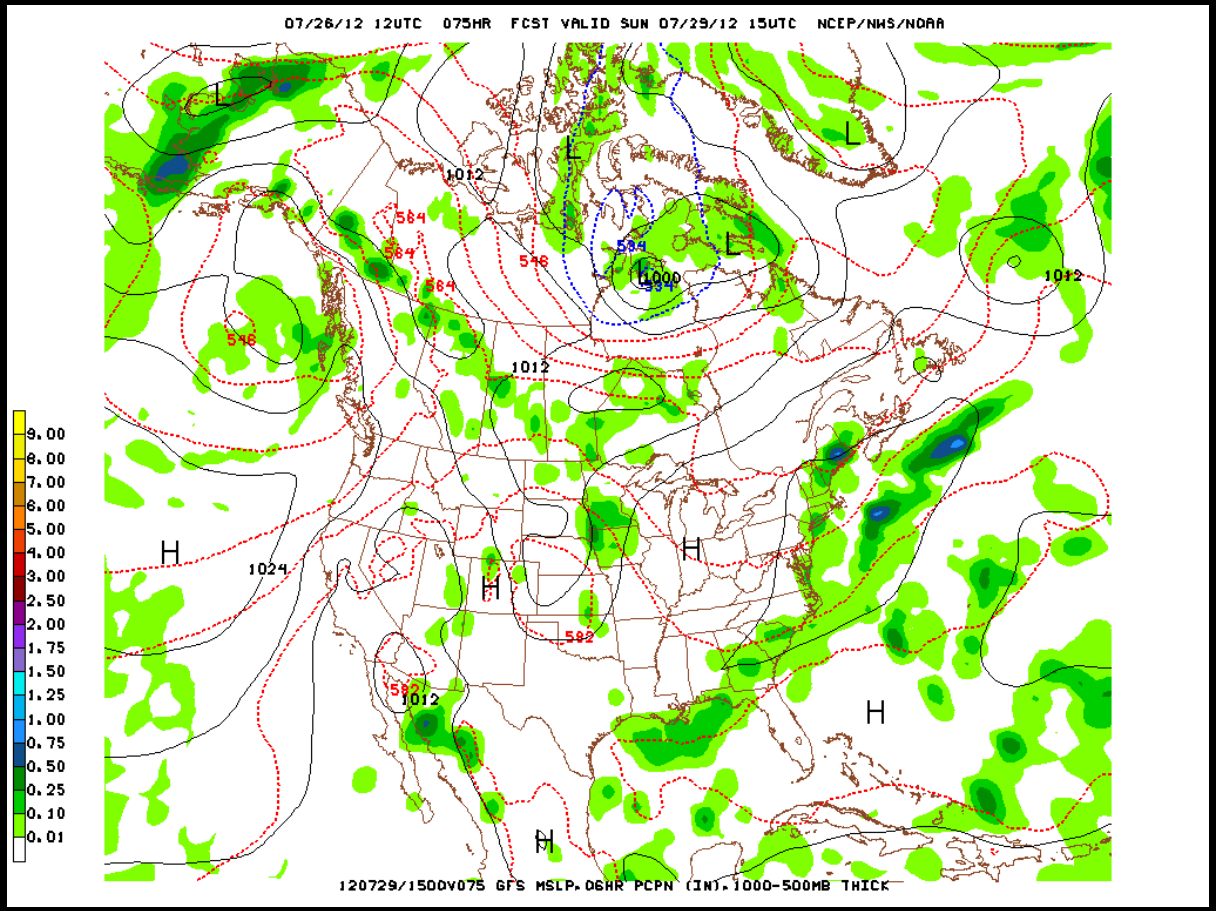
	Operations	Marketing & Midstream	Hedging
Function			
Forecast Horizon			
Value Per Year			

» Chesapeake Weather Services

- Weather consulting business for entities with weather risk outside of energy (agriculture, transportation/logistics, finance)

NCEP GFS Forecasts

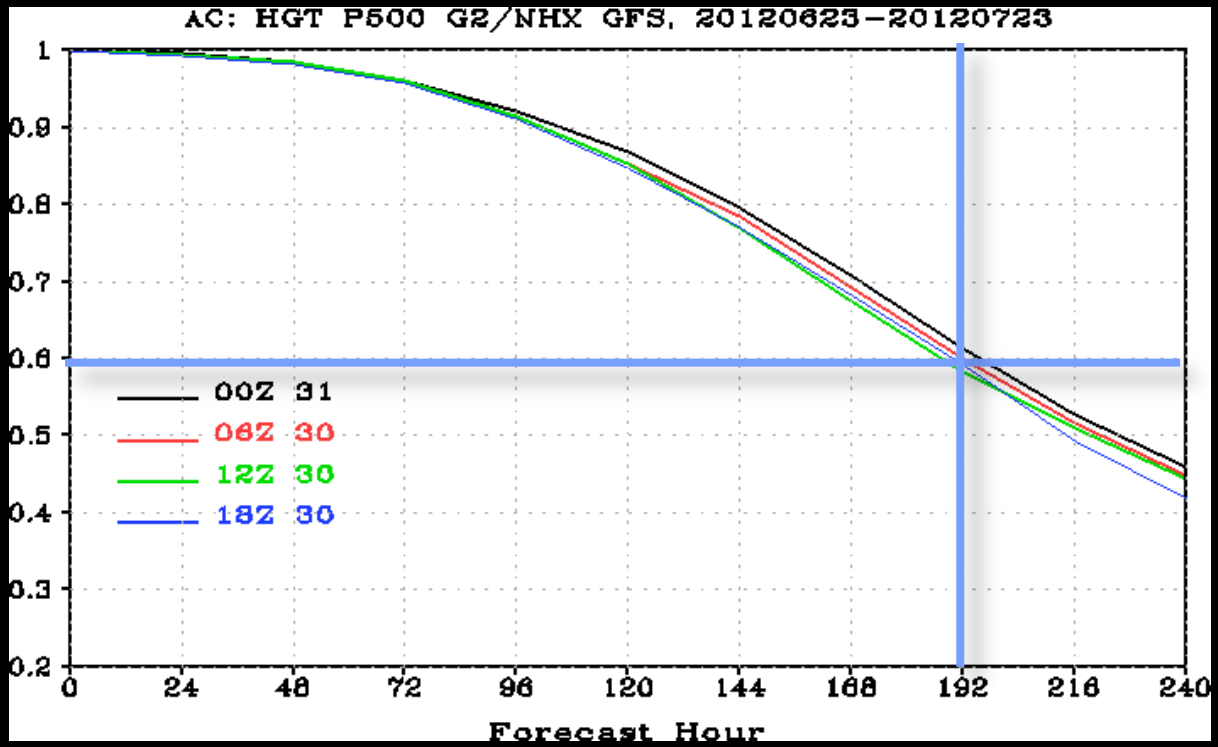
- 16-day forecasts
- Freely available to everyone
- Markets respond to these forecasts



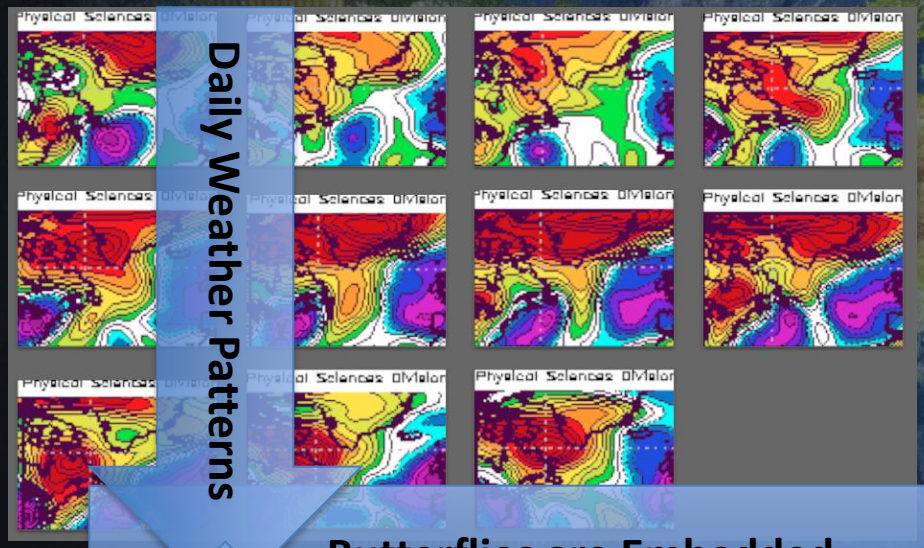
Limits of GFS Forecast Skill

- 0.6 is considered skillful
  - Only lasts for about 8 days
- Despite this limit, the market responds to longer range GFS forecasts
- Business opportunity:
  - Beat the GFS beyond 8 days

Anomaly Correlations for 500-hPa heights over the Northern Hemisphere

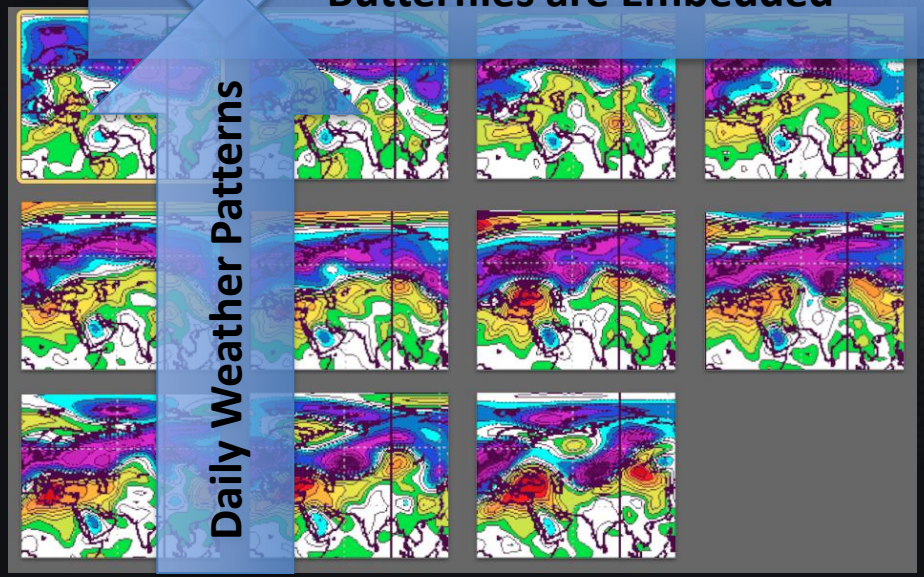


Analog Approach



Daily Weather Patterns

Butterflies are Embedded



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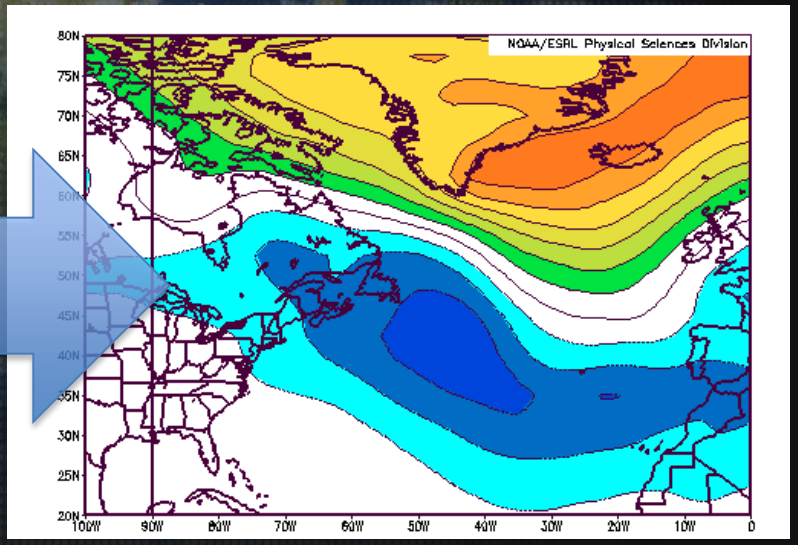
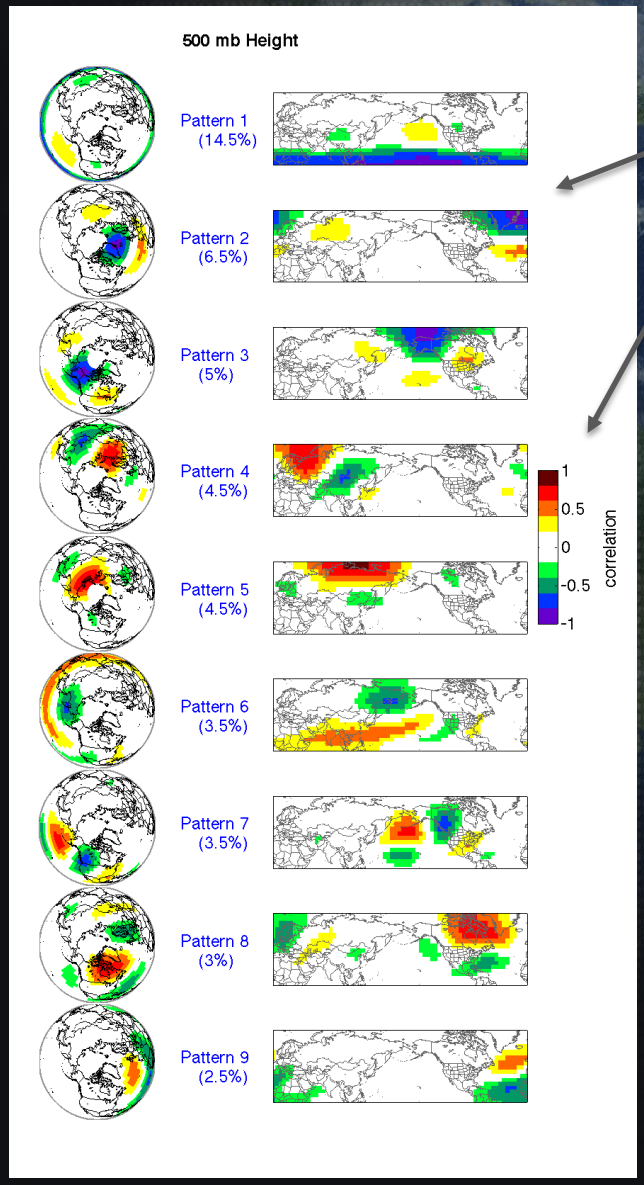


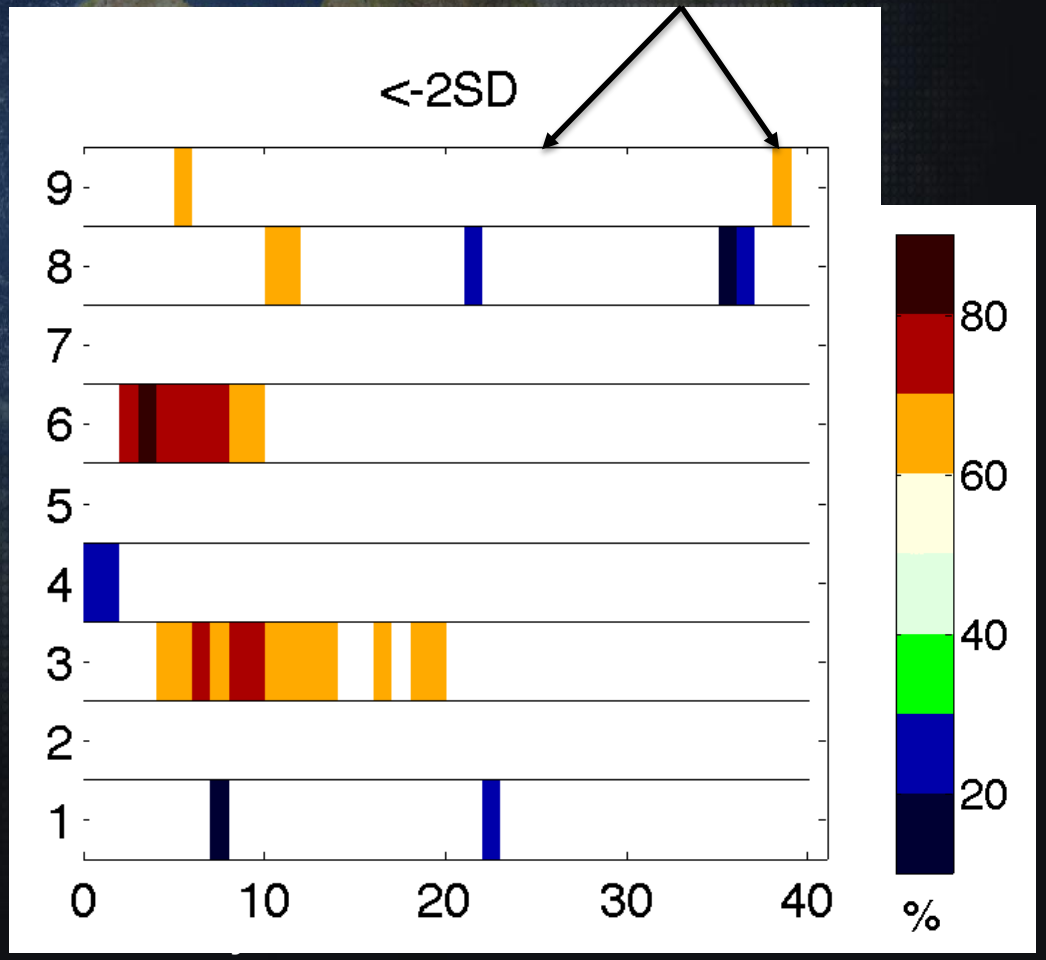
EarthRisk Technologies

Quantify and Catalog Extreme Weather

Jet Stream Patterns

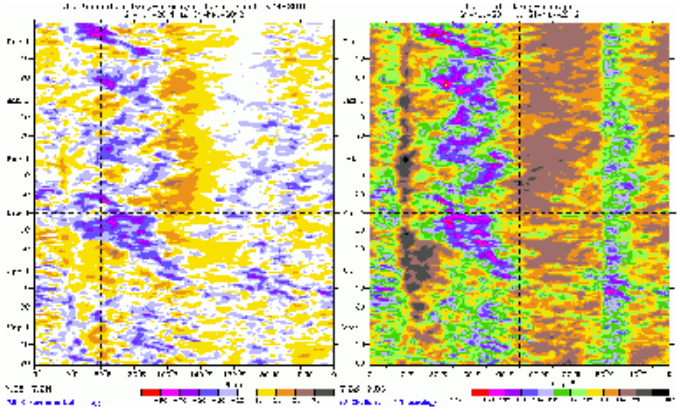


Cold Outbreak Incidence



Process Patent Pending – UC San Diego

Hovmoller Plots of Near Equatorial OLR/A



Time sections of daily mean outgoing long radiation anomalies (OLRA; left panel) and totals (OLR; right panel) for the most recent 6 months. The data is aerial averaged from 7.5S – 7.5N. OLR/A is used as a proxy for tropical rainfall, with the scale in units of W/m^2 at the bottom of the plots. Negative (positive) anomalies of OLR suggest enhanced (suppressed) rainfall relative to climatology. Additional online plots can be found at http://cawcr.gov.au/staff/mwheeler/maproom/index.htm

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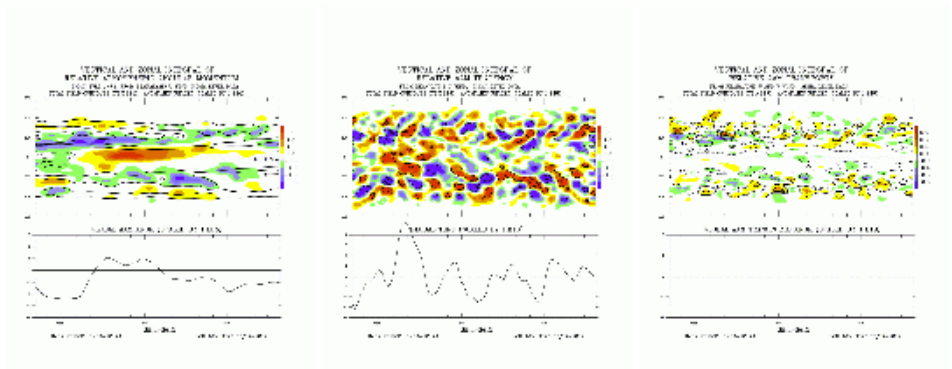
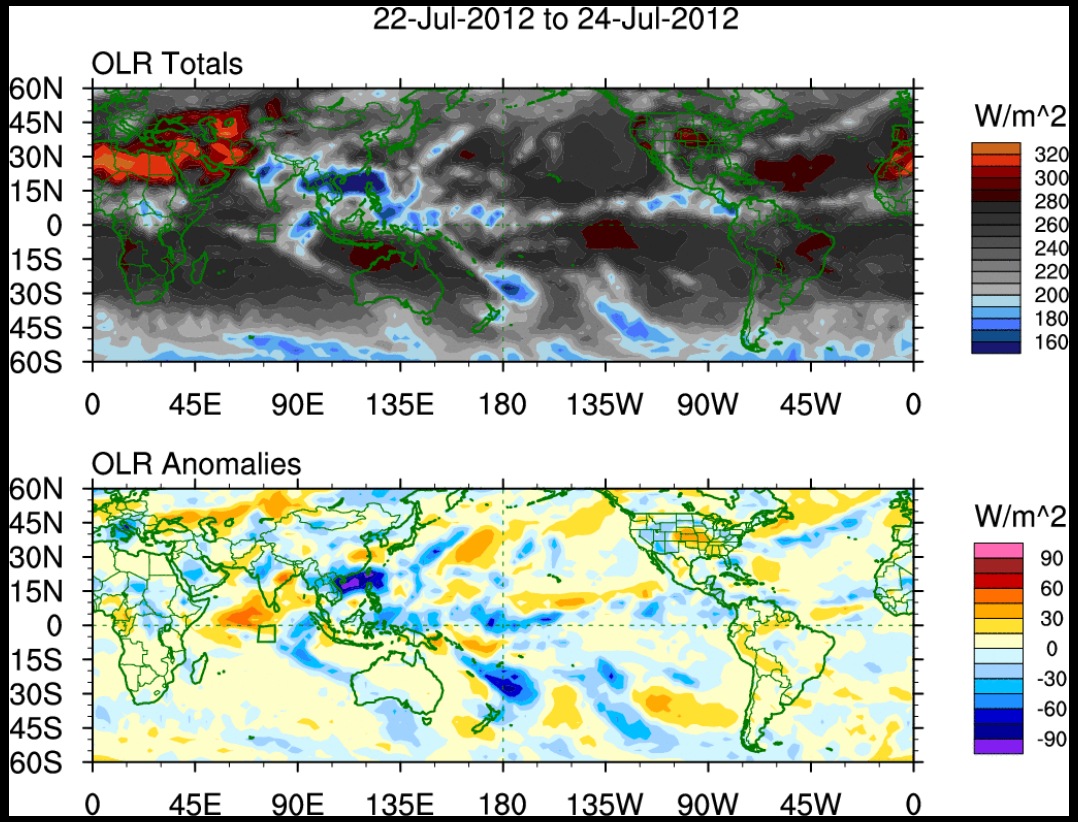
AAM Budget



Why include OLR?

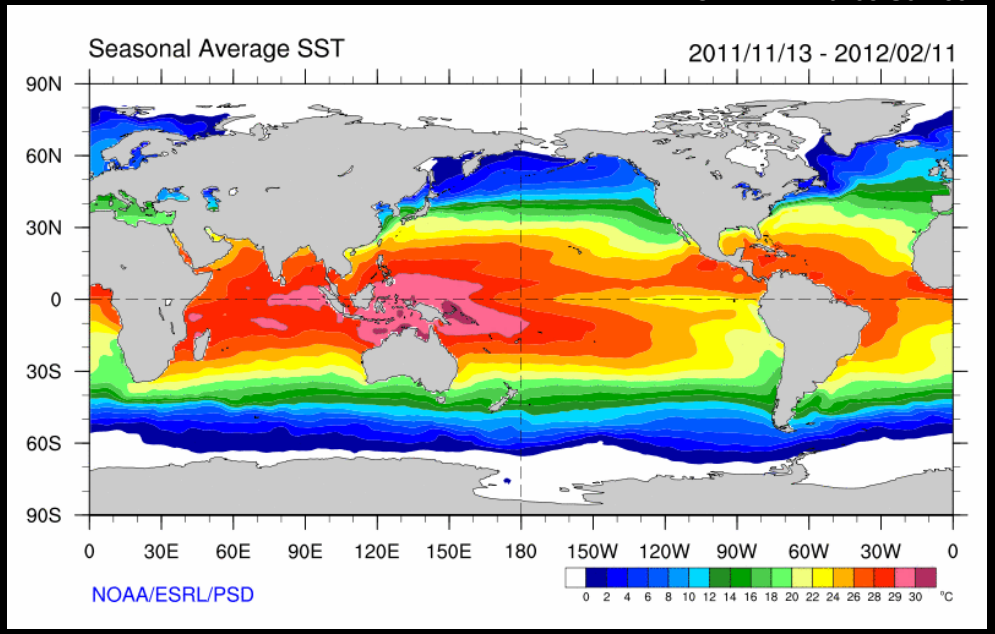
OLR is a proxy
for tropical convection

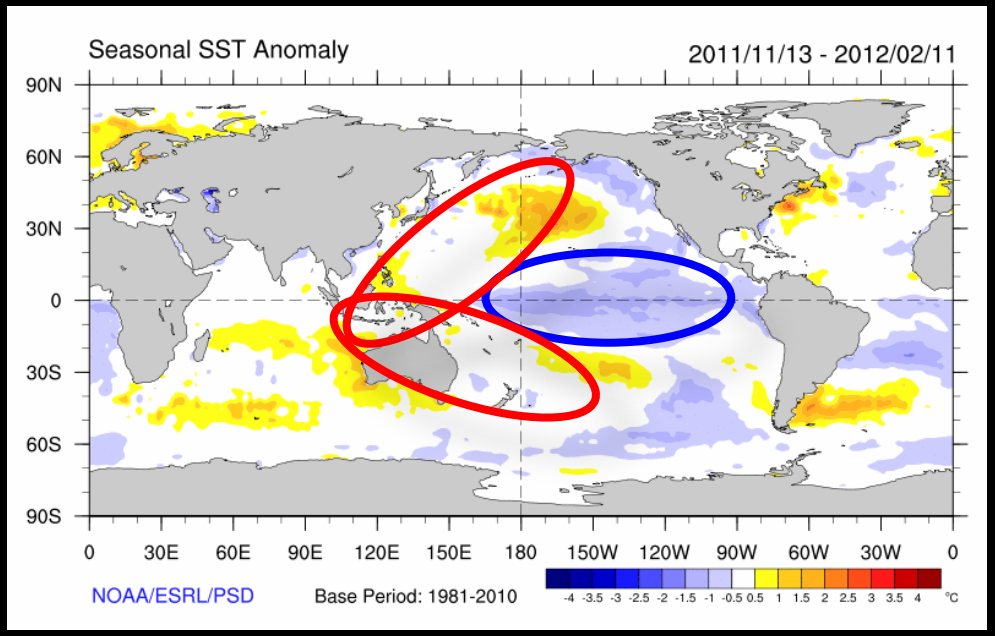
Taller clouds = Lower OLR



Consider ENSO…

- SST anomalies show that last winter was a La Niña
- How do SST anomalies in the Pacific affect our weather?





Convection connects us to the Tropical Oceans

SST Anomalies

↓

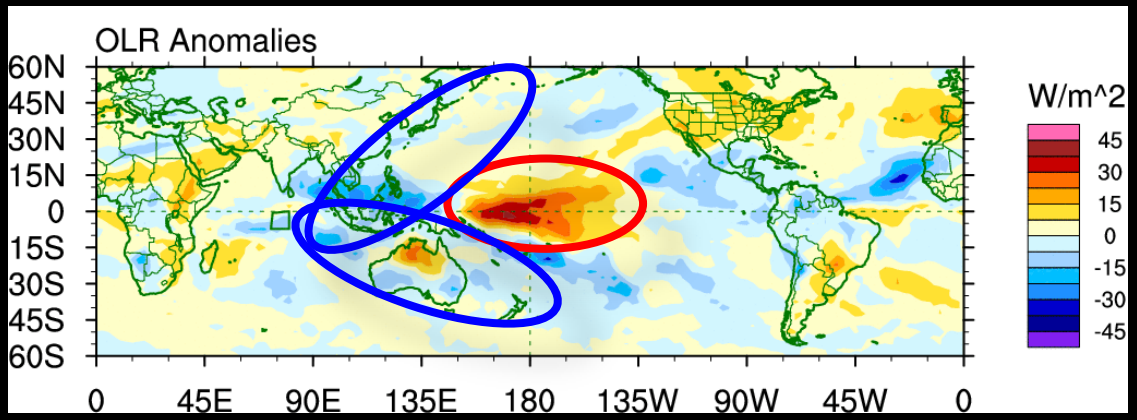
Convection

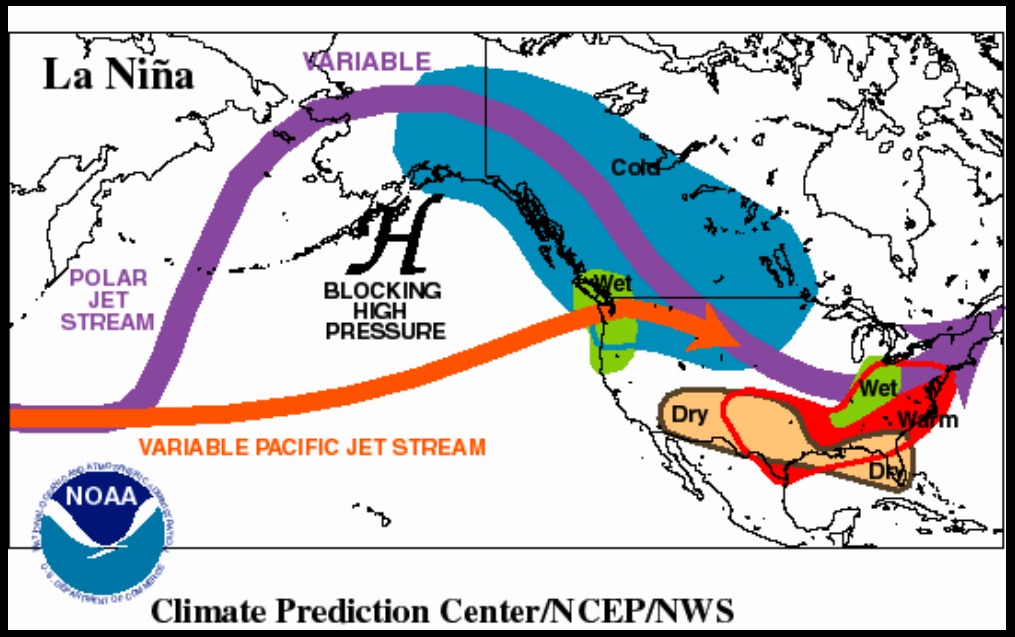
↓

Divergent Circulations

↓

Mid-latitude Weather Patterns

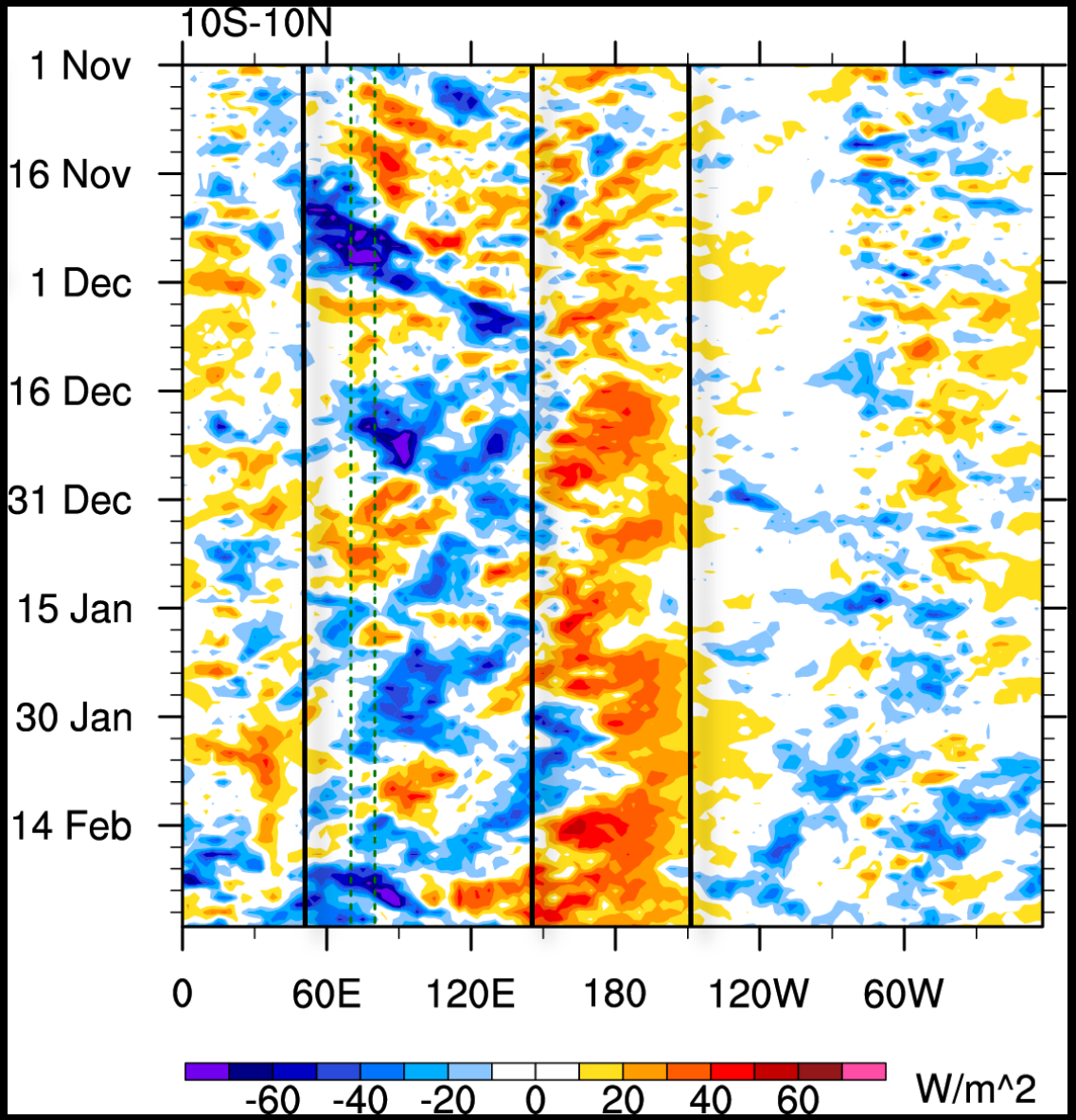




Tropical Variability

time

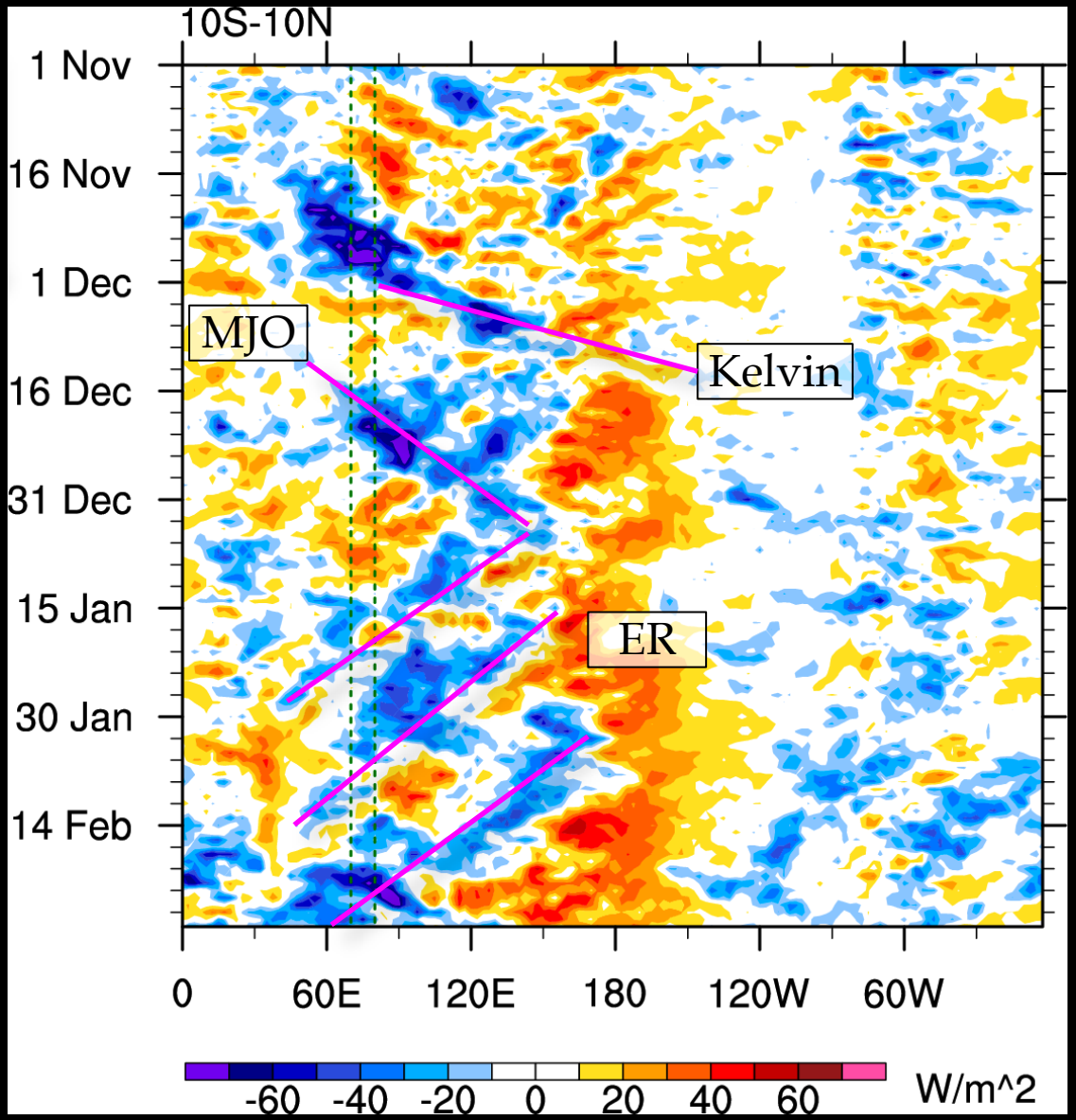
- ENSO creates longitudes of enhanced or suppressed convection
- But there's more to it!



Tropical Variability

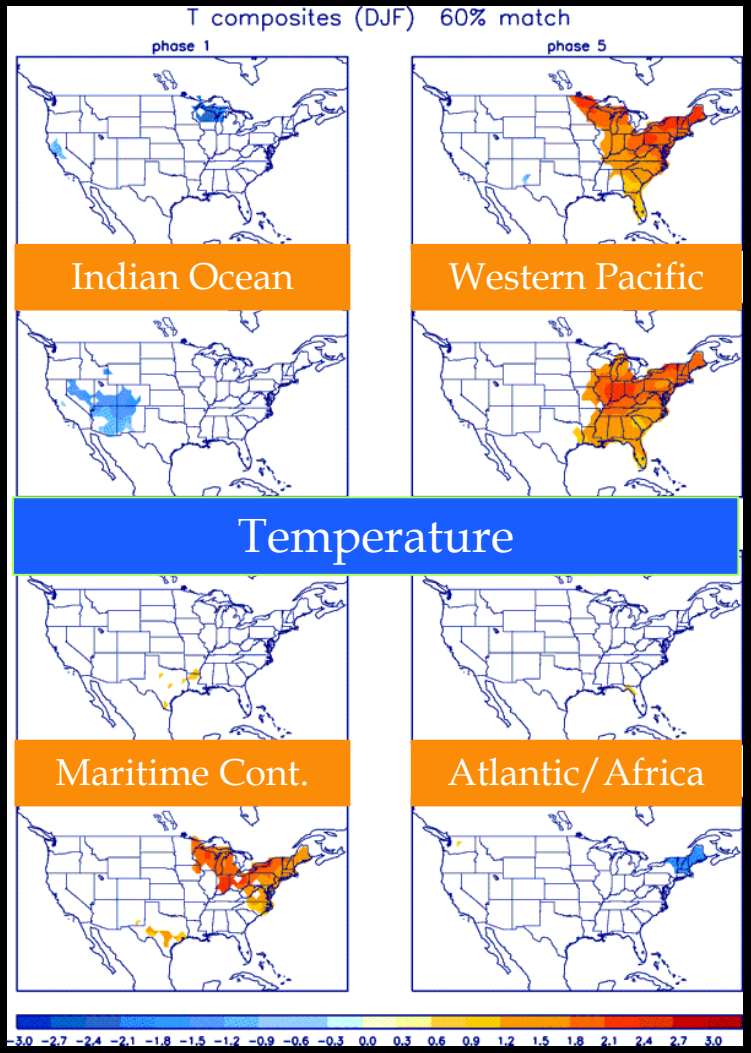
time

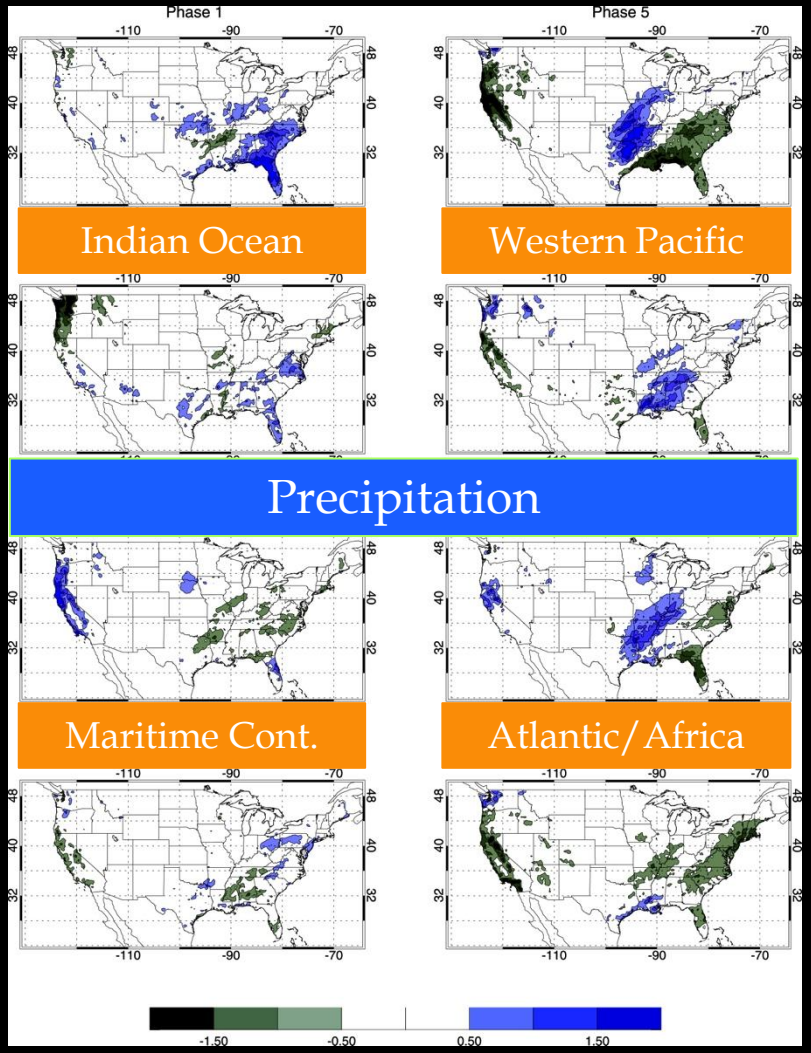
- Slow Eastward
  - The MJO
- Fast Eastward
  - Kelvin Waves
- Slow Westward
  - Equatorial Rossby (ER) Waves
- Fast Westward
  - Mixed Rossby–Gravity (MRG) Waves
  - Easterly Waves



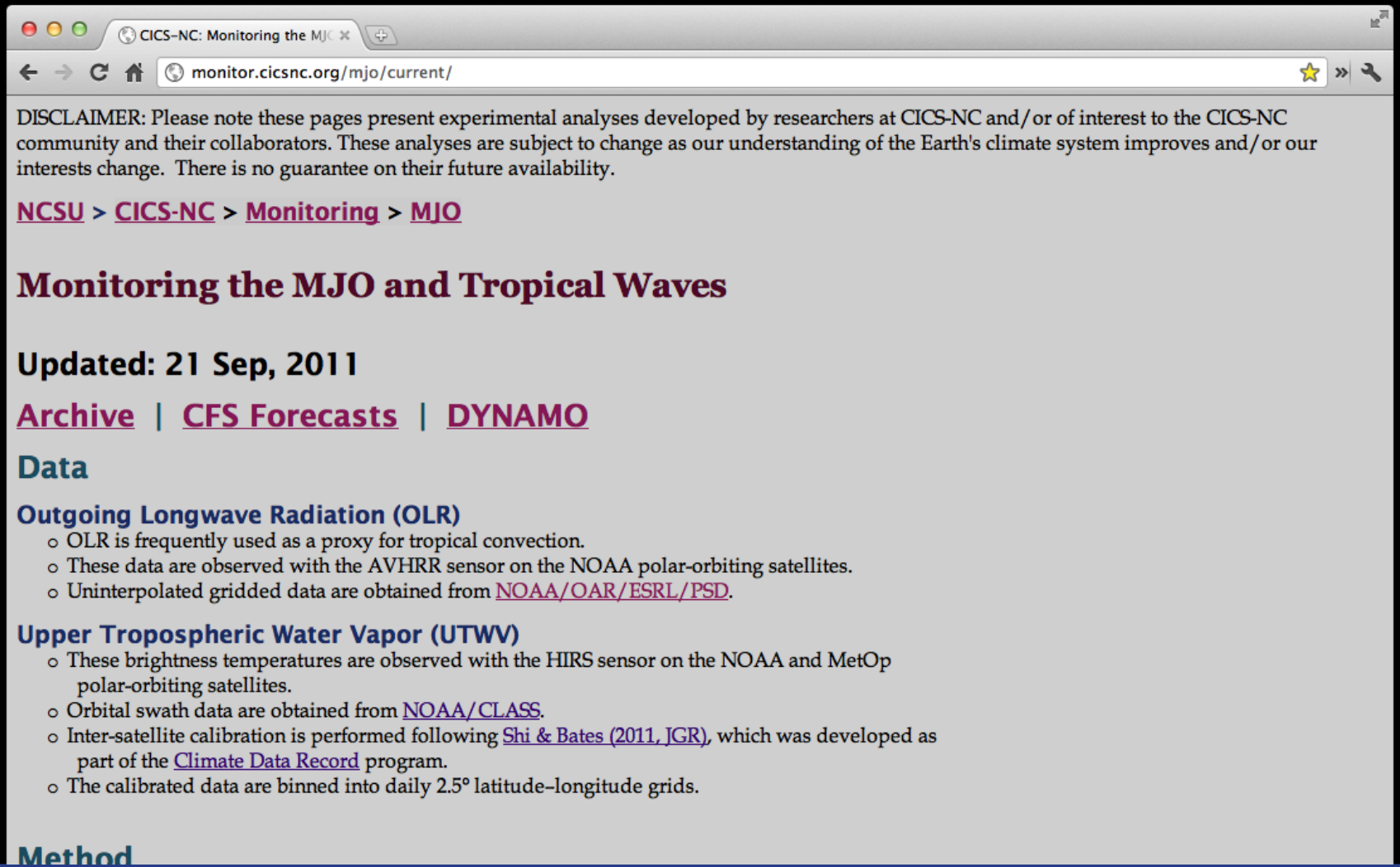
MJO Impacts in the United States

Zhou et al. (2011, Clim. Dyn.) and Becker et al. (2012, J. Climate)

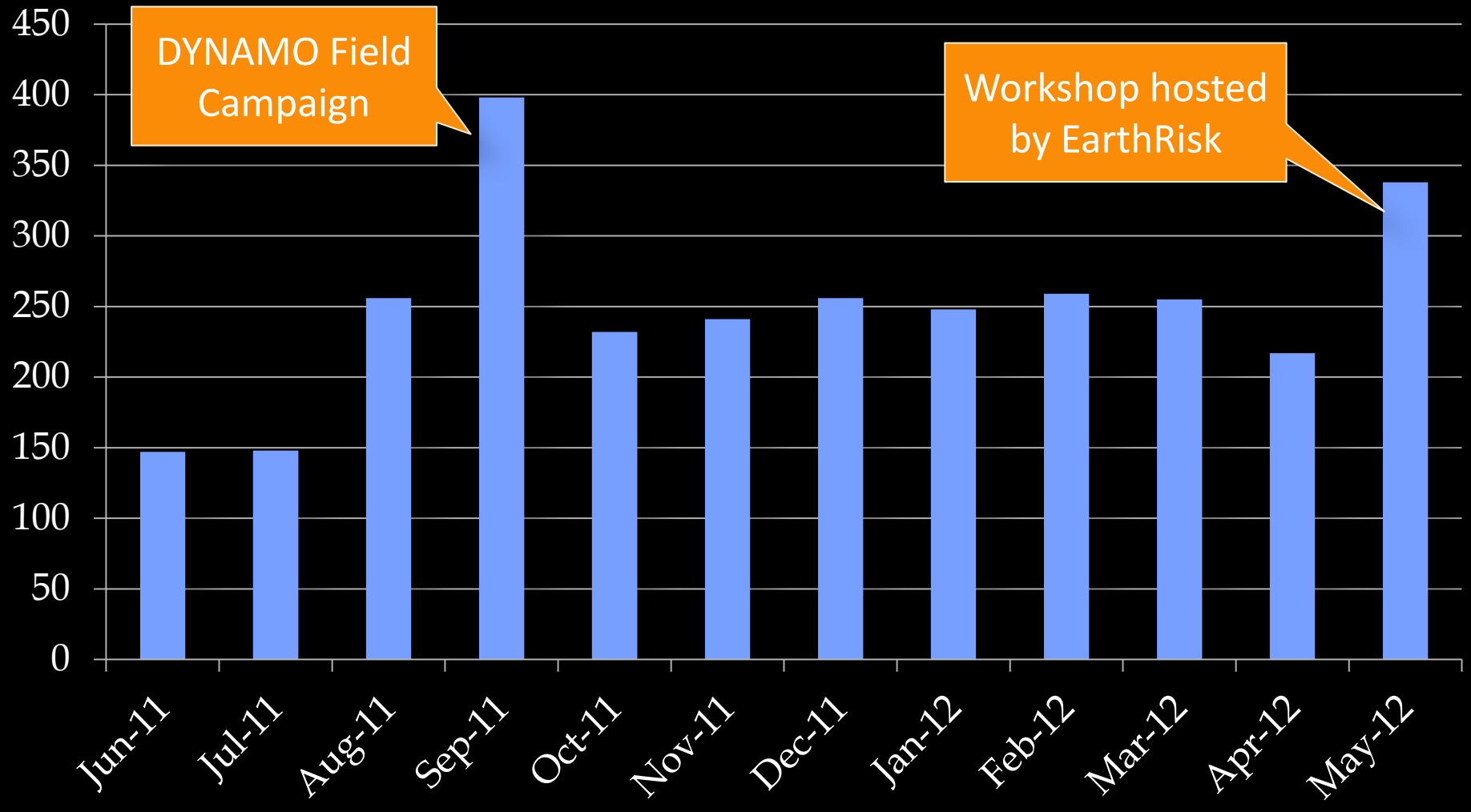




monitor.cicsnc.org/mjo/



Monthly Visitors to monitor.cicsnc.org/mjo/



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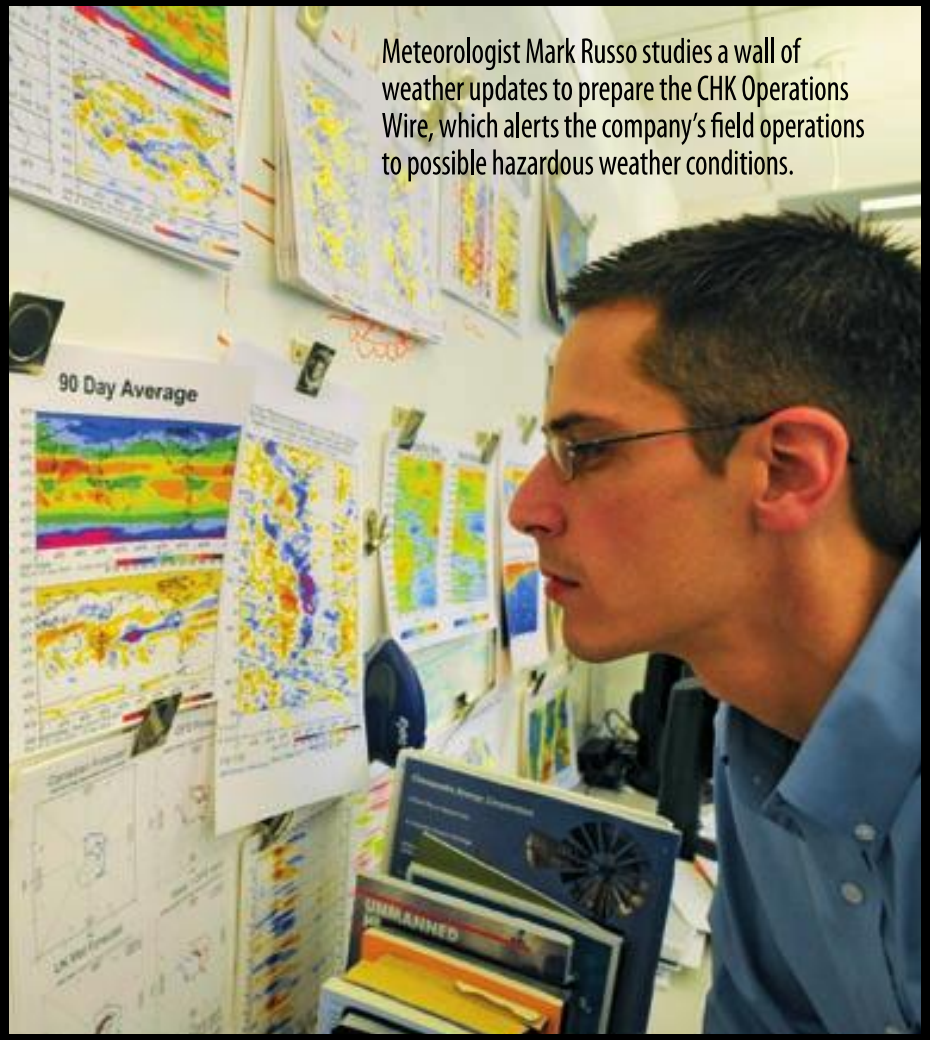

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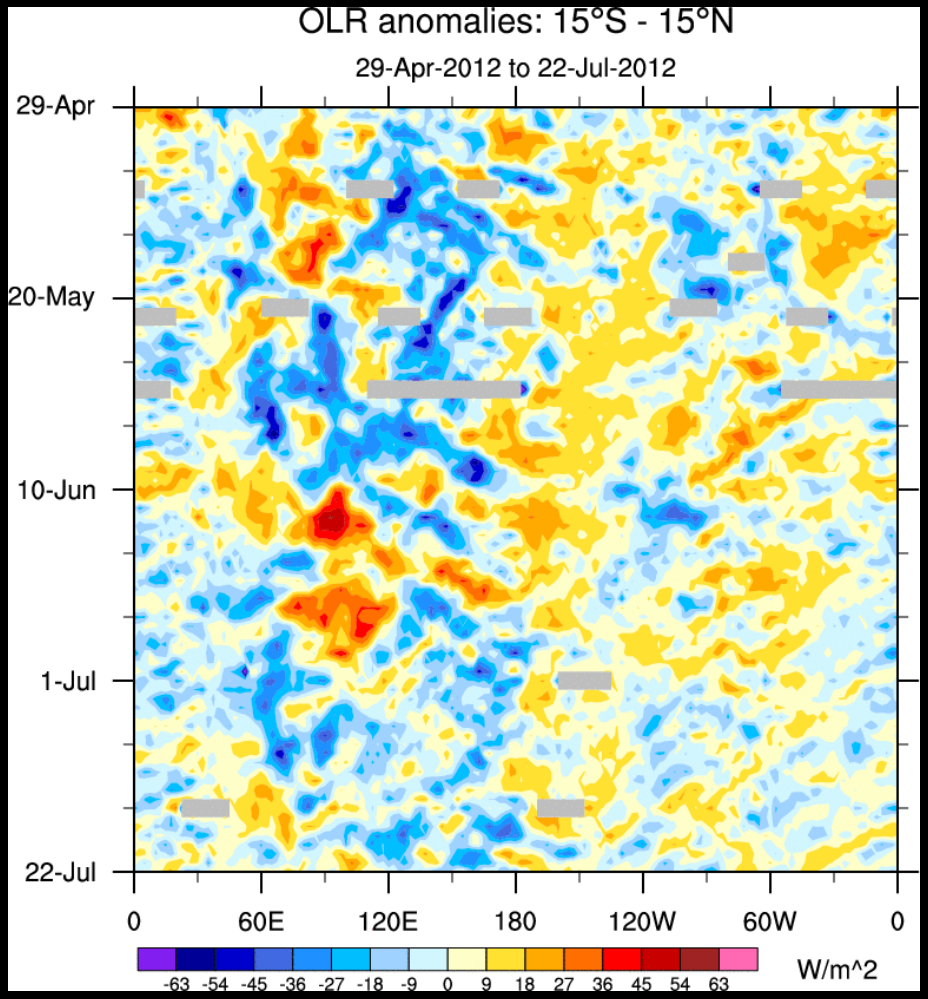
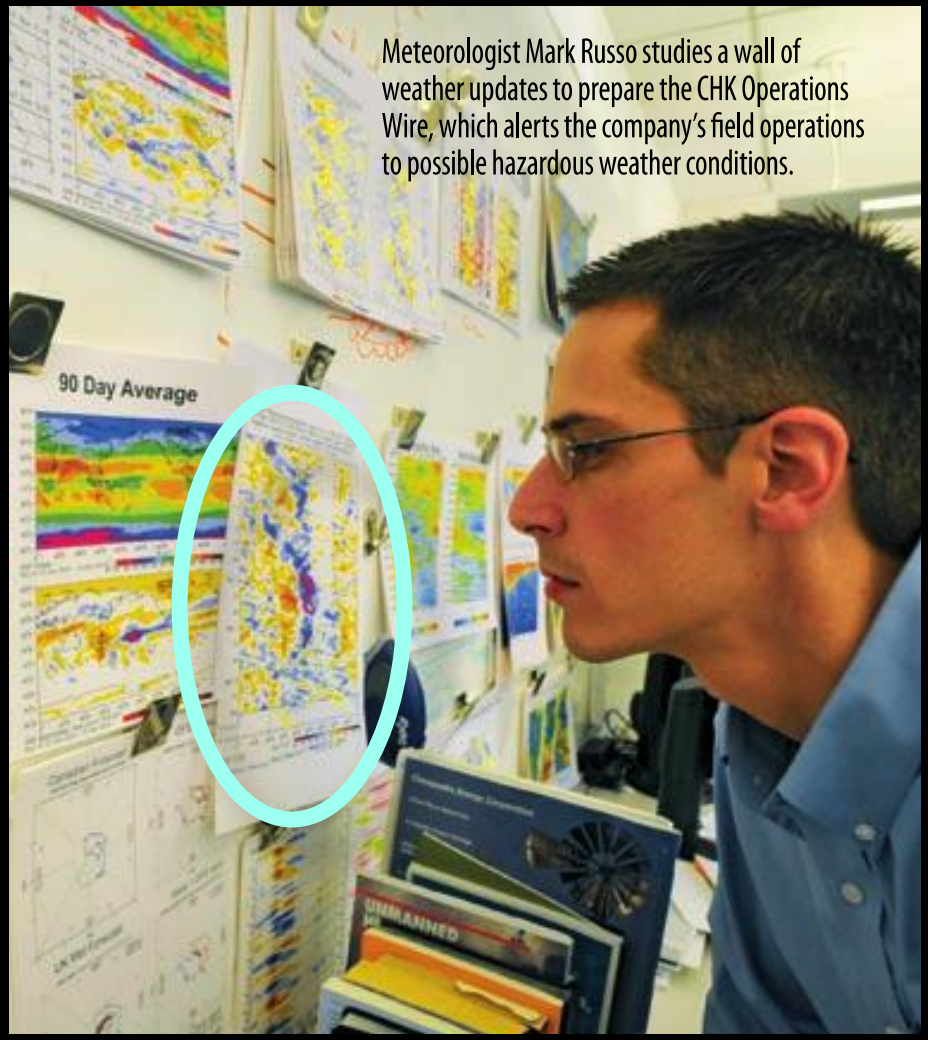

OLR anomalies: 15°S - 15°N
29-Apr-2012 to 22-Jul-2012
29-Apr
20-May
10-Jun
1-Jul
22-Jul
0
60E
120E
180
120W
60W
0
-63 -54 -45 -36 -27 -18 -9 0 9 18 27 36 45 54 63
W/m^2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90 Day Average

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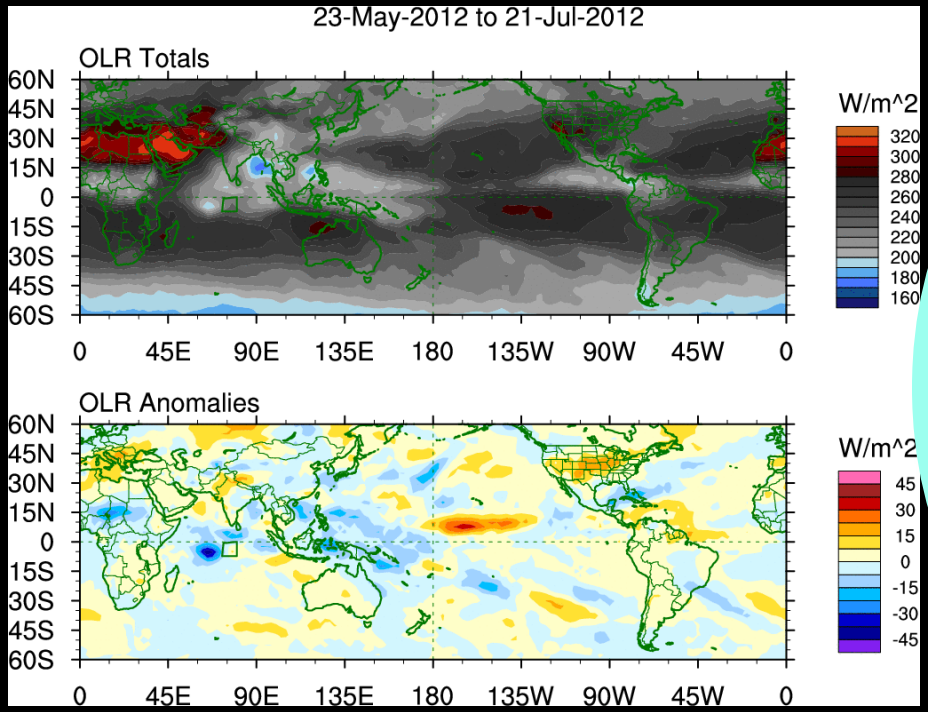

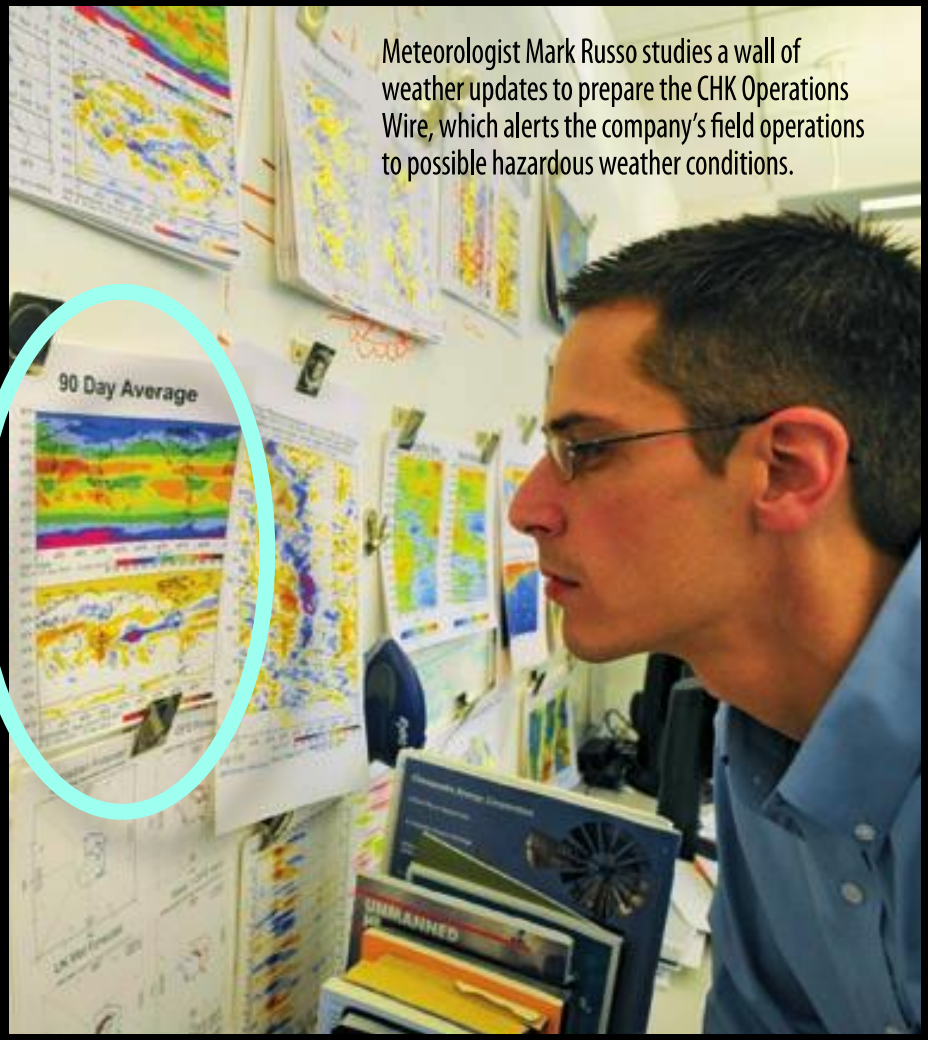

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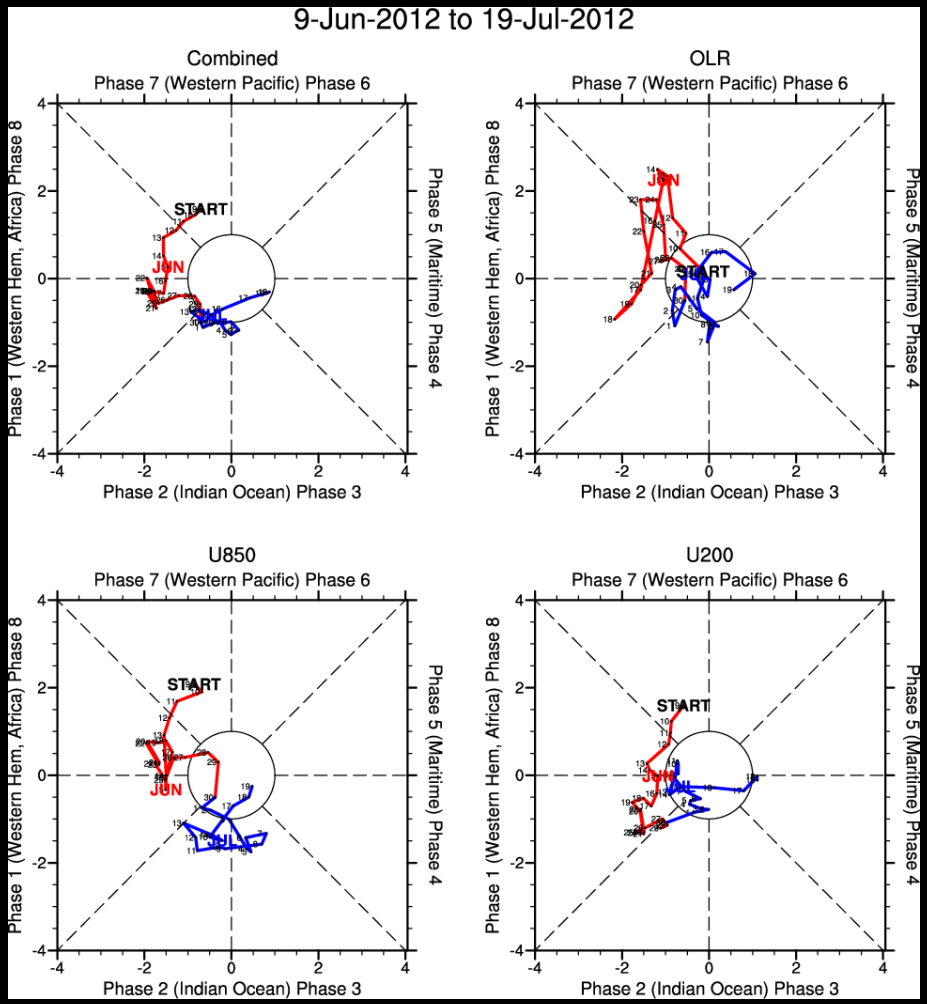
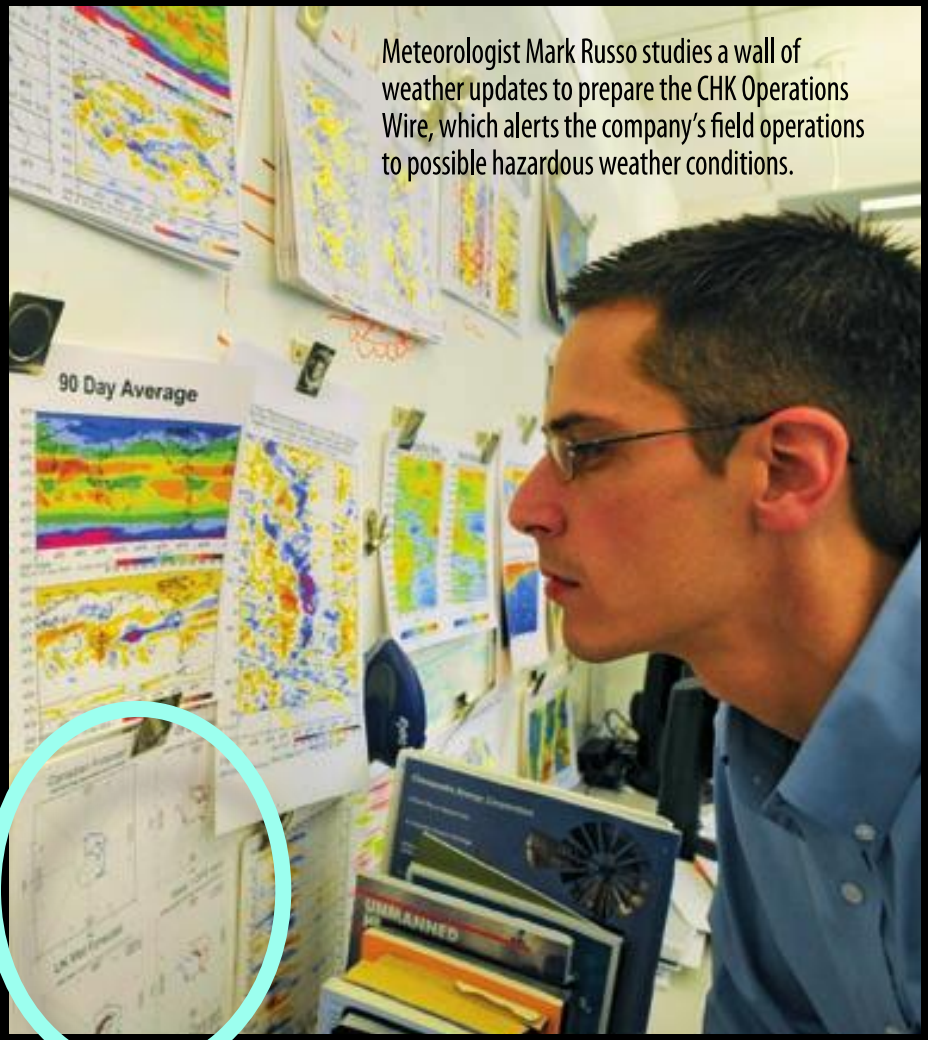

9-Jun-2012 to 19-Jul-2012
Combined
OLR
U850
U200
Phase 7 (Western Pacific) Phase 6
Phase 1 (Western Hem, Africa) Phase 8
Phase 5 (Maritime) Phase 4
Phase 2 (Indian Ocean) Phase 3
START
JUN
JUL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Going Forward

- Users need daily gridded data
- Convective proxies like OLR or rainfall would be esp. valuable
- UTWV shows promise, but users need to be educated about it
- Calibrating the data to the current satellite will make them easier to use operationally

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