

Impact of the MJO on the Forecast Skill of Week-2 Severe Weather over the United States

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NOAA's 46th Climate Diagnostics and Prediction Workshop
Virtual Workshop, 26–28 October 2021

Motivation

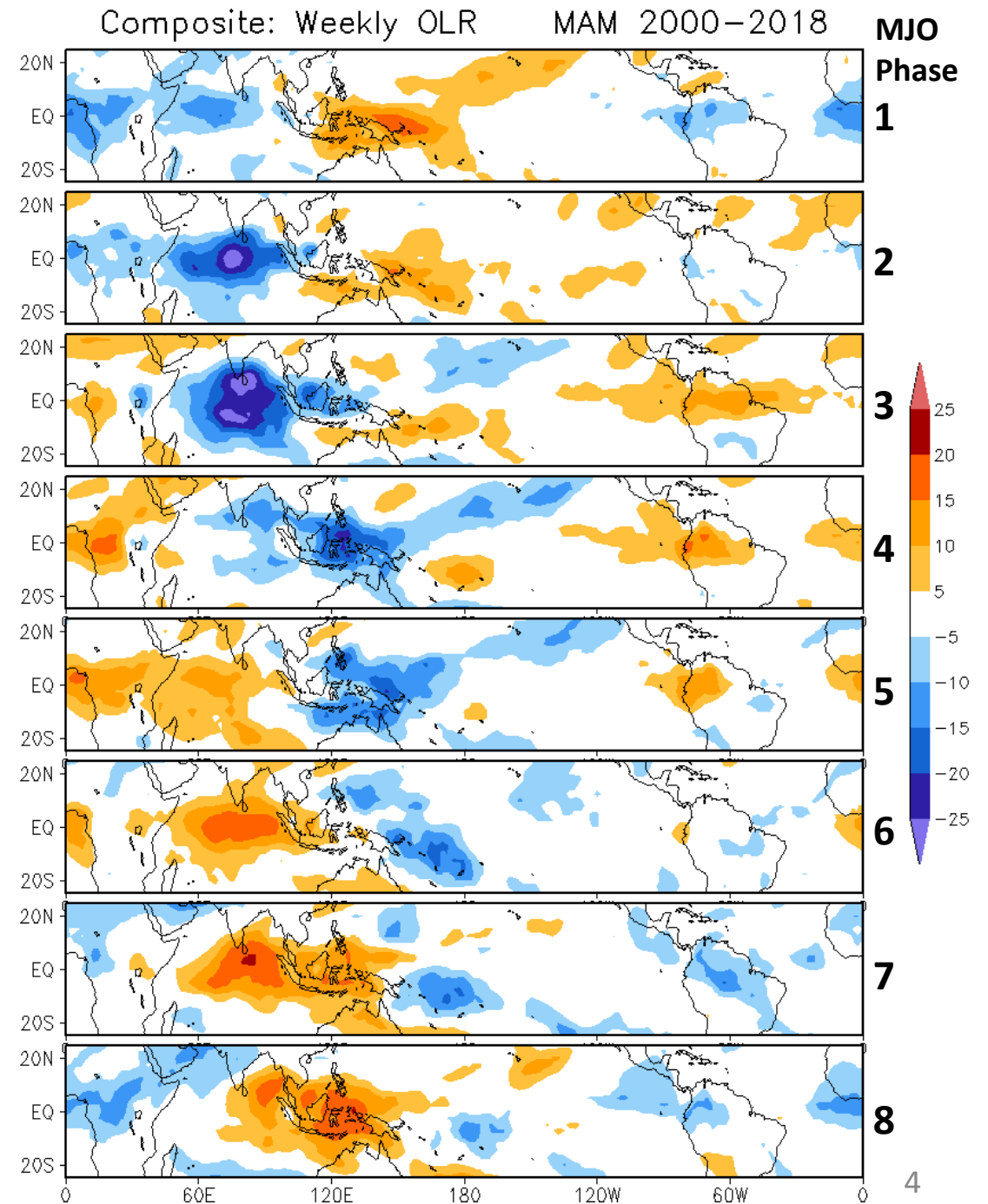
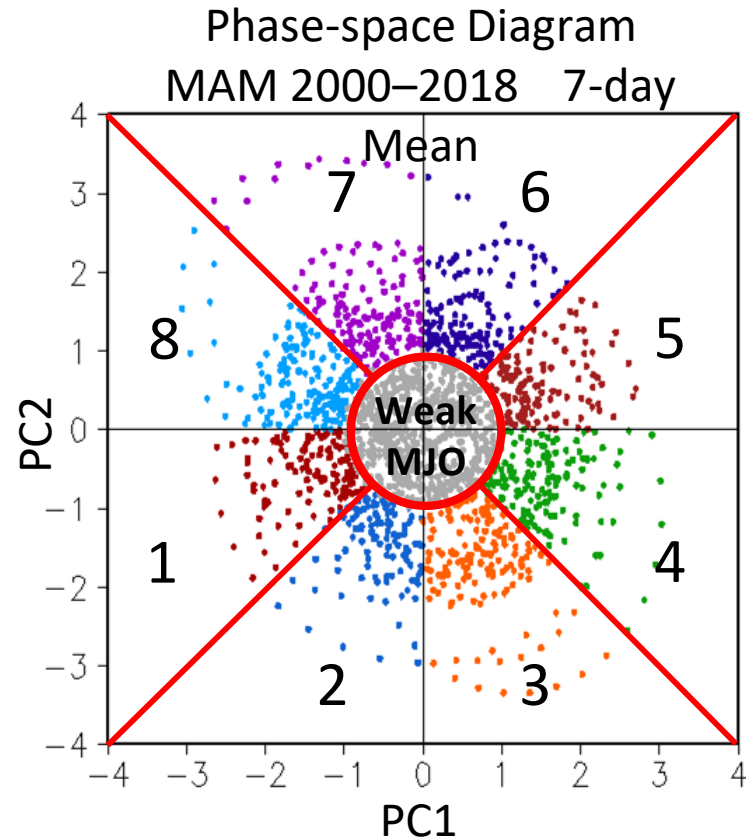
- The MJO is known to influence severe weather over the U.S.
- A dynamical-statistical model is developed at the CPC for forecasting week-2 severe weather, based on the GEFS 16-day forecasts.
- How does the MJO impact both weekly severe weather activity and week-2 forecast skill?

Goals

- To document weekly severe weather activity conditional to the phase of the MJO,
- To examine the forecast skill for week-2 severe weather during different phases of the MJO, and
- To identify the regions where tropical heating associated with the MJO may favor severe weather over the U.S.

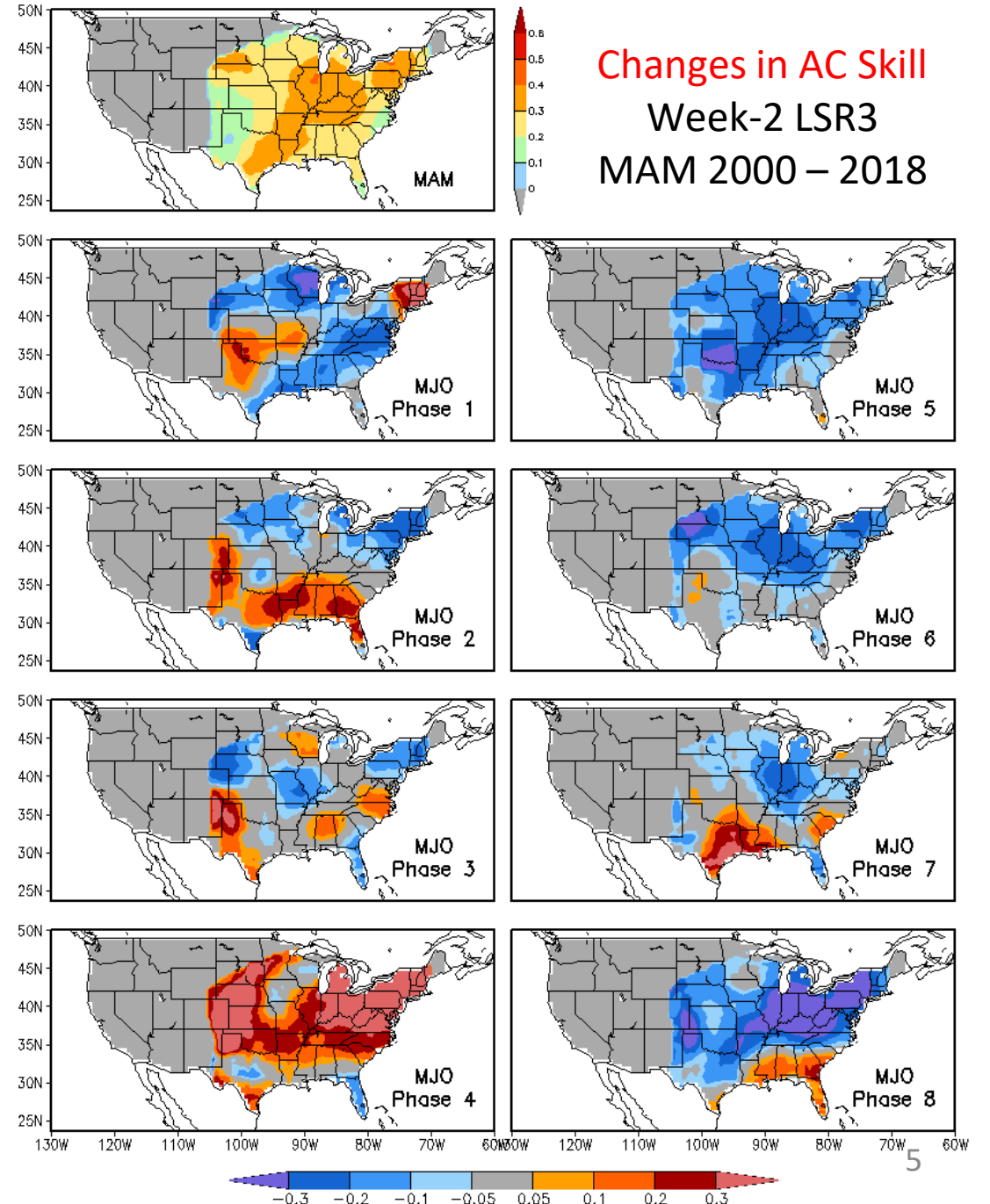
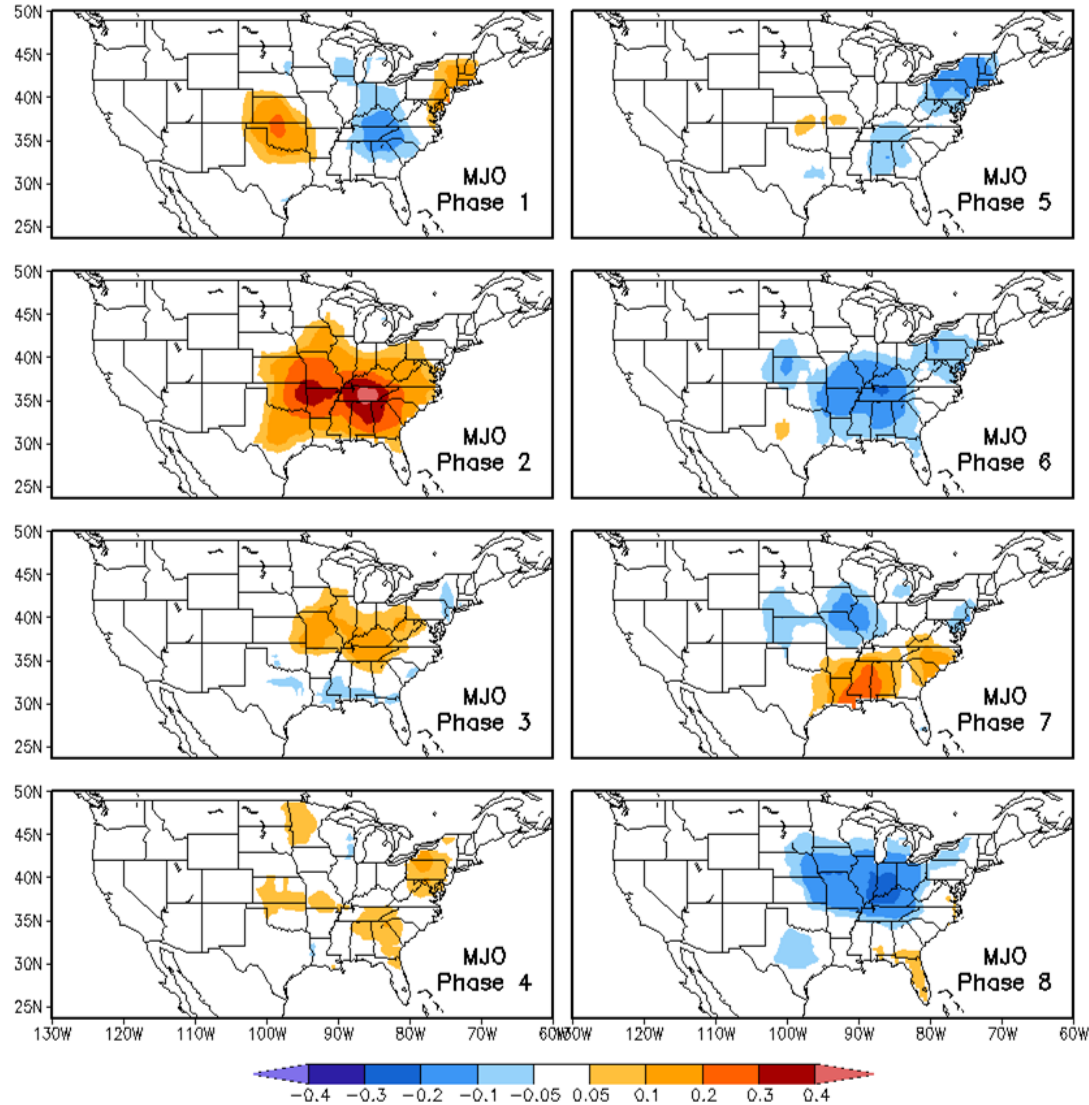
MJO

- 7-day mean OLR, U200, U850
- 20–100 day band-pass filter
- 15°S – 15°N average
- MJO: 2 leading EOFs

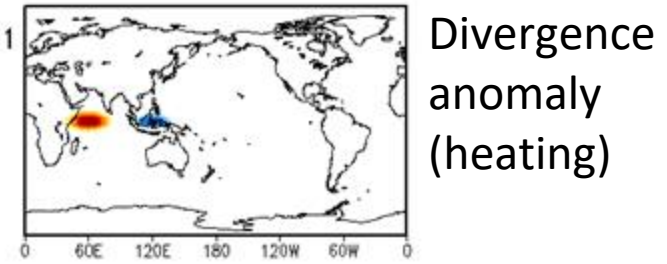
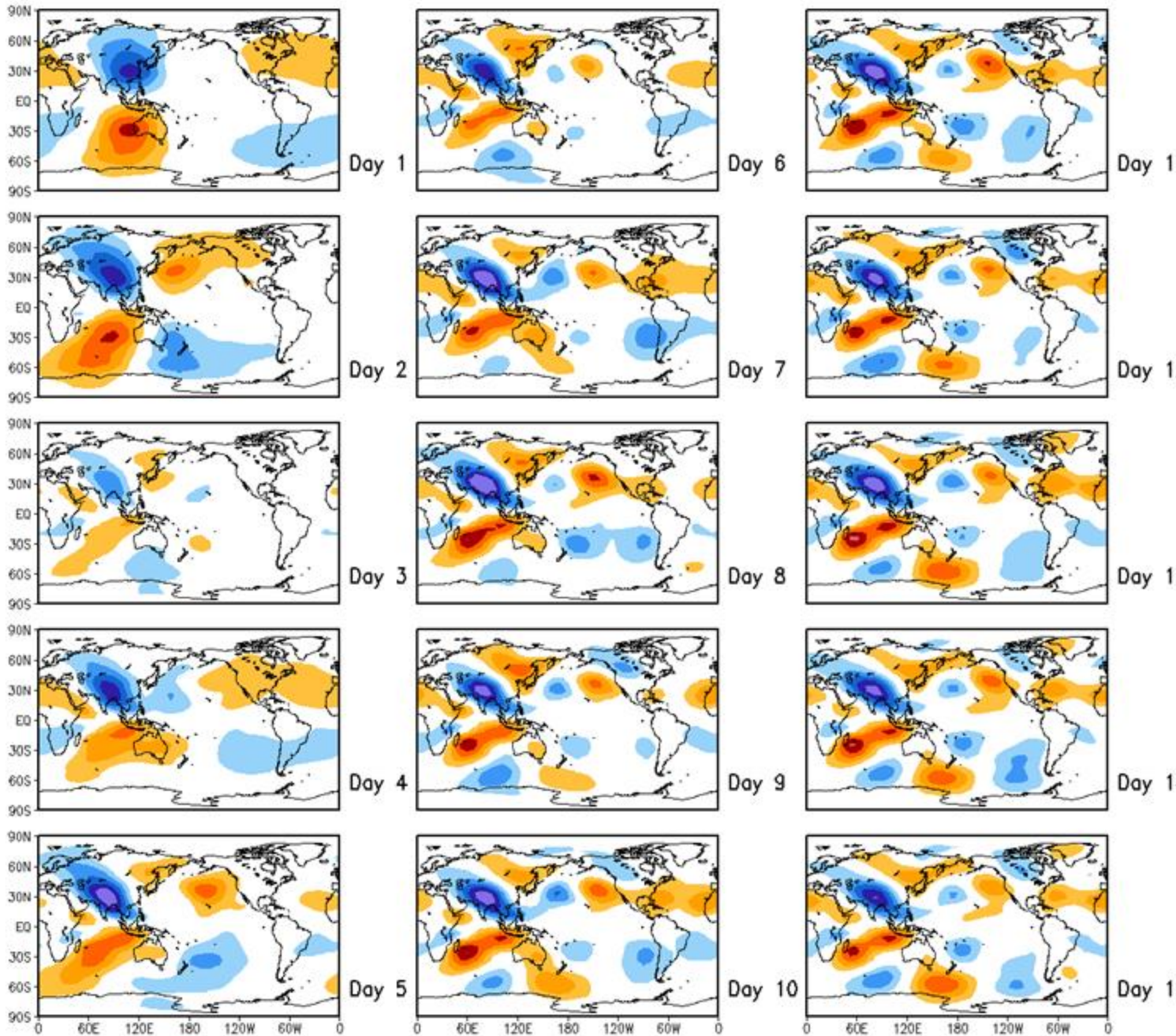


Impact of the MJO on Weekly Severe Weather

Composite: Weekly LSR3 Anomaly
MAM 2000–2018



Linear Barotropic Model



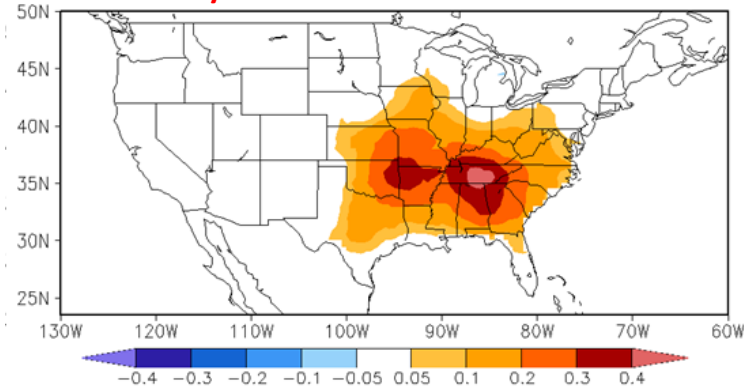
$$\left(\frac{\partial}{\partial t} + u \frac{\partial}{\partial x} + v \frac{\partial}{\partial y} \right) \zeta + \beta v = -(\zeta + f) \left(\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y} \right)$$

- Linearized about a mean state
- Tropical heating
- Divergence anomaly

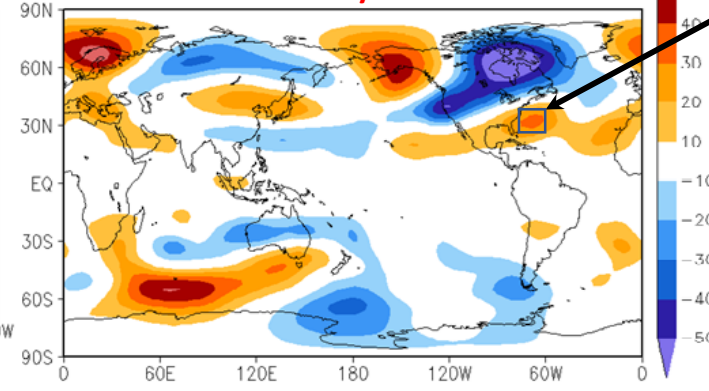
Steady response over North America after 10 days

MJO Phase 2 Composite MAM 2000–2018

Weekly LSR3



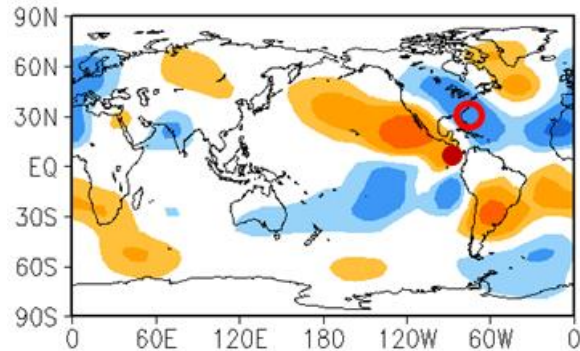
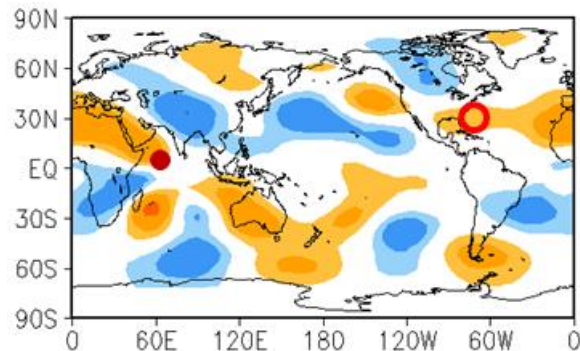
Weekly H200



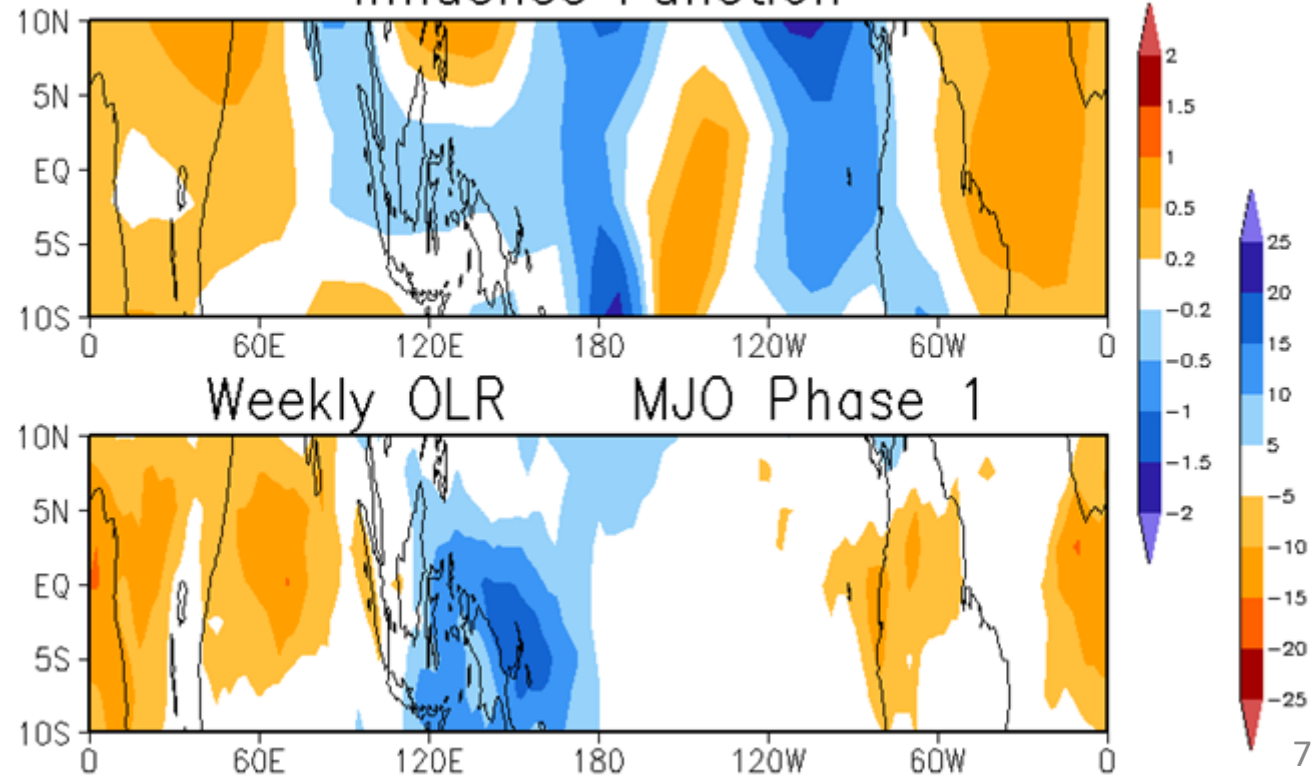
Anomalous ridge

- Enhanced LLJ
- Moisture flux

Response to Point



Influence Function



Conclusions

- Weekly severe weather over the eastern and central U.S. is enhanced (suppressed) during MJO phases 1–4 (5–8). The week-2 forecast skill can be increased in the areas of enhanced severe weather by the MJO.
- A linear barotropic model demonstrated that it takes about 10 days for extratropical circulation to get a steady response to tropical heating associated with the MJO.
- The influence function suggests specific regions where tropical heating can force the extratropical circulation that is favorable for severe weather over the US.