Main Results:
• Warm signal in Phase 5 only occurs for Negative MVP
• Cold signal in Phase 8 only occurs with Positive MVP
• These results cannot be replicated with the conventional PNA

Summary:
The Multi-Variate PNA (MVP) index:
• Combined EOF of 20–100 days OLR and streamfunction at 850 hPa and 200 hPa over the North Pacific and North America
• Distinguishes MJO events that affect North American temperatures from those that do not

Key Differences from the conventional PNA:
• Southward shift in the wave guide
• Direct link with tropical convection
• Better distribution of values in all MJO phases

So what matters most?
• Convection in the Eastern Hemisphere?
• Convection in the Western Hemisphere?
• Pre-existing extratropical wave state?

Method:
• Pre-filter data for 20–100 days to focus on the MJO
• Calculate the combined EOF of 200-hPa streamfunction, 850-hPa streamfunction, and outgoing longwave radiation (OLR)
• Focus on the North Pacific and North America
• Project the EOF onto unfiltered data for real-time monitoring

Description:
• 200-hPa wave train resembles the conventional Pacific North American (PNA) pattern, but shifted 5°–10° southward
• 850-hPa streamfunction identifies anomalous zonal winds near Hawaii
• OLR shows a tripole with a convective anomaly near Hawaii and opposite signs to the east and west

Problem:
• The MJO affects weather over the United States
• Can we identify which events produce a response and which do not?