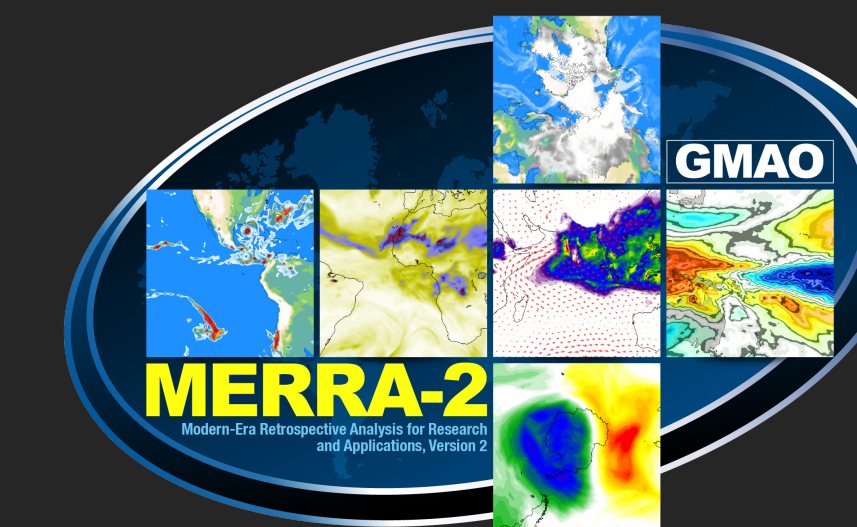




Events along the Coast of Washington State

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Global Modeling & Assimilation Office

Background

- Atmospheric rivers (ARs) are responsible for extreme precipitation events along the west coast of the U.S. that result in flooding, mudslides, and other societal impacts
- Precipitation Observations: CPC Unified Gauge-Based Analysis of Daily Precipitation; Meteorological Fields: MERRA-2
- ARs detected with tempestExtremes, as in Shields et al., 2018 (<https://doi.org/10.5194/gmd-11-2455-2018>)
- Study Period: November, December, and January 1980 - 2019

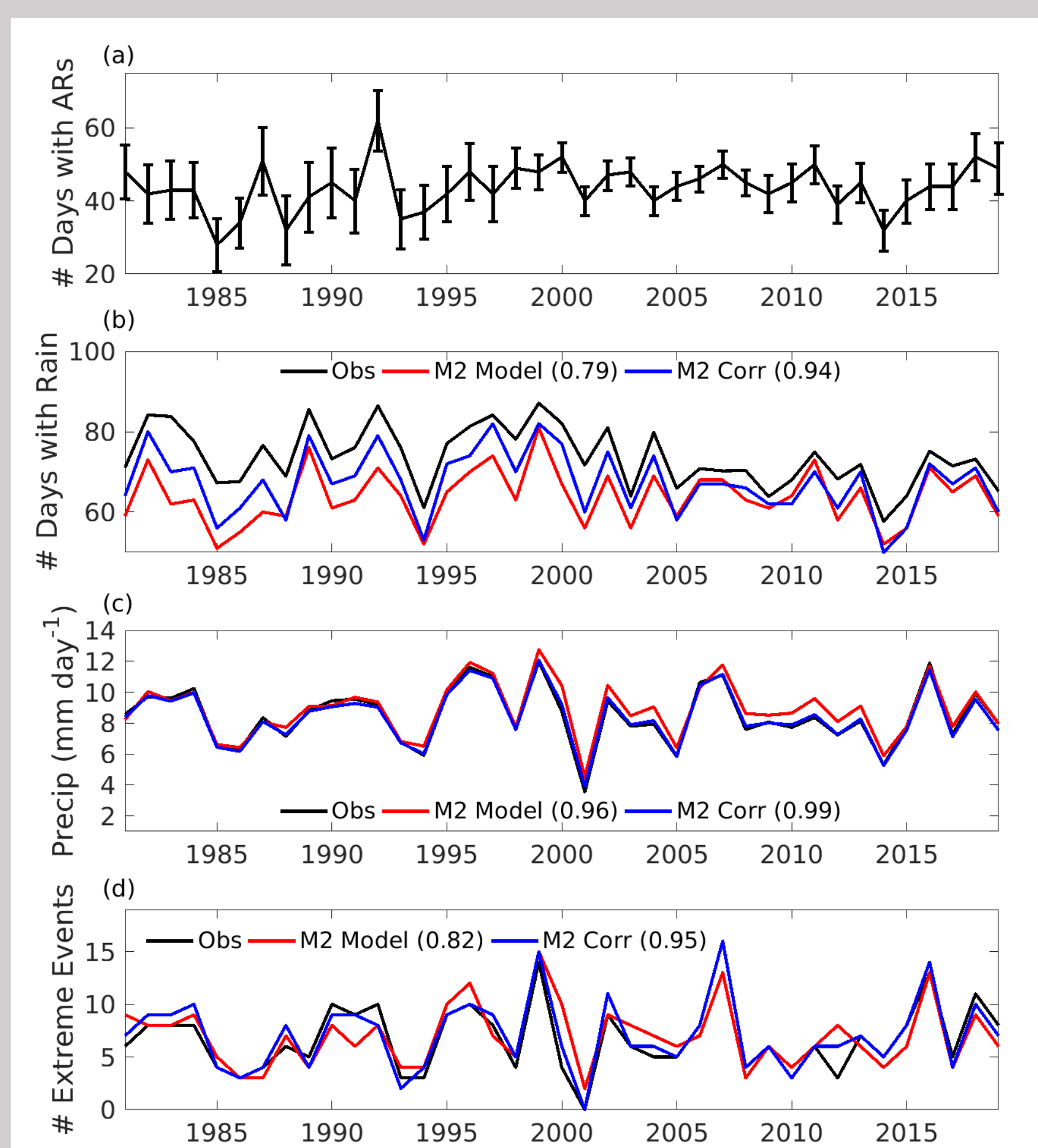
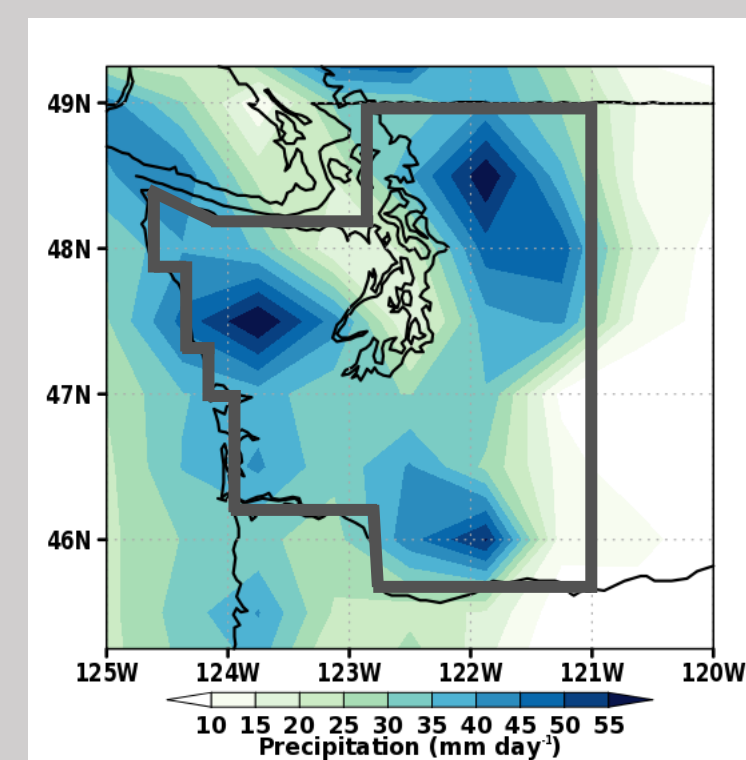


Figure 1: (a) Count of days with an AR, (b) count of days with 1 mm of precipitation, (c) mean precipitation, and (d) count of AR induced extreme precipitation events exceeding the 95th percentile of precipitation

Figure 2 (below): Precipitation during extreme events.

Gray outline = region of focus



Key Findings

- There is some influence of data assimilation on the frequency of ARs and their associated precipitation in MERRA-2
- A negatively tilted low pressure system in the Gulf of Alaska, Rossby wave breaking aloft, and enhanced vapor transport are present during extreme precipitation events associated with an AR
- There is little influence of the MJO on typical ARs, but phases 1, 5, and 8 are preferred during extreme precipitation events
- ENSO interacts with the MJO and determines when individual phases of the MJO are more likely to contribute toward AR induced extreme precipitation events
- Phase 1 of the MJO is more likely to be associated with El Niño during extreme events, but Phase 8 of the MJO is more likely during neutral ENSO conditions



MORE INFO

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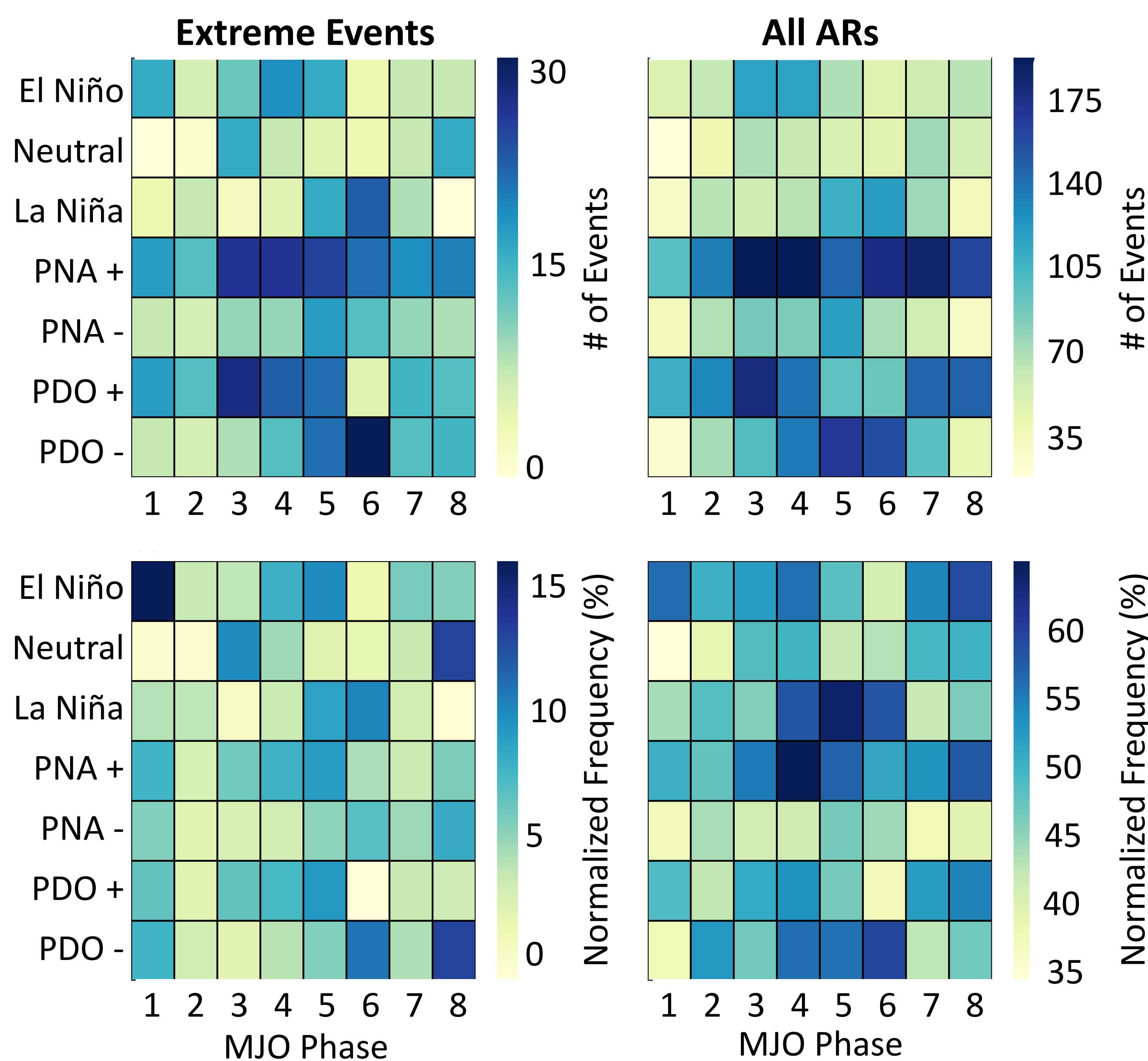
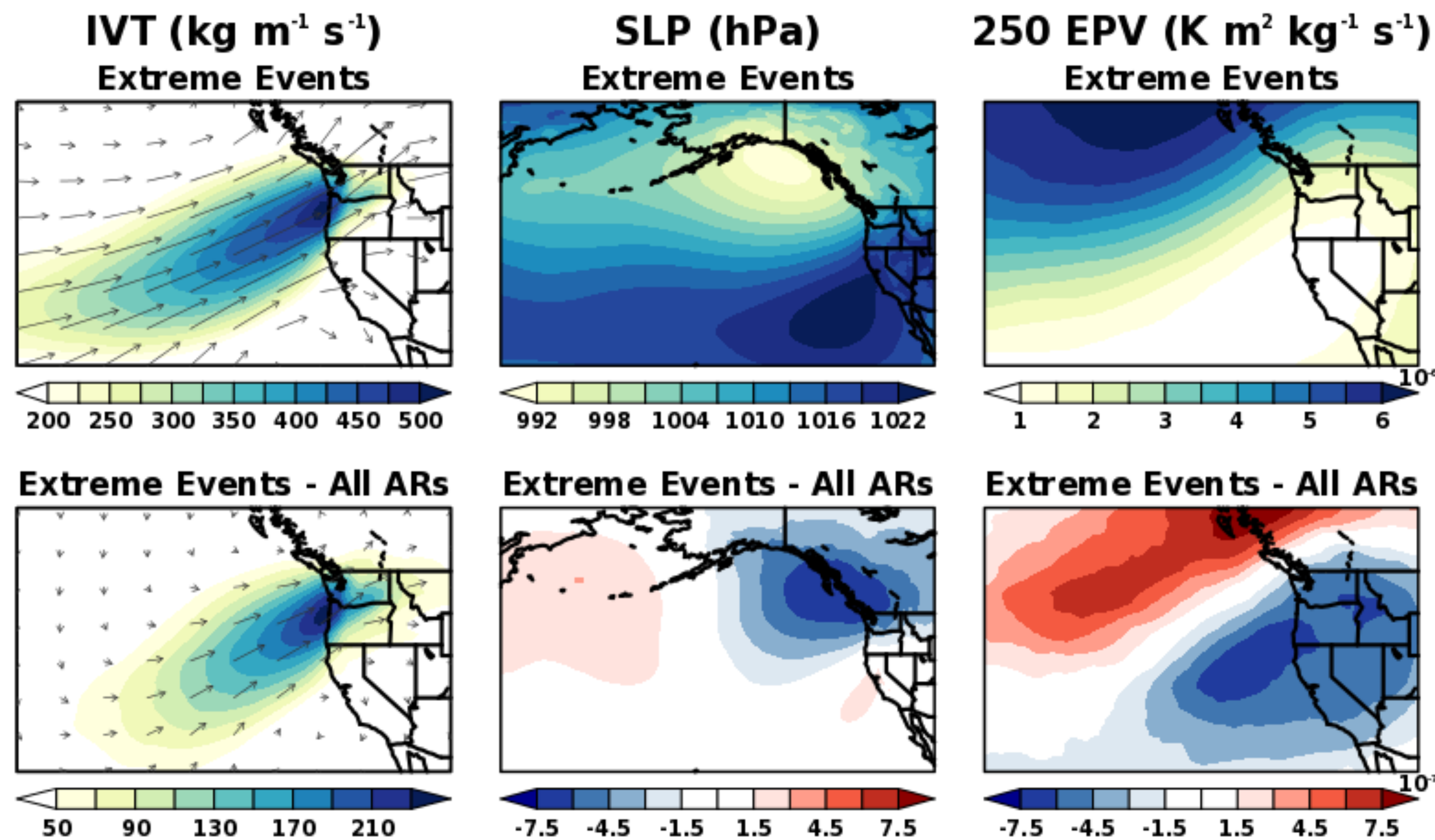


Figure 3 (top): Integrated water vapor transport (IVT), sea level pressure (SLP), and Ertel's potential vorticity composited on days with an AR induced extreme precipitation event and the difference to days with a typical AR

Figure 4 (bottom): Histogram of the count and normalized frequency of AR induced 95th percentile extreme precipitation events and all ARs on the Washington coast for teleconnection patterns during each phase of the MJO

