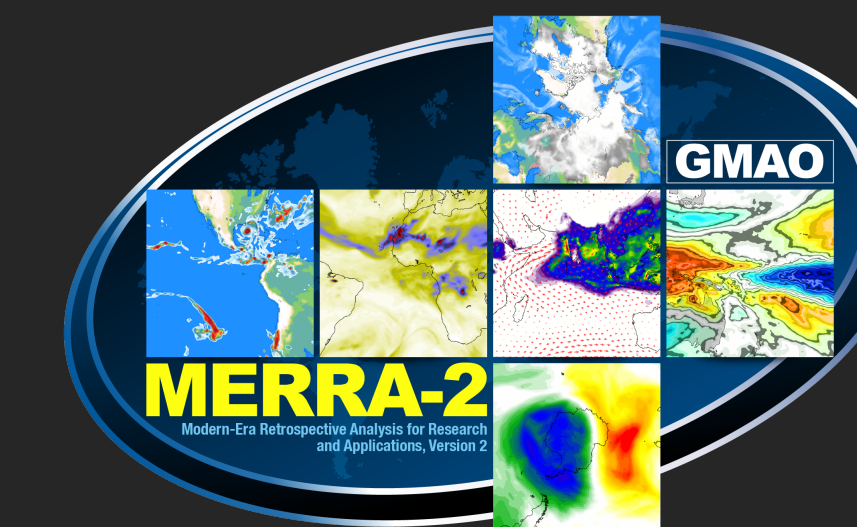




## Events along the Coast of Washington State

Allison Collow<sup>1,2</sup>, Haiden Mersiovsky<sup>3</sup>, and Michael Bosilovich<sup>2</sup>

<sup>1</sup> Universities Space Research Association, <sup>2</sup> NASA GSFC, Code 610.1, <sup>3</sup> Florida State University



### 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

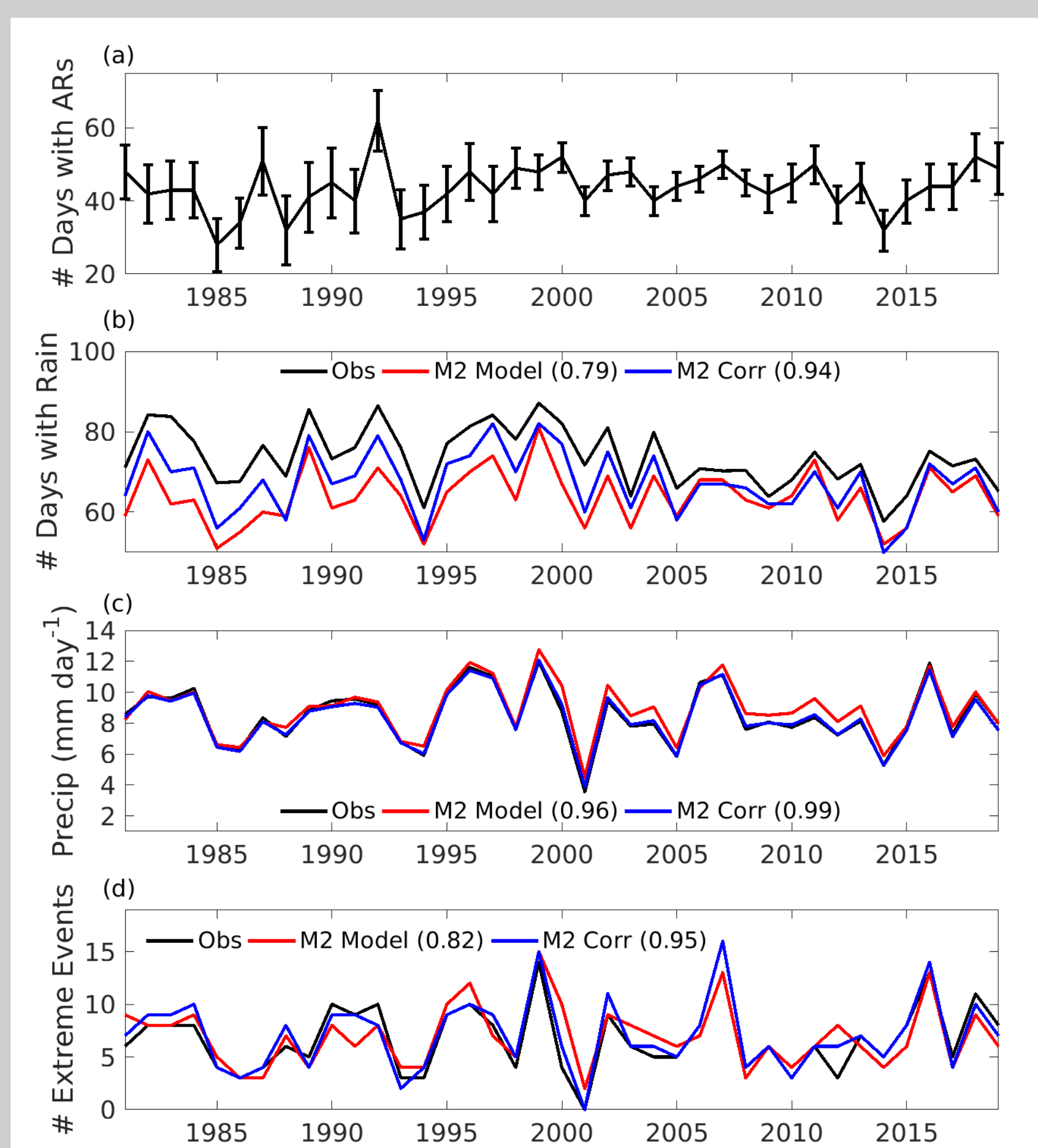
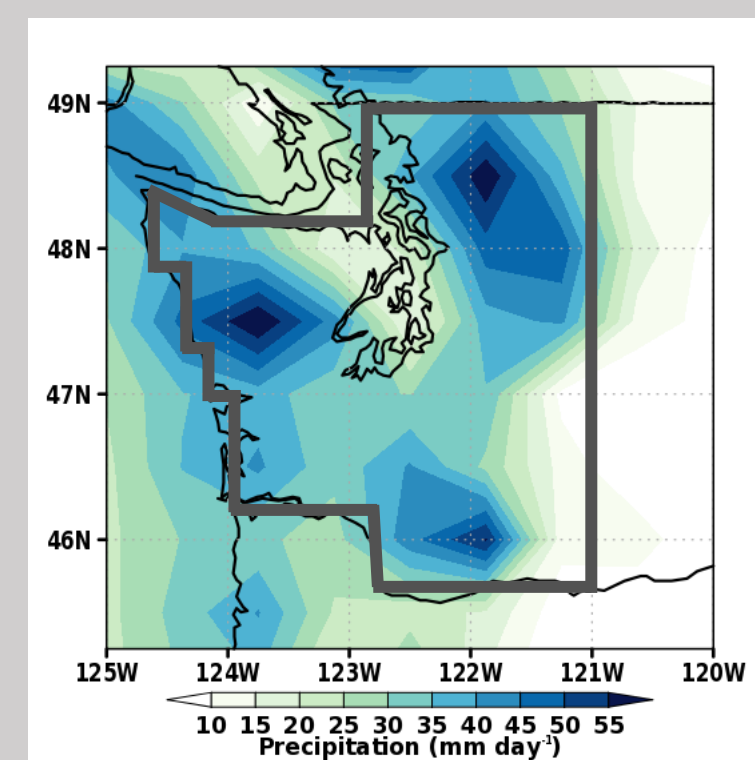


Figure 1: (a) Count of days with an AR, (b) count of days with 1 mm of precipitation, (c) mean precipitation, and (d) count of AR induced extreme precipitation events exceeding the 95<sup>th</sup> percentile of precipitation. Figure 2 (below): Precipitation during extreme events. Gray outline = region 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

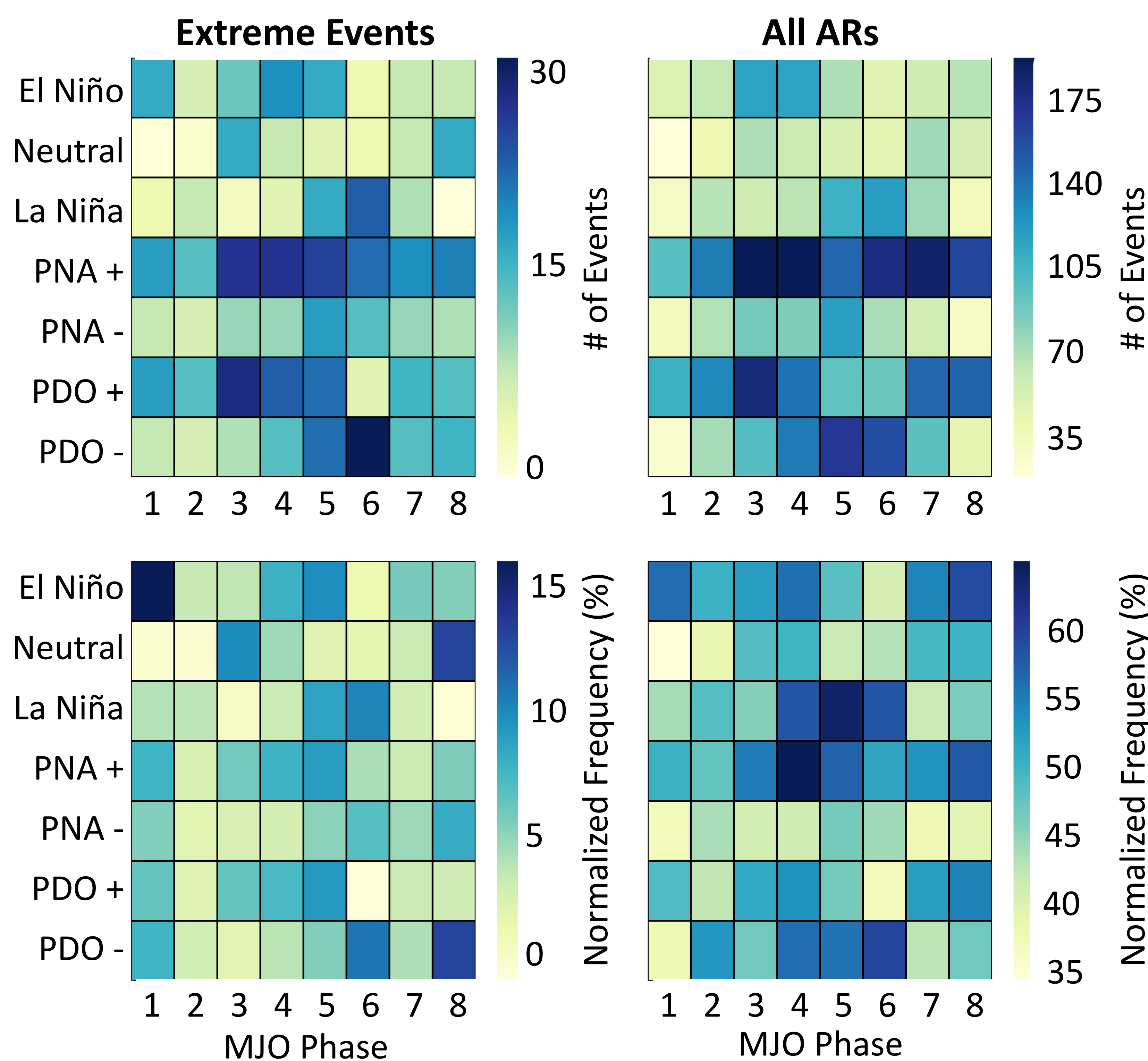
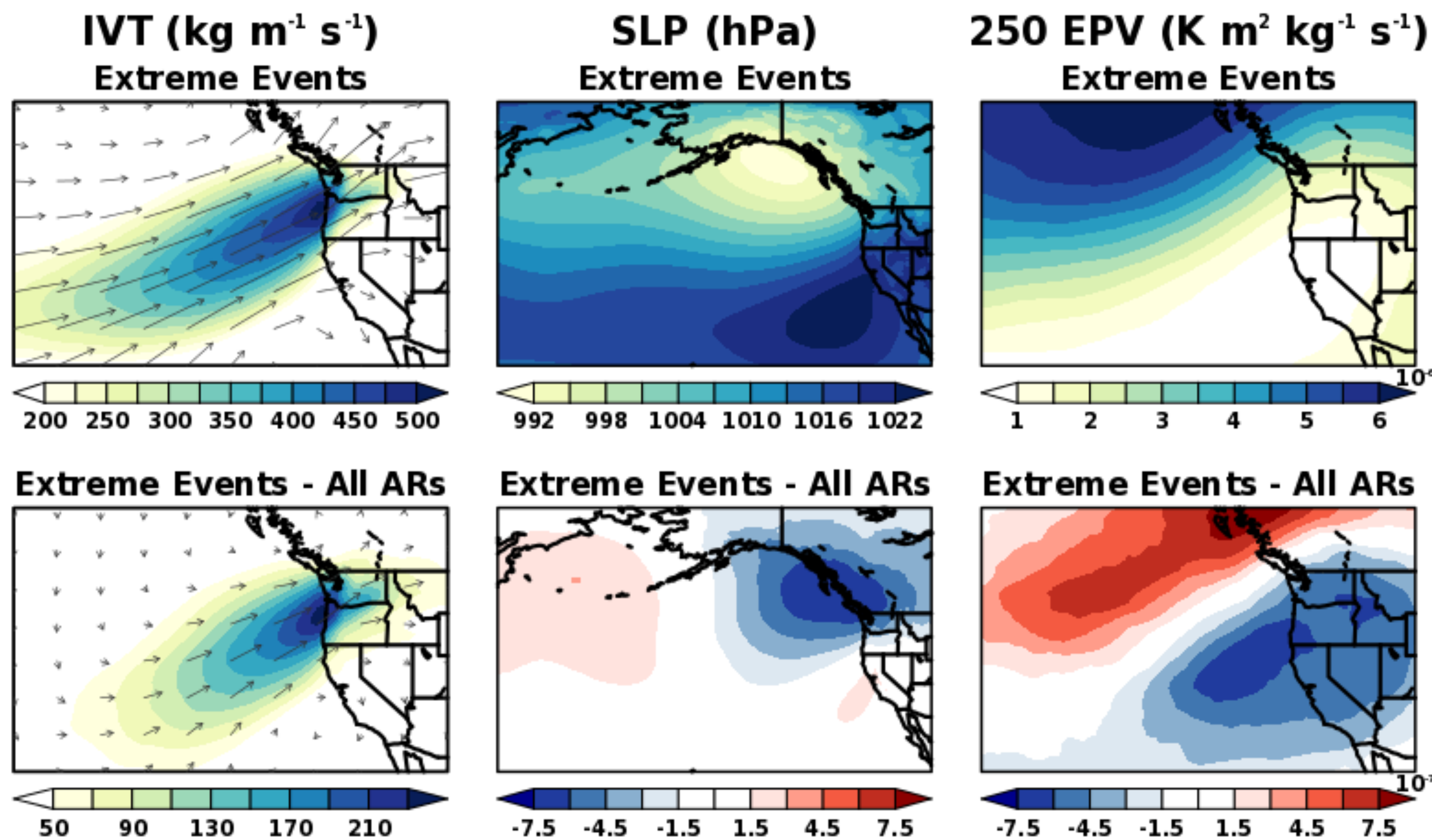


Figure 3 (top): Integrated water vapor transport (IVT), sea level pressure (SLP), and Ertel's potential vorticity composited on days with an AR induced extreme precipitation event and the difference to days with a typical AR

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



### MORE INFO

E-mail: [allison.collow@nasa.gov](mailto:allison.collow@nasa.gov)  
 Web: [gmao.gsfc.nasa.gov](http://gmao.gsfc.nasa.gov)

