



2020 Regional & Global Model Analysis Program Area PI Meeting

Extremes and Impacts Breakout

Precipitation Morphology in the Western United States:

Its Relationship to Ambient Atmospheric Conditions and Future Changes

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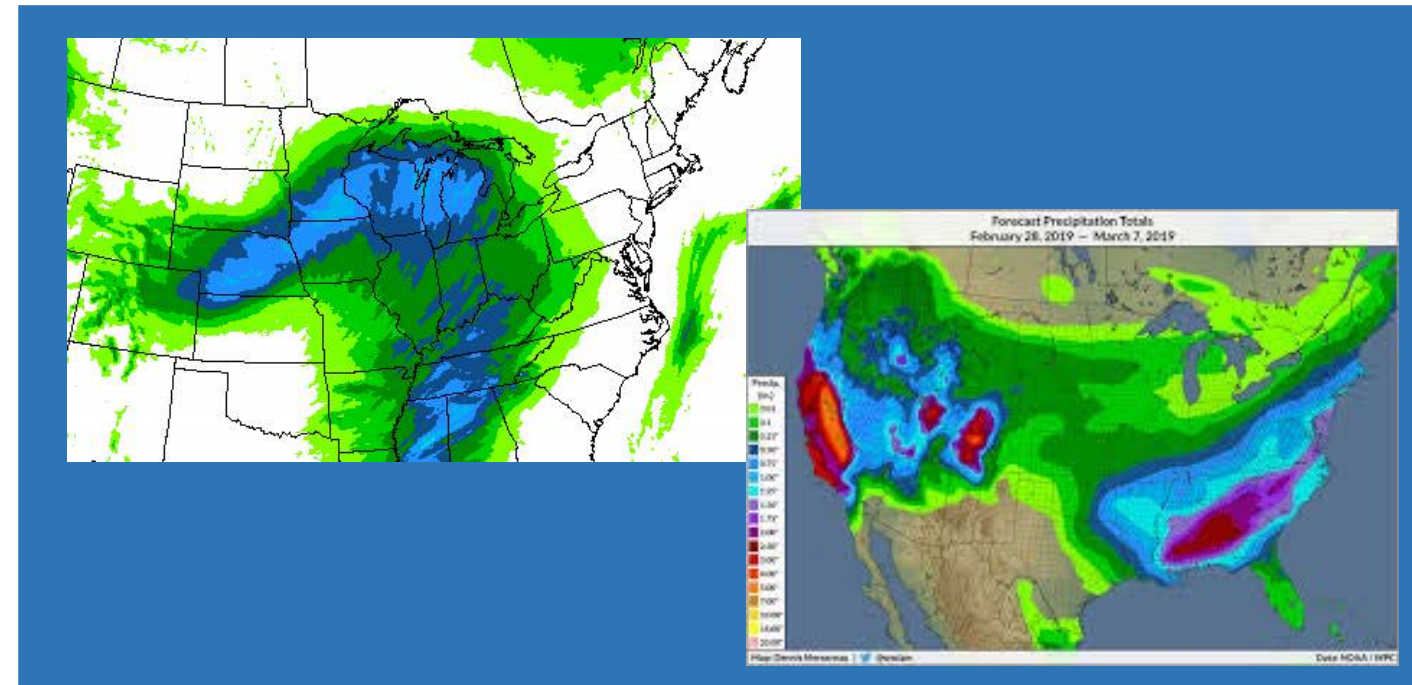
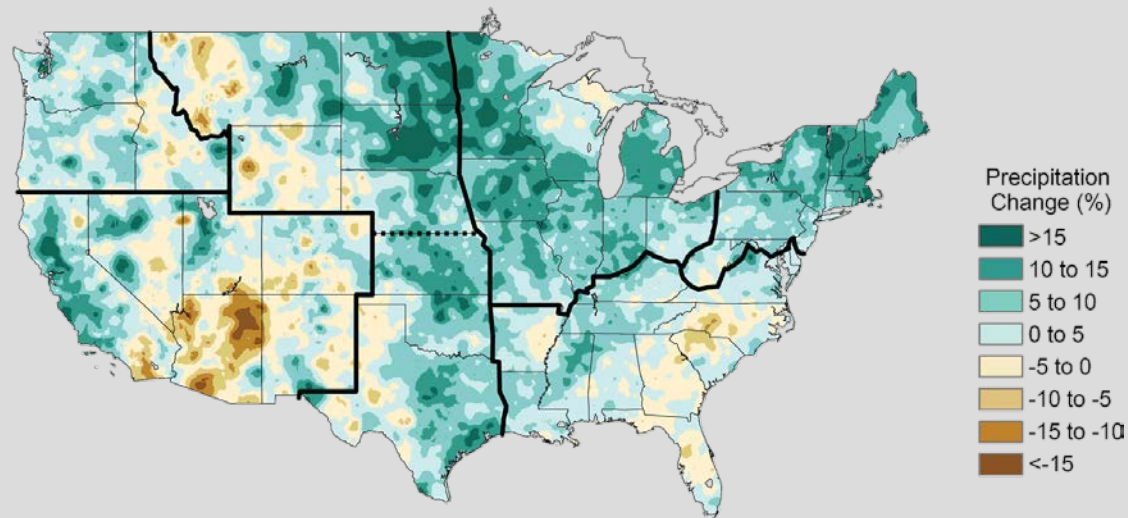
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From grid-based to event-based analysis

- Grid-based analysis is useful in characterizing the general patterns of climate change, but they ignore the structure of precipitation events (i.e., percentiles of precipitation amount vary within precipitating area)

Observed U.S. Precipitation Change

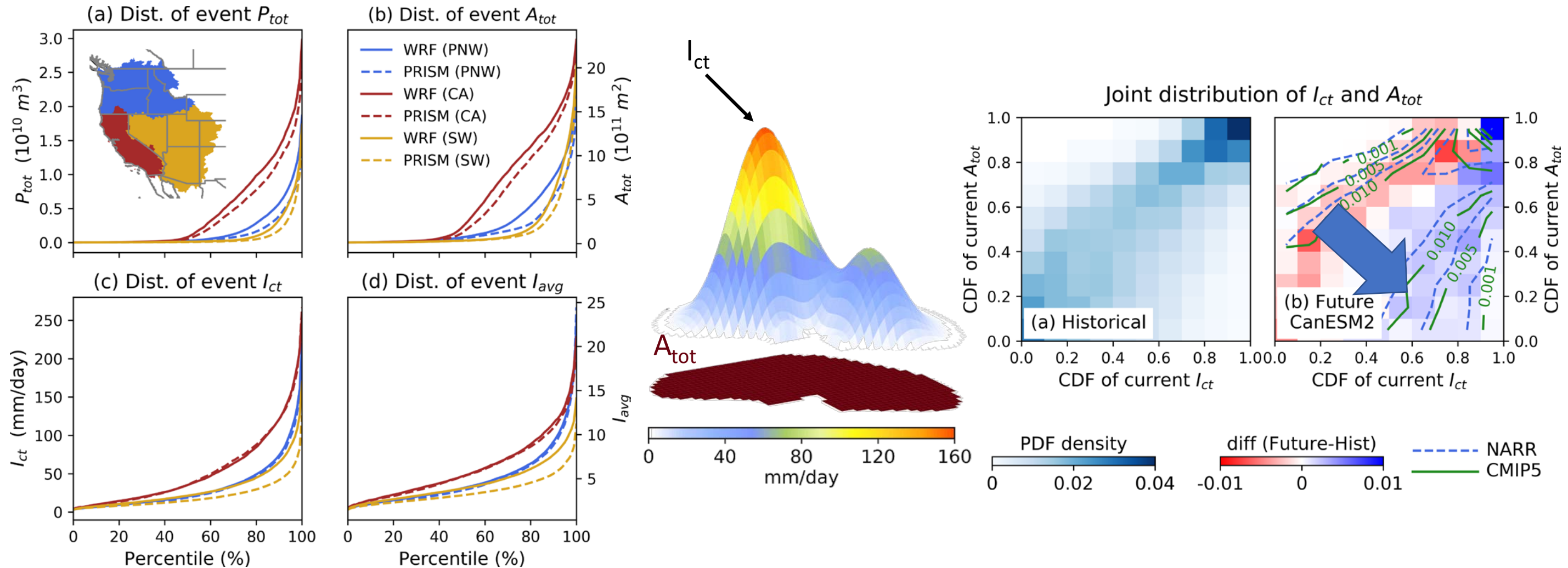


- Features of precipitation EVENTS and their changes are what we experience, and they are more relevant to runoff response and disaster preparation (flooding, landslides, etc.). Yet they are not very well understood
- Western U.S. as a demonstration of what new knowledge we can learn from event-based analyses

Precipitation change in the western U.S.

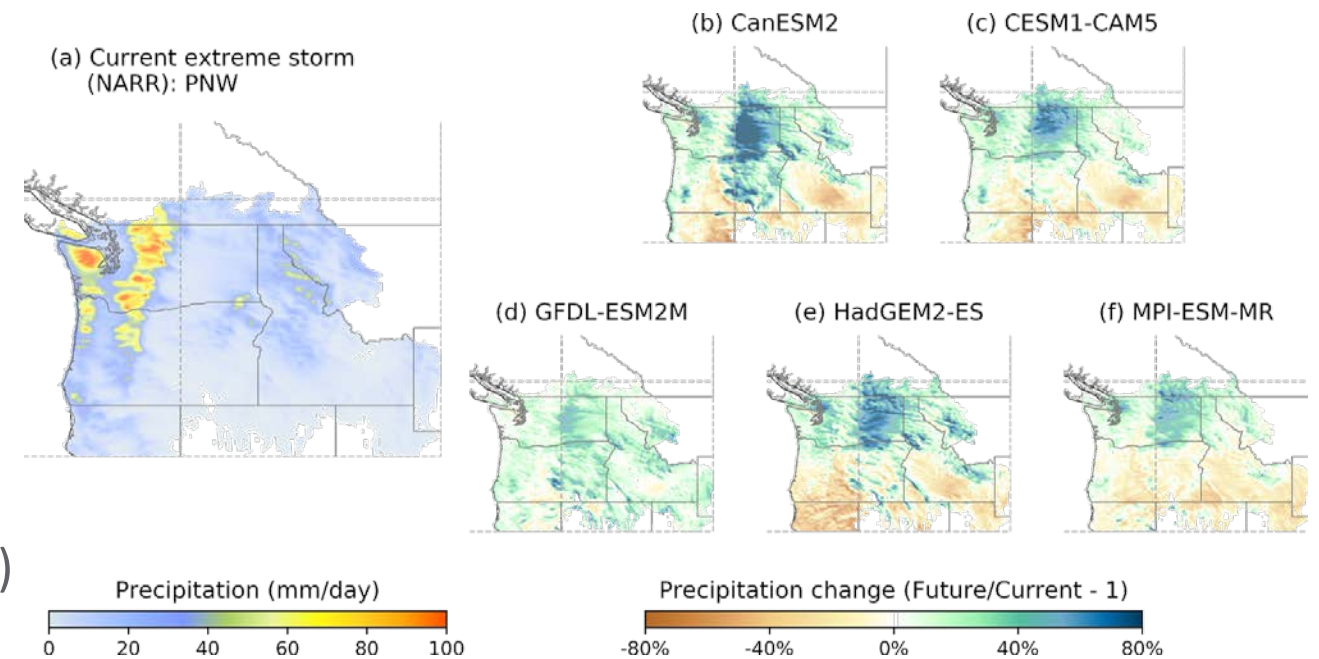
➤ **Historical (1981-2010):** simulation using 6-km convection-permitting WRF is highly consistent with PRISM obs.

➤ **Future (2041-2070):** reduced precipitation area along with higher precipitation center magnitude (“smaller and sharper”). Robust across five driving CMIP5 models



Summary

- Analyzing precipitation on an event basis serves better for runoff and disaster analyses
- Convection-permitting simulations exhibit similar precipitation event features as obs.
- Precipitation objects in the western U.S. will become “smaller but sharper” under climate change
 - Implying different runoff responses across different scales
 - Bias in the current stationary risk assessment approach that assumes a static “precipitation shape”?
- Other completed works:
 - Analysis of more features of precipitation events
 - A focus on extreme precipitation events (such as top 50 events)
 - Relationship of these changes to ambient atmos. conditions



1. Chen, X., L. R. Leung, C. Dang, Y. Gao, Y. Liu, M. Wigmosta, and M. Richmond, Event-based analysis of future precipitation change in the western U.S. (to be submitted)
2. Chen, X., L. R. Leung, and C. Dang, Increased cold season heavy precipitation in the western U.S. under climate change (to be submitted)