

NASA Science Mission Directorate Earth Science Division Applied Sciences Program



Advancing Drought Onset Detection and Seasonal Prediction Using a Composite of NASA Model and Satellite Data

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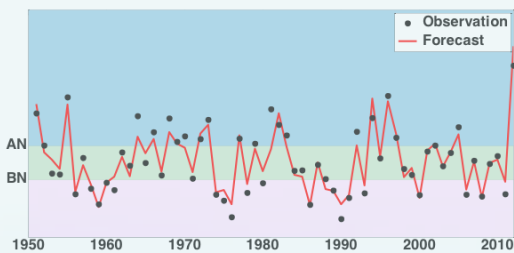


Background



Analog-Year Model Combined with Dynamic Model Simulations

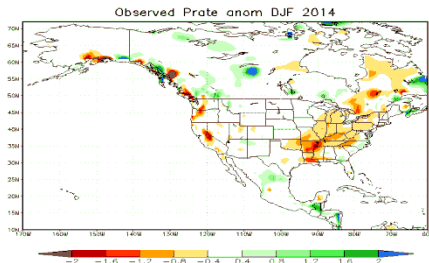
Analog-Year Model



Multi-Model
Assessment
Using the
**Expert Advice
(EA) Algorithm**

Seasonal Precipitation
Forecasts

Dynamic Model Simulations

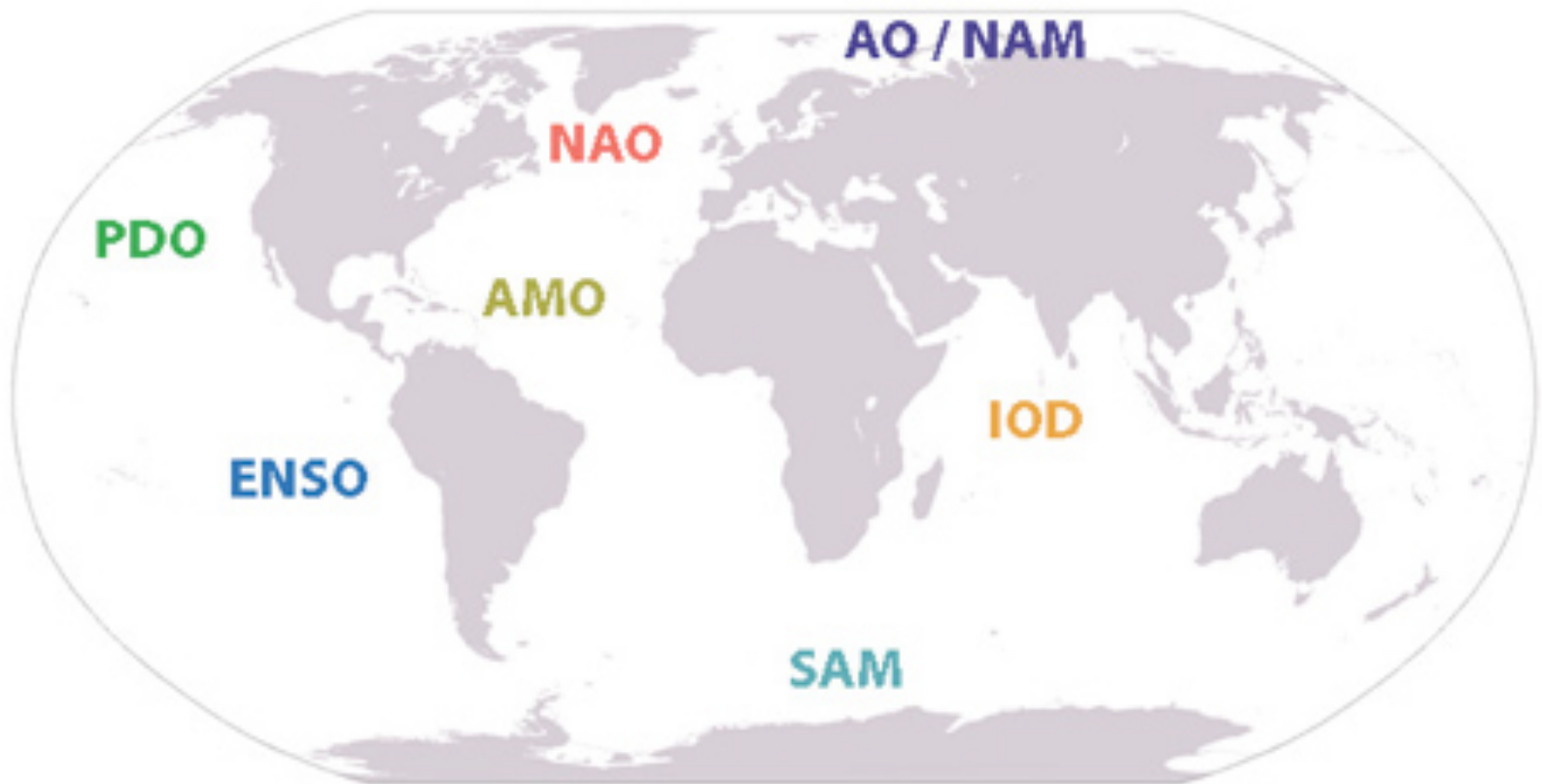


Madadgar S., et al., 2016, A Hybrid Statistical-Dynamical Drought Prediction Framework: Application to the Southwestern United States, *Water Resources Research*, 52 (7), 5095-5110.

AMS Glossary of Meteorology



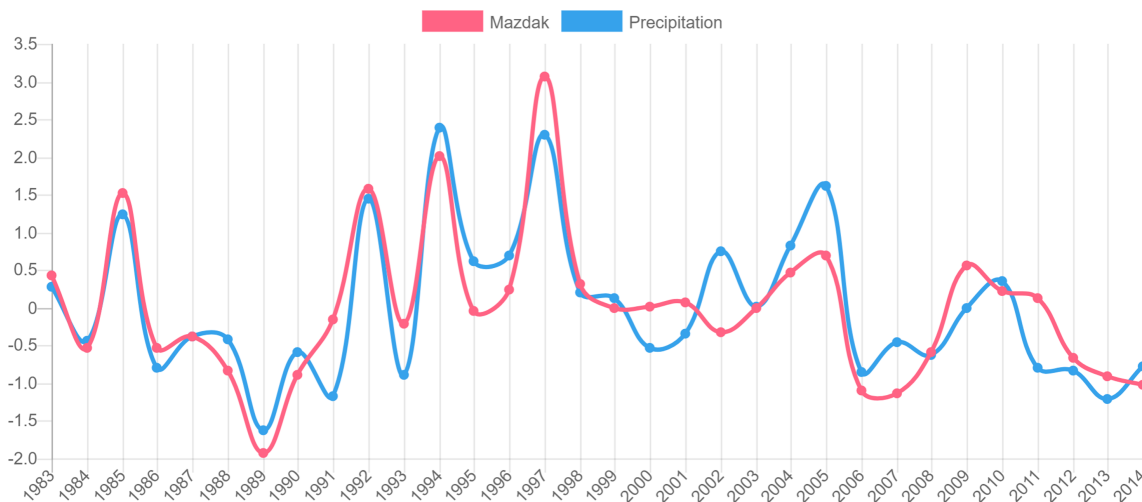
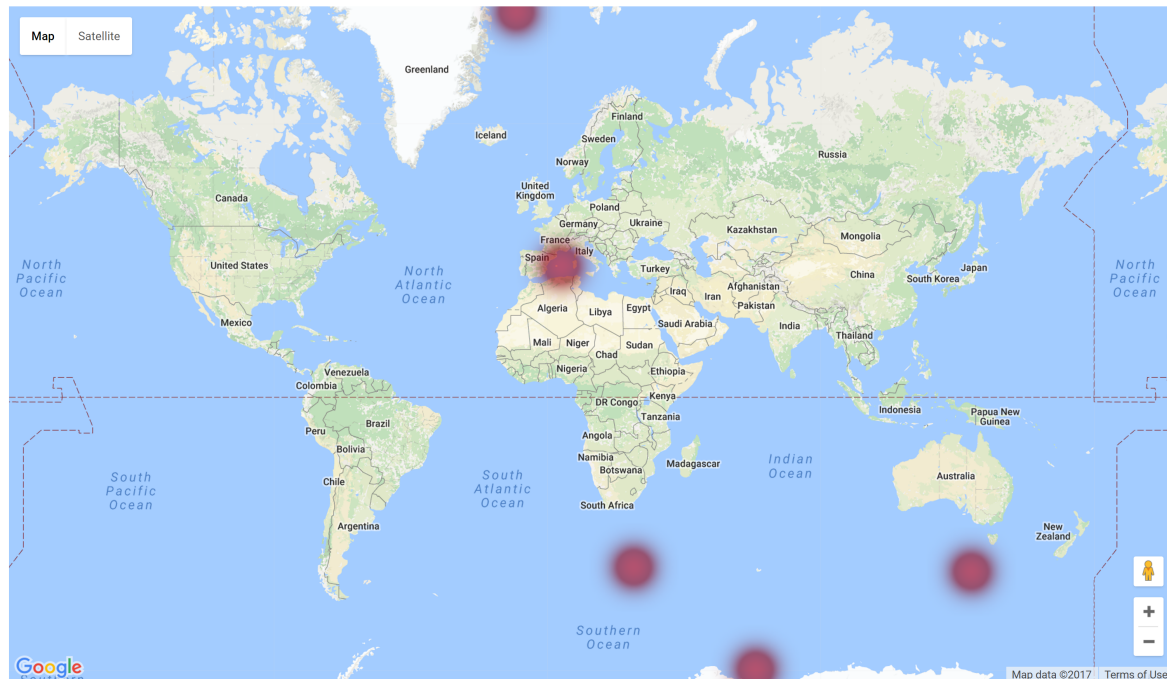
- Teleconnection:
 - A linkage between weather changes occurring in widely separated regions of the globe.
 - A significant positive or negative correlation in the fluctuations of a field at widely separated points.



MAZDAK Concept



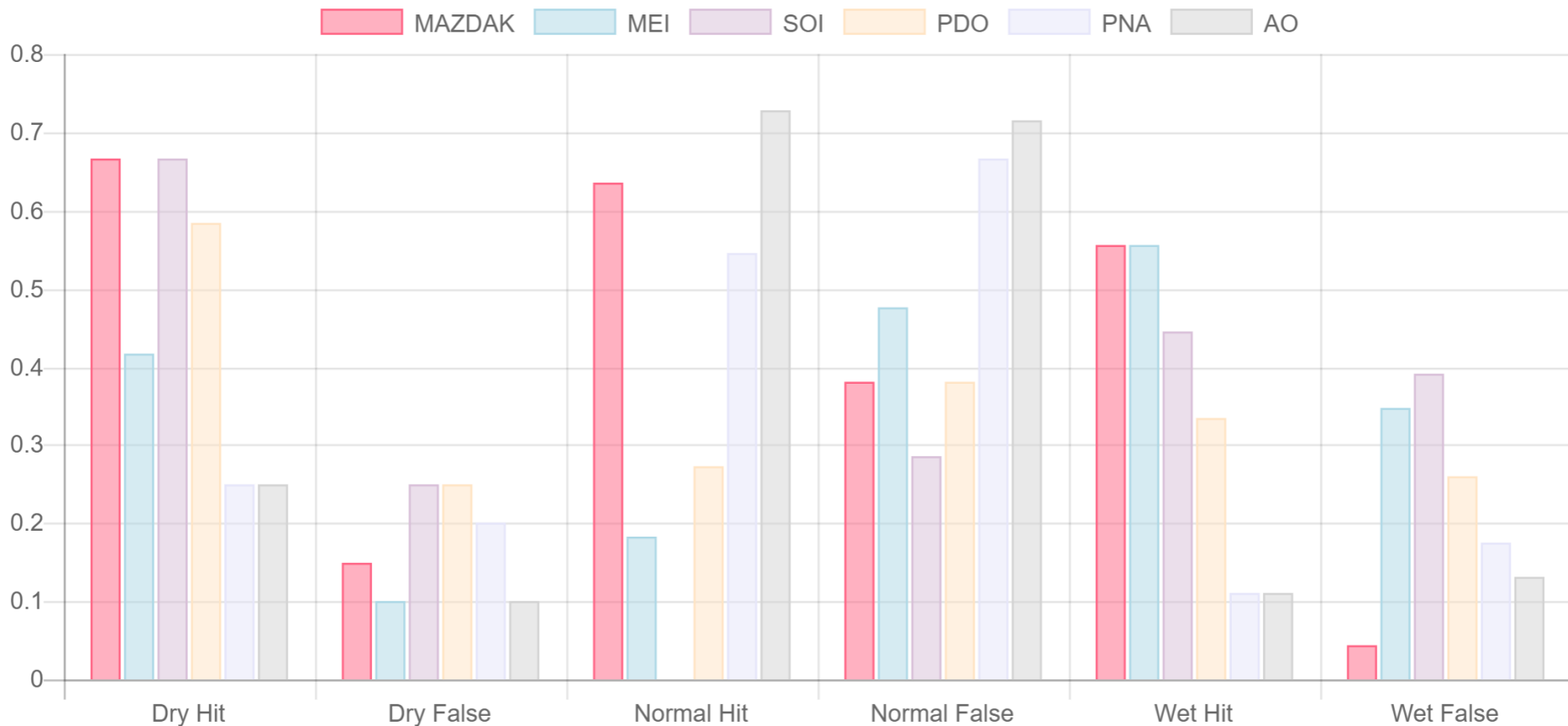
California, USA
MAZDAK-CA: Sep – Nov
Precipitation: Nov – Apr
Lead-time: 12 months
Correlation: 0.87

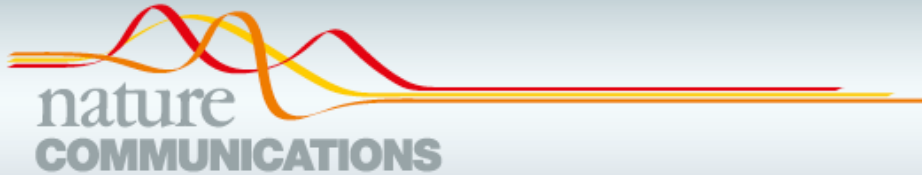


MAZDAK Concept



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ARTICLE

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OPEN

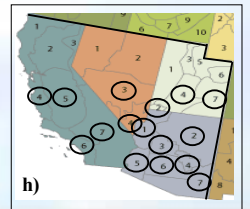
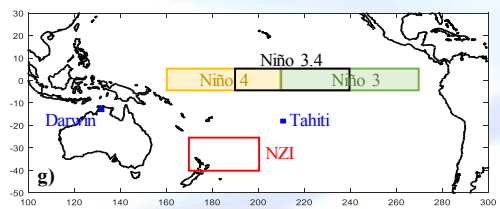
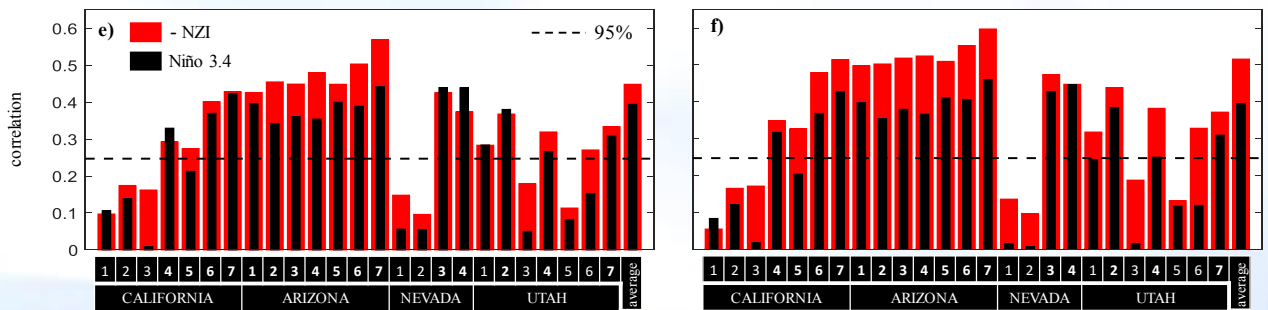
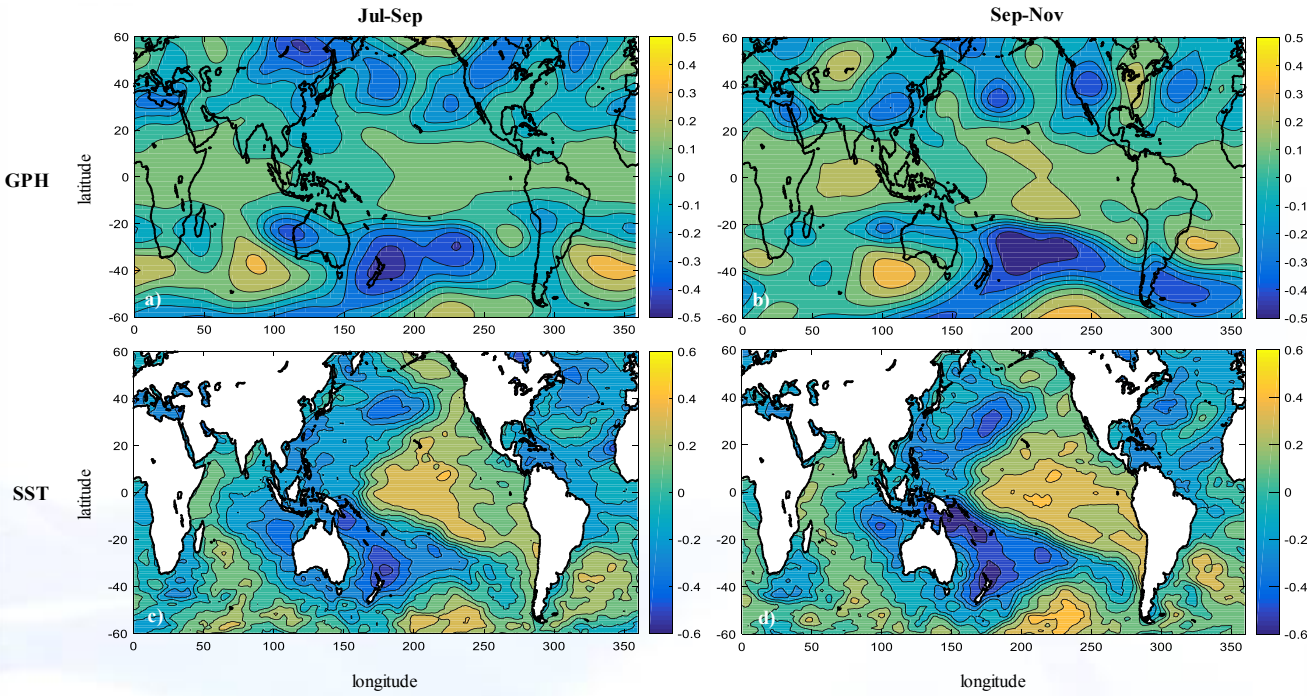
A new interhemispheric teleconnection increases predictability of winter precipitation in southwestern US

Antonios Mamalakis ¹, Jin-Yi Yu ², James T. Randerson ², Amir AghaKouchak ^{1,2}
& Efi Foufoula-Georgiou ^{1,2}

New Zealand Index (NZI)



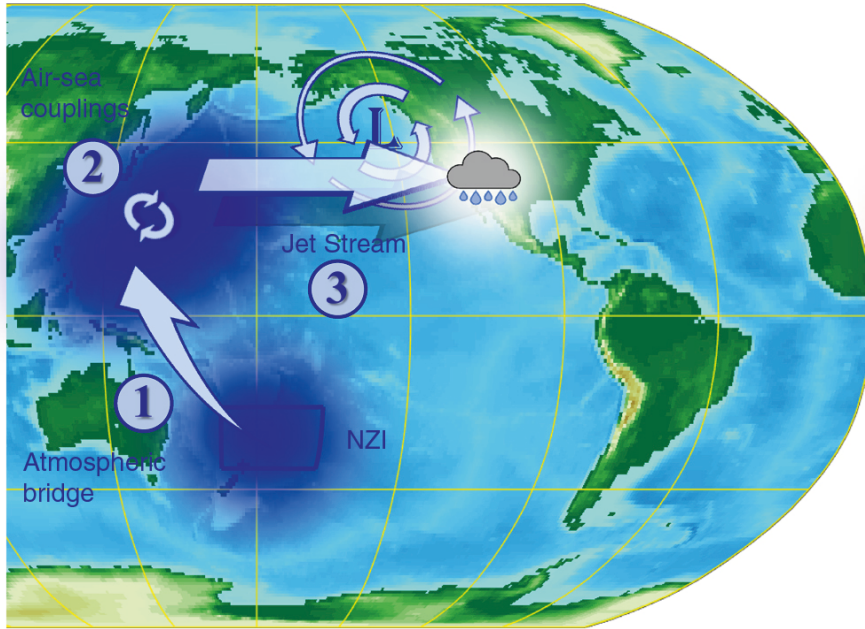
Evidence for a new teleconnection in the Southwestern Pacific. (a) Correlation map between GPH anomalies (400 mb; July-Sept) and the regionally averaged winter precipitation depth in SWUS (over climate divisions with statistically significant correlations between precipitation and NZI; see Fig 1h); (b) Same as (a) but for GPH averaged over Sept-Nov; (c)-(d) Correlation maps as in (a)-(b) but using SST anomalies. The emergence of a persistent anomaly in the southwestern Pacific (coined as the New Zealand Index, NZI) is robust for SST and GPH anomalies; (e)-(f) Correlation coefficients of NZI and ENSO with winter precipitation for all climate divisions and for the two lead times; (g) the location and areal extent of NZI and ENSO indices; (h) The selected climate divisions in SWUS, for deriving the regionally averaged precipitation depth, based on their significant correlation with NZI.



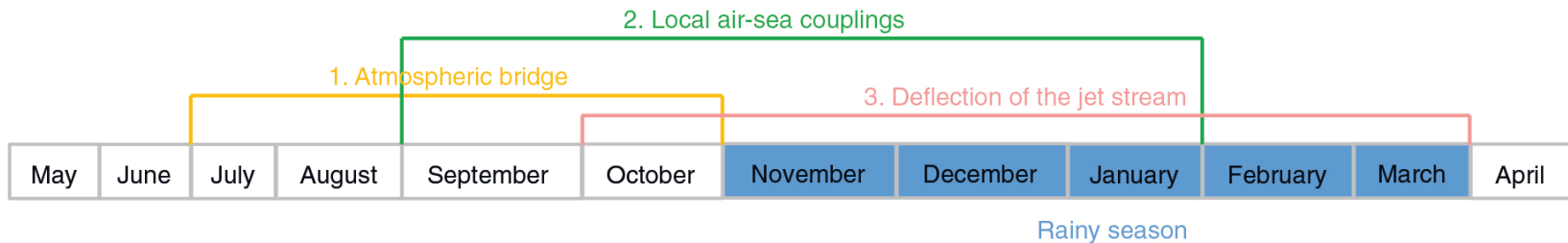
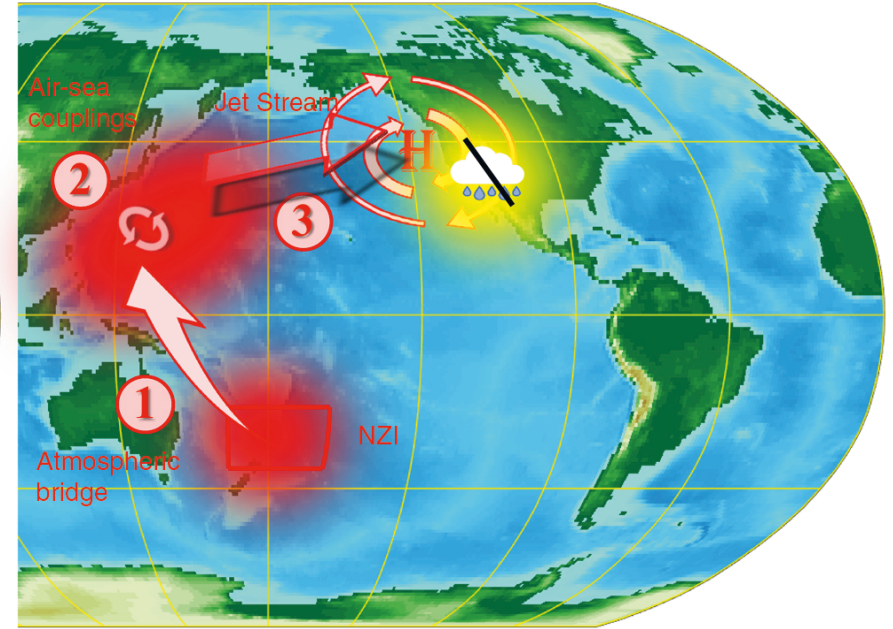
New Zealand Index (NZI)



a Cool NZI



b Warm NZI



The New Zealand Index (NZI) teleconnection depends on a western Pacific ocean–atmosphere pathway. a Negative SST anomalies (blue shading) in the NZI region cascade in the northern hemisphere through a late summer interhemispheric atmospheric bridge and are maintained by air-sea coupling until the following winter. The SST anomalies affect the atmospheric pressure in the US west coast and strengthen the regional jet stream which brings more winter storms in the SWUS; b Late-summer positive SST anomalies (red shading) in the NZI region deflect the jet stream to the north, leading to dry conditions over the SWUS.

Mamalakis et al., 2018

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