

Supplementary

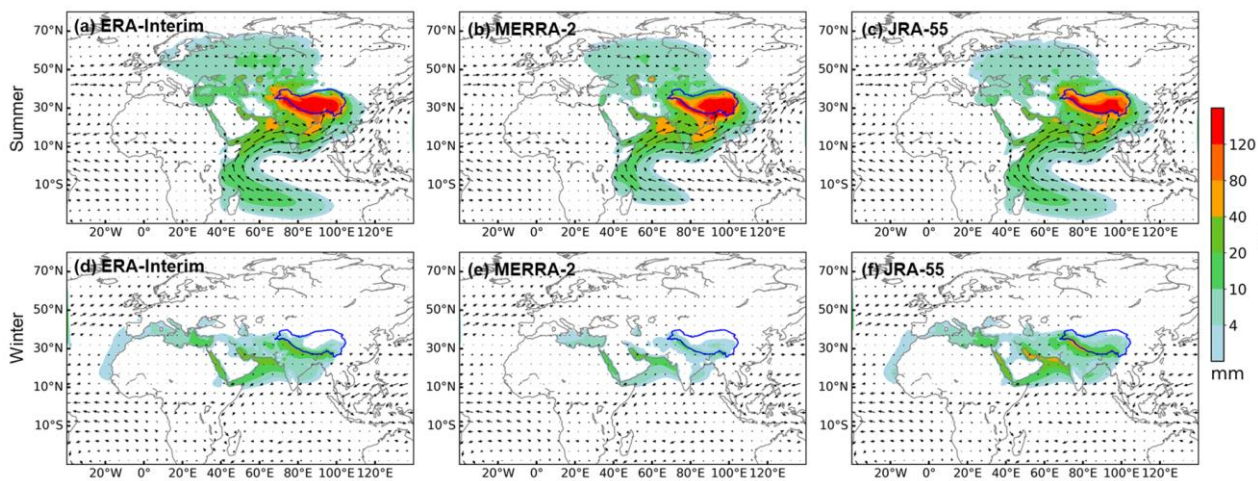


Figure S1: Long-term mean moisture source of the TP precipitation in summer and winter. Blue lines represent the location of the TP. The moisture contributes to the TP is tracked backward by using WAM-2layers and three forcing datasets (ERA-Interim, MERRA-2, and JRA-55) in summer (a–c) and winter (d–f), with the moisture contribution shown as equivalent water height (mm).

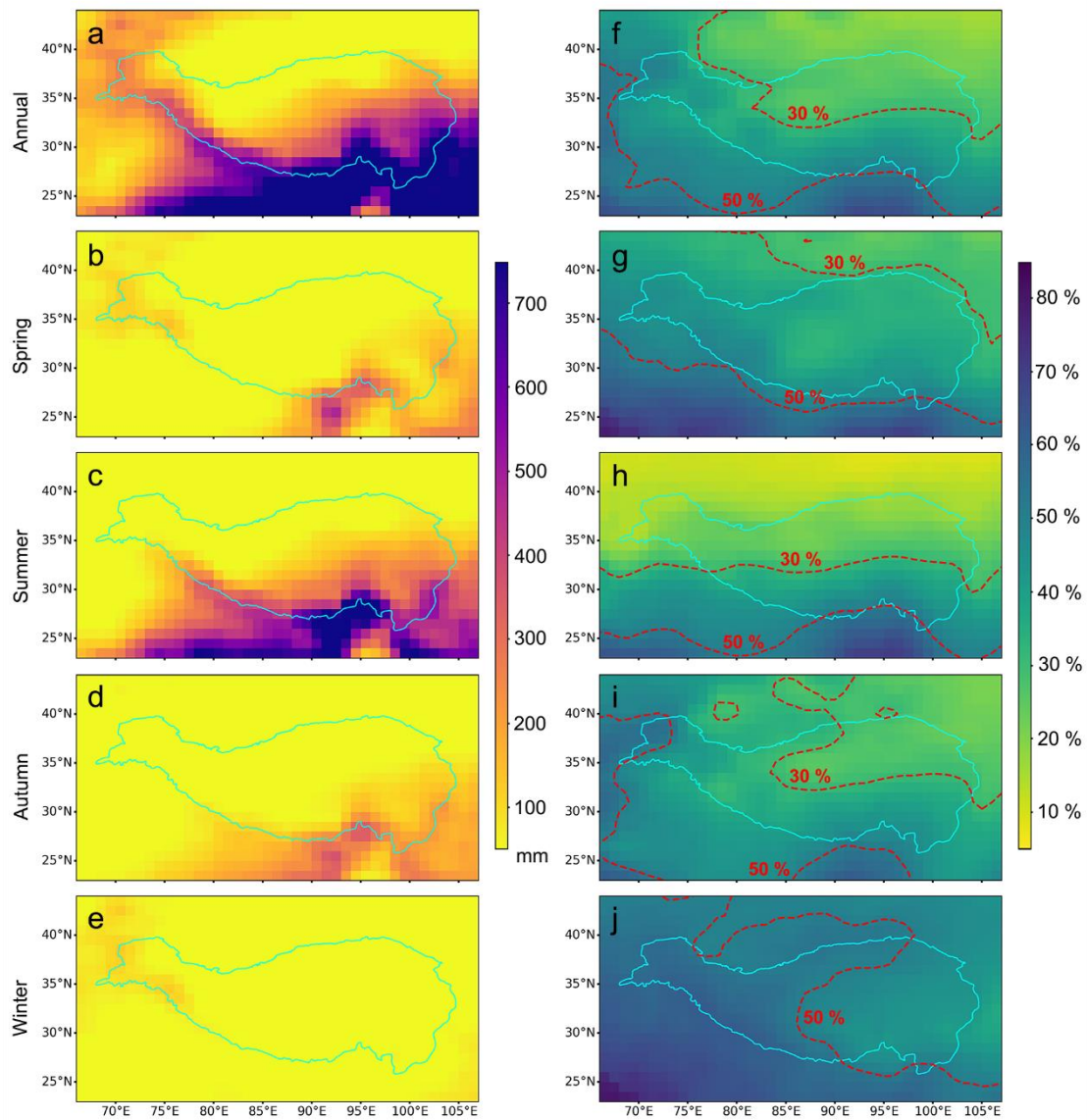
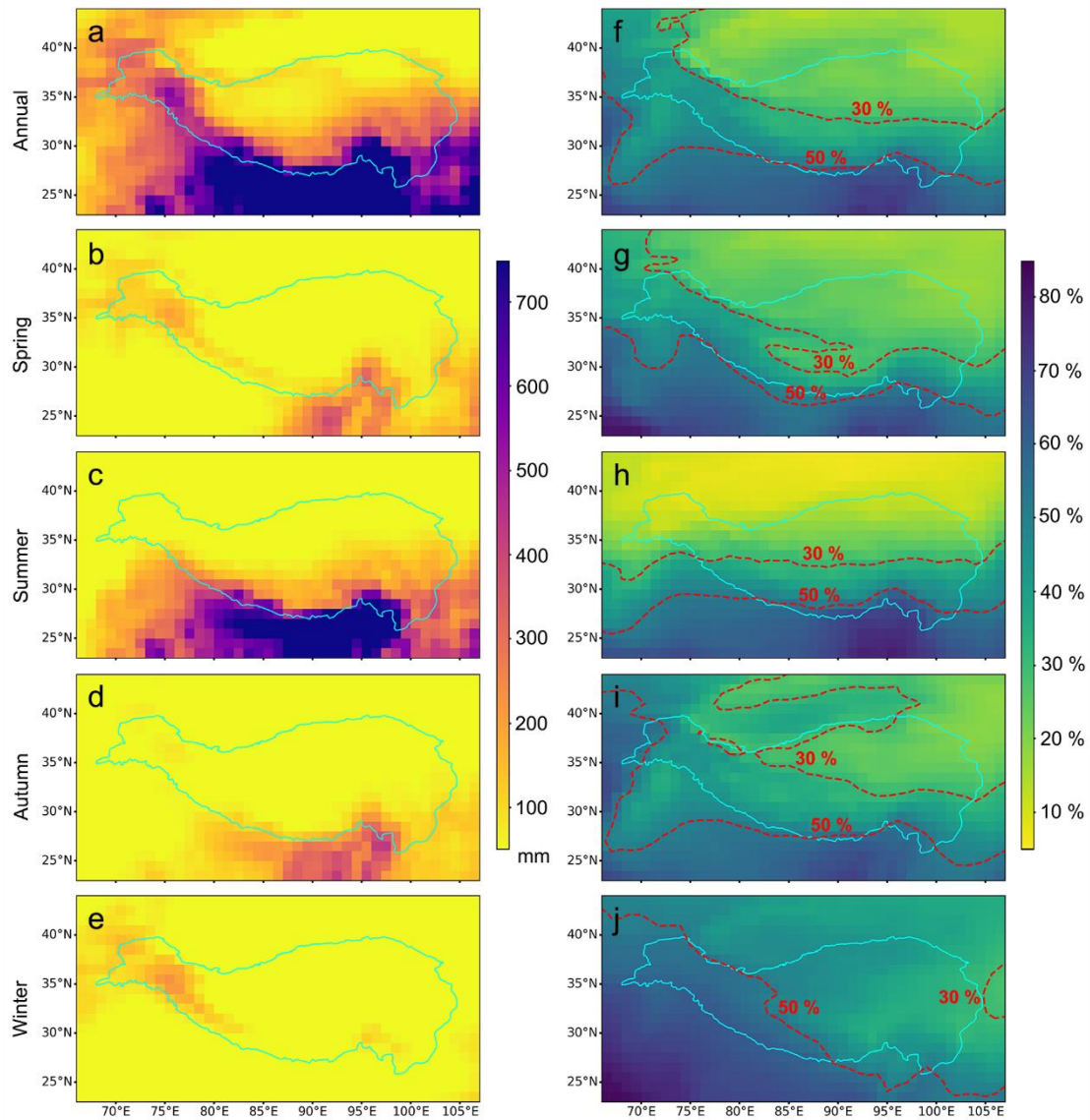


Figure S2: Same as Figure 1 but based on MERRA-2 (1980–2015).



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Figure S3: Same as Figure 1 but based on JRA-55 (1979–2015).

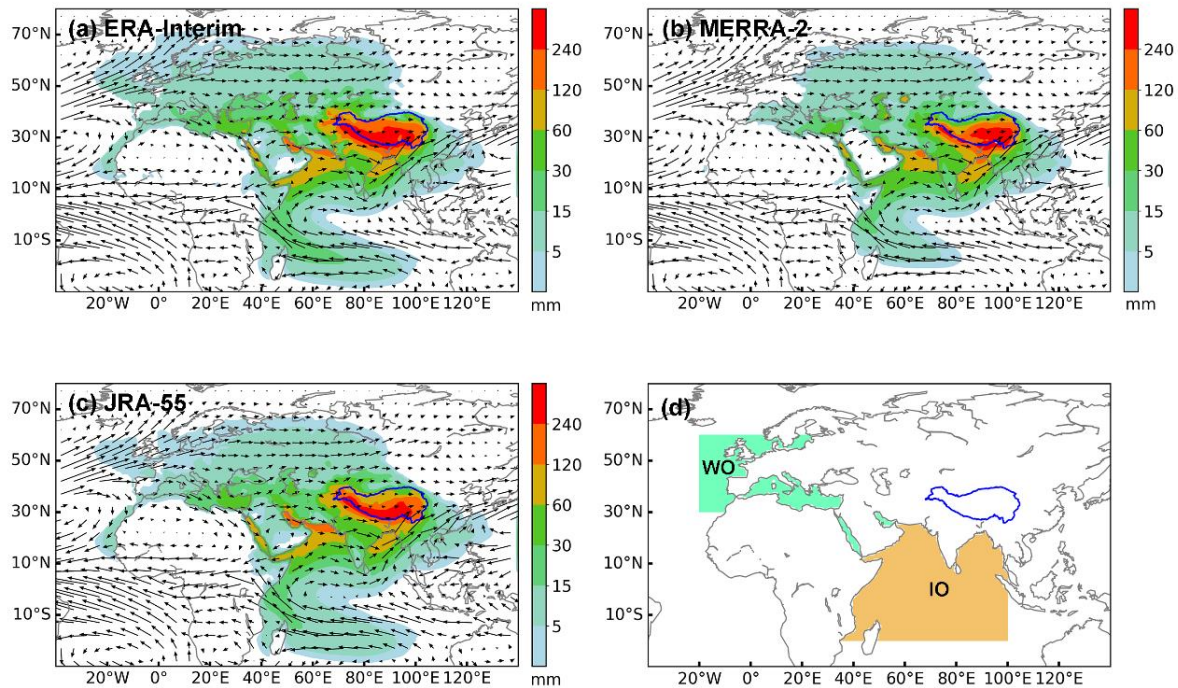
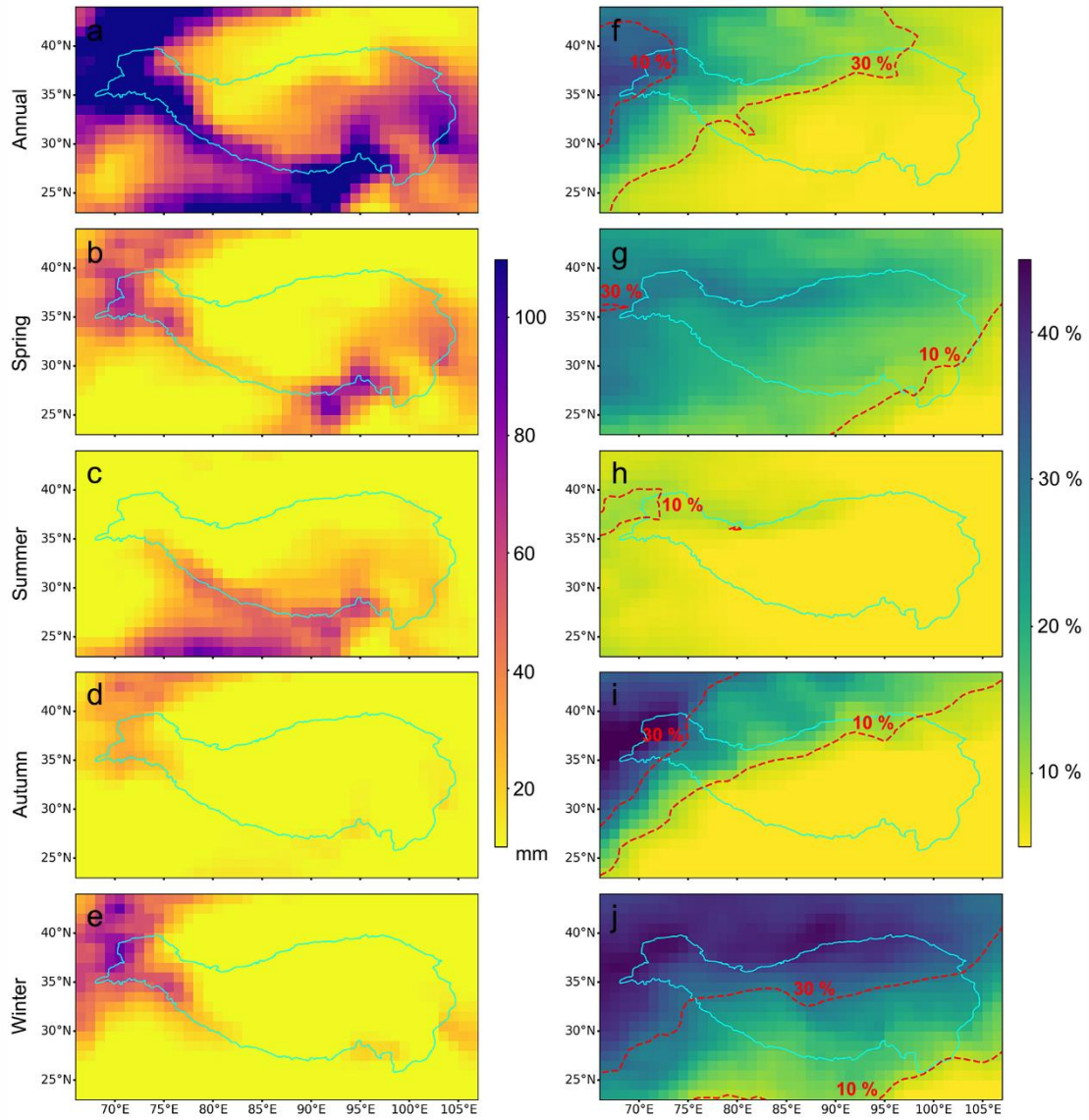


Figure S4: Long-term mean moisture source of the TP precipitation and the partition of western oceans (WO) and Indian Ocean (IO).
 15 Blue lines represent the location of the TP. (a–c) Moisture contribution to the TP is tracked backward by using WAM-2layers and three forcing datasets (ERA-Interim, Merra-2, and JRA-55), with the moisture contribution shown as equivalent water height (mm). (d) Two critical oceanic sources (global oceans are defined by land-sea mask provided by ERA-Interim) are defined as western oceans (WO) and Indian Ocean (IO).



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Figure S5: Same as Figure 3 but based on MERRA-2 (1980–2015).

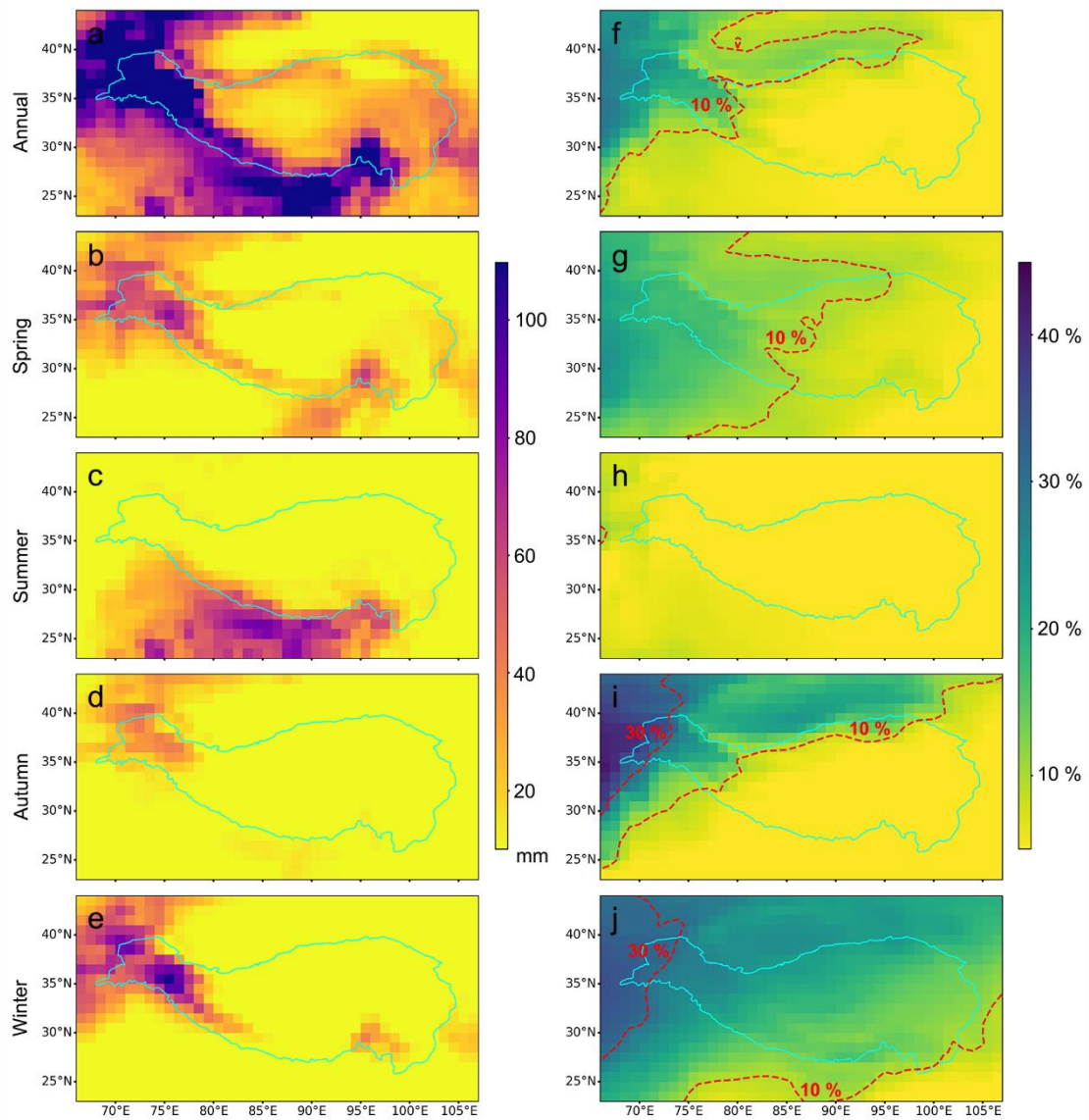


Figure S6: Same as Figure3 but based on JRA-55 (1979–2015).

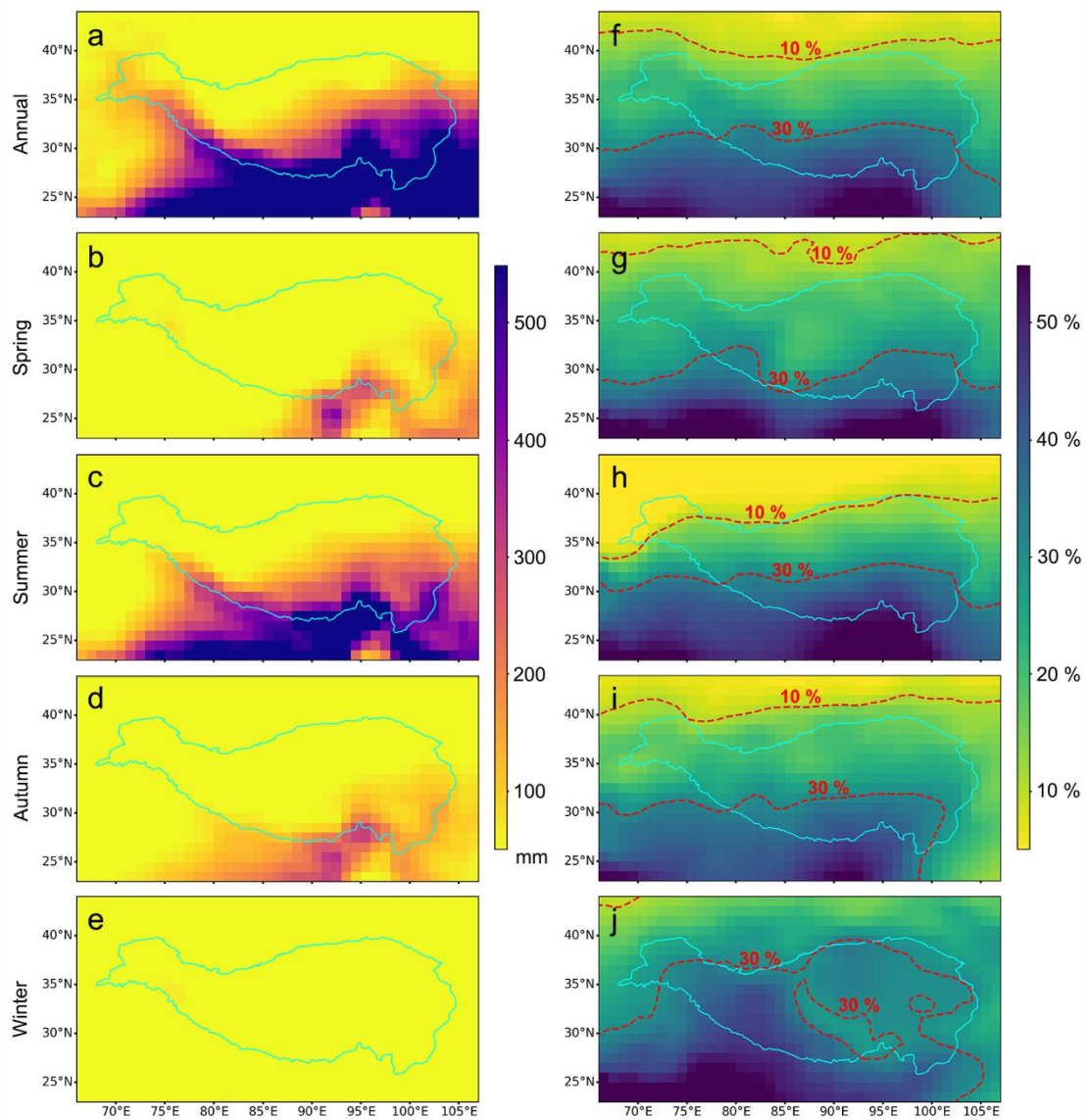
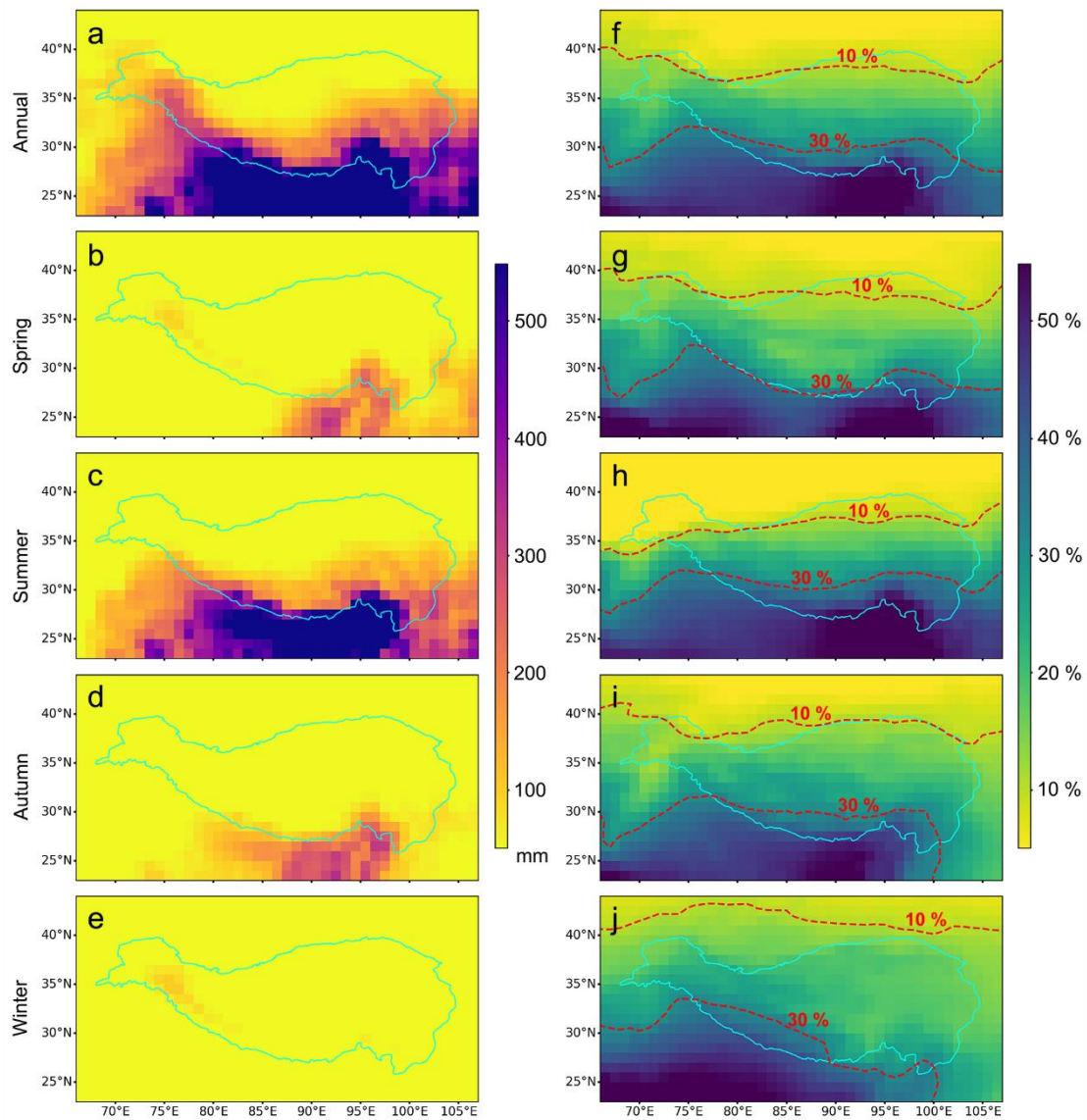


Figure S7: Same as Figure 4 but based on MERRA-2 (1980–2015).



30 **Figure S8:** Same as Figure 4 but based on JRA-55 (1979–2015).

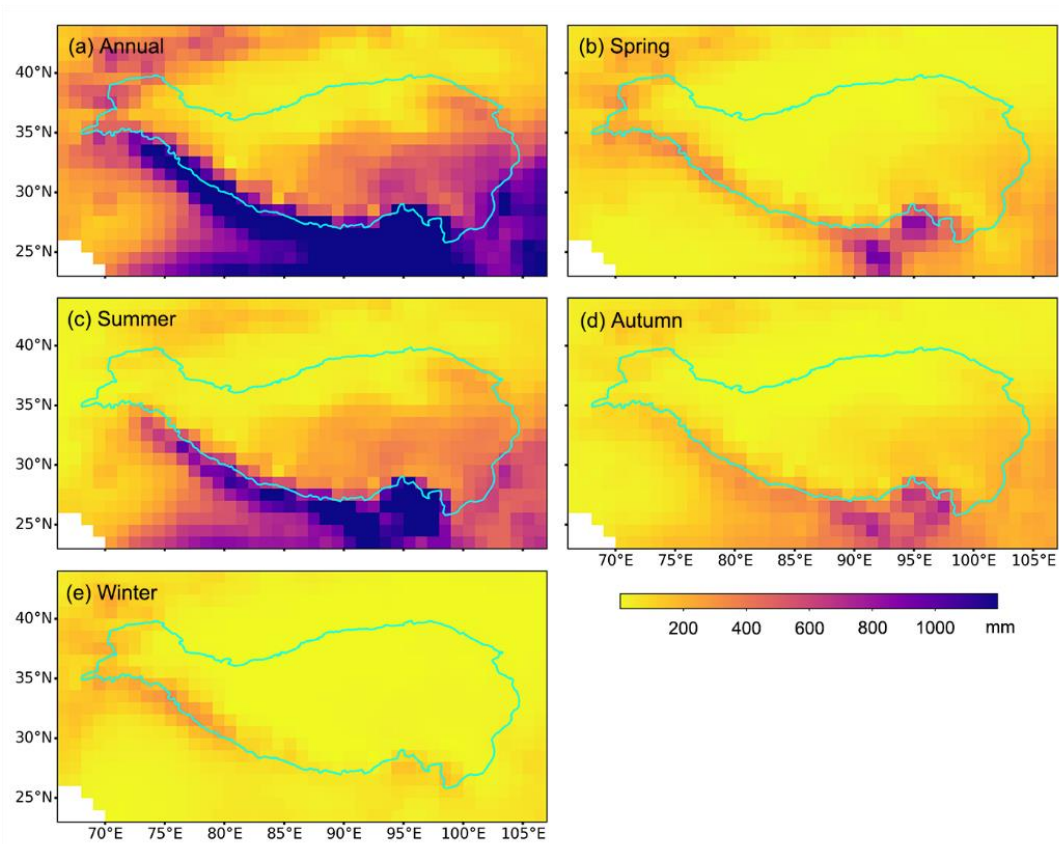


Figure S9: Long-term mean precipitation patterns over the TP on annual and seasonal scales. Based on GPCC precipitation during 1979–2015.

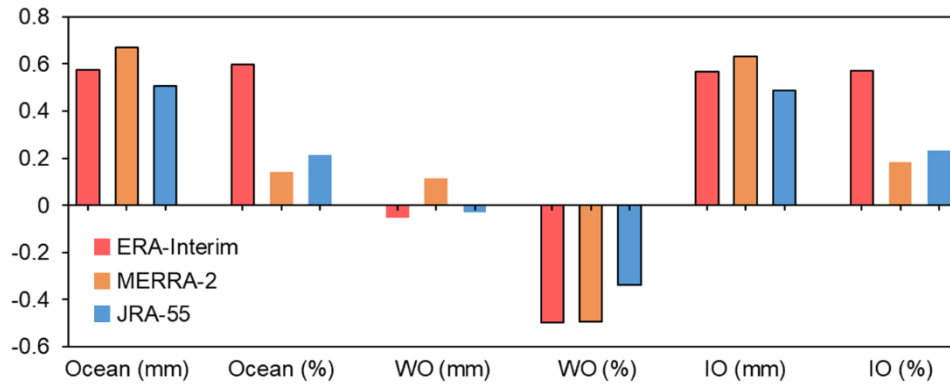


Figure S10: Correlation coefficients between time series of precipitation and absolute (mm) and relative (%) contributions of oceanic moisture from global oceans (Ocean), western oceans (WO), and Indian Ocean (IO) over the entire TP during 1979/1980–2015. Precipitation data is from the GPCC (1979–2015), and all oceanic moisture contributions are from forward moisture tracking (WAM-2layers) driven by ERA-Interim (1979–2015), MERRA-2 (1980–2015), and JRA-55 (1979–2015). Bars with black edges represent statistically significant correlations ($p < 0.05$).

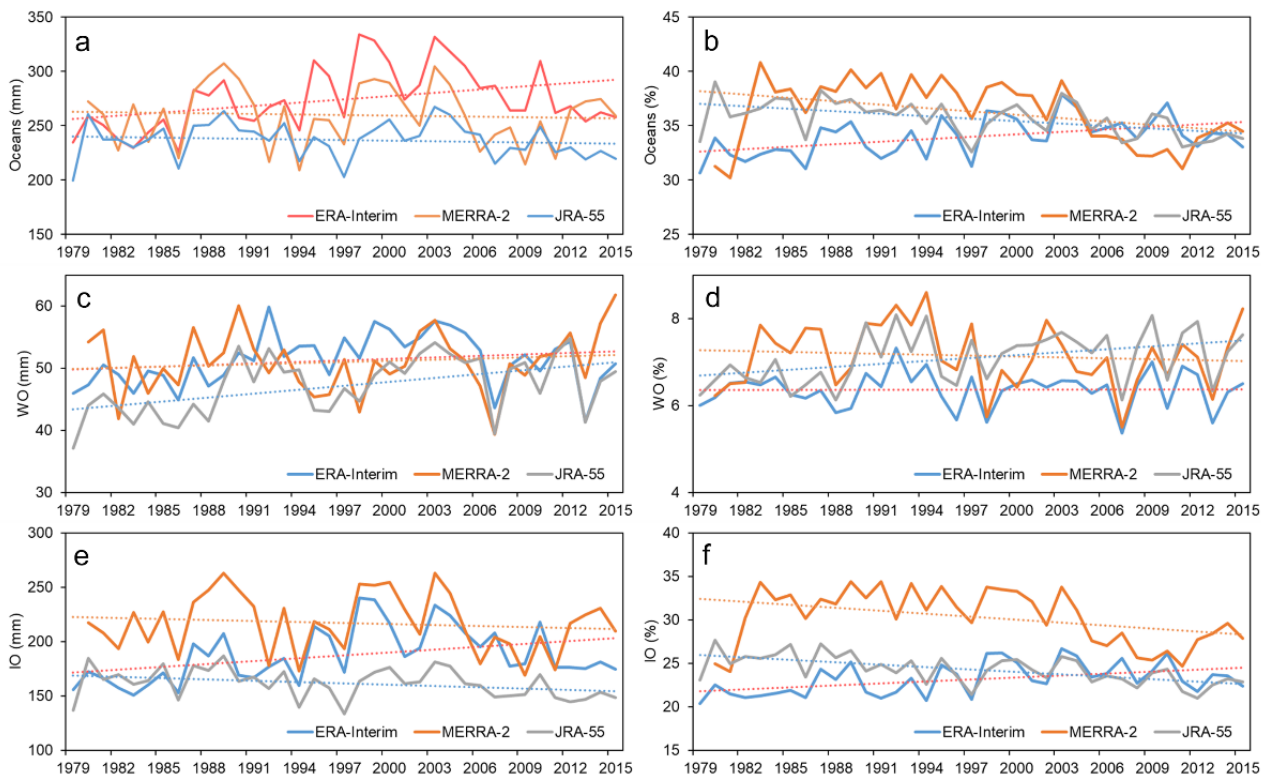


Figure S11: Time series of oceanic moisture contributions to the TP from absolute (mm) and relative (%) perspectives based on the three datasets. Dashed lines are linear regressions fits for time series.

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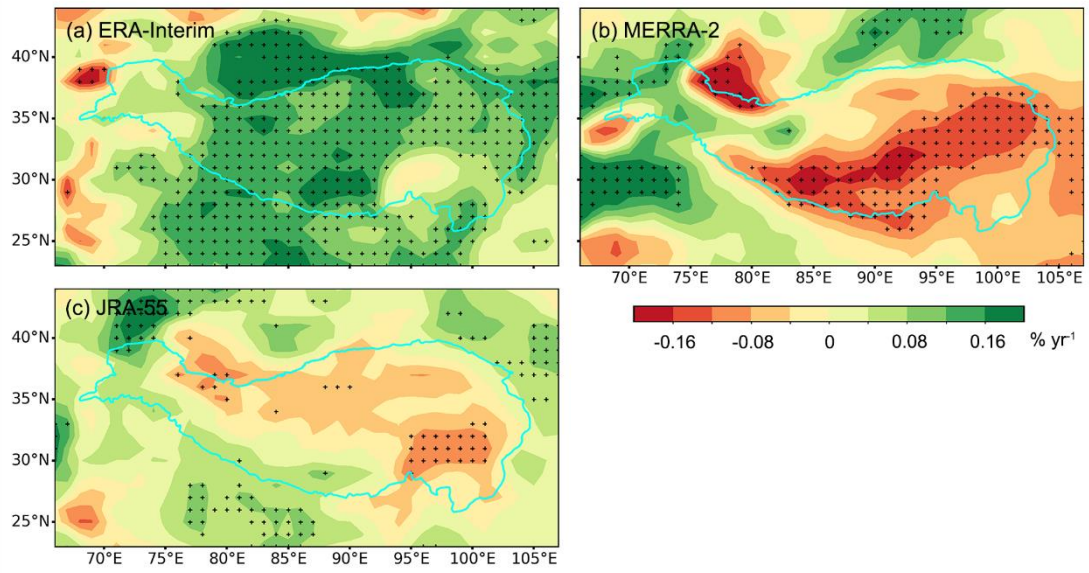


Figure S12: Same as Figures 5a–c but for relative contribution of oceanic moisture.

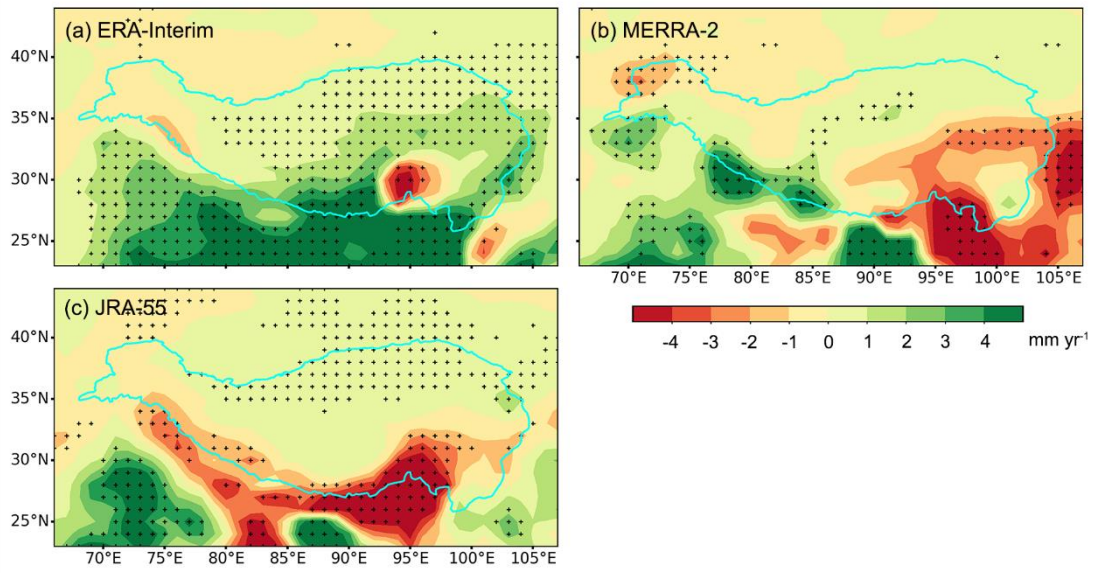
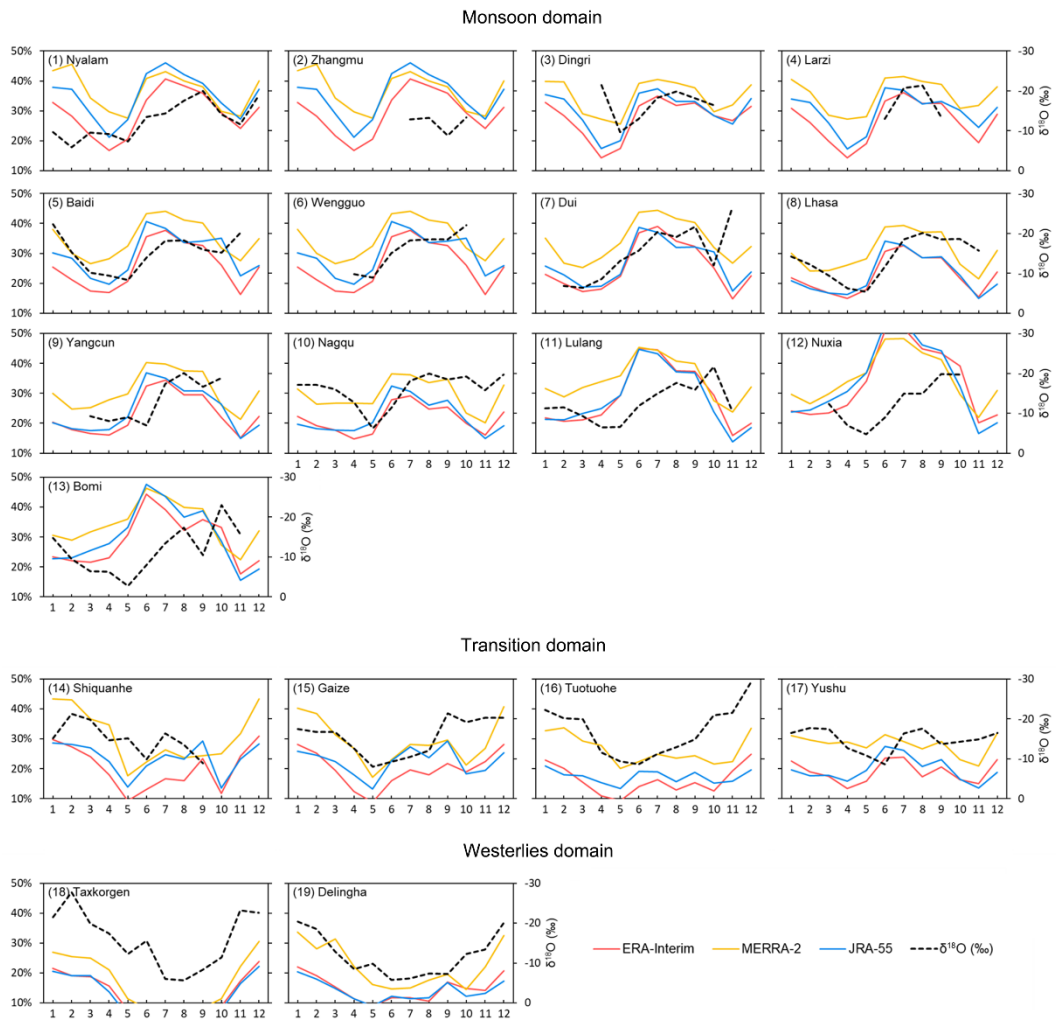


Figure S13: Same as Figure 5a–c but for absolute contribution of oceanic moisture from IO.



55 **Figure S14:** The relationship between monthly relative contributions of moisture from IO in three sets of simulations and precipitation isotope observations at 19 stations.

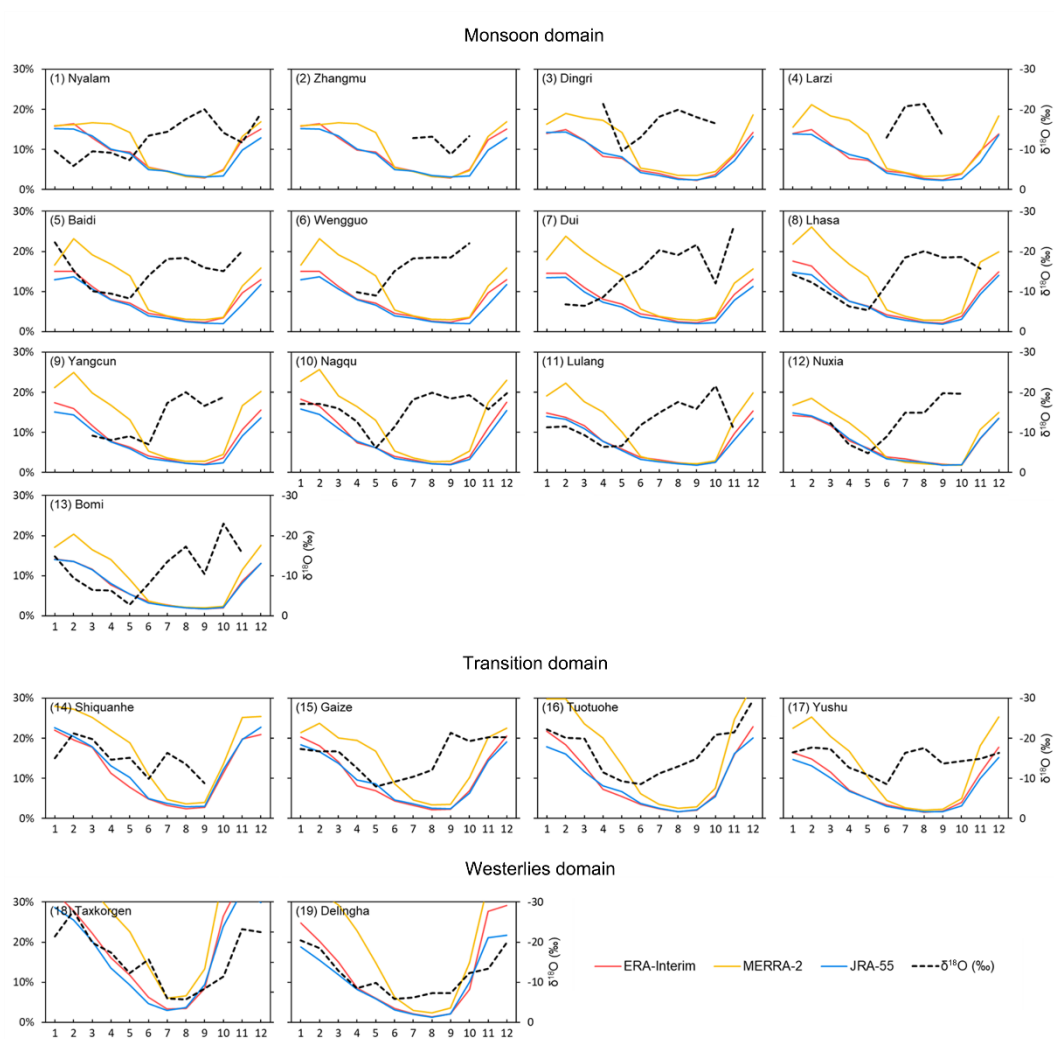


Figure S15: Same as Figure S14 but for relative moisture contribution from WO.

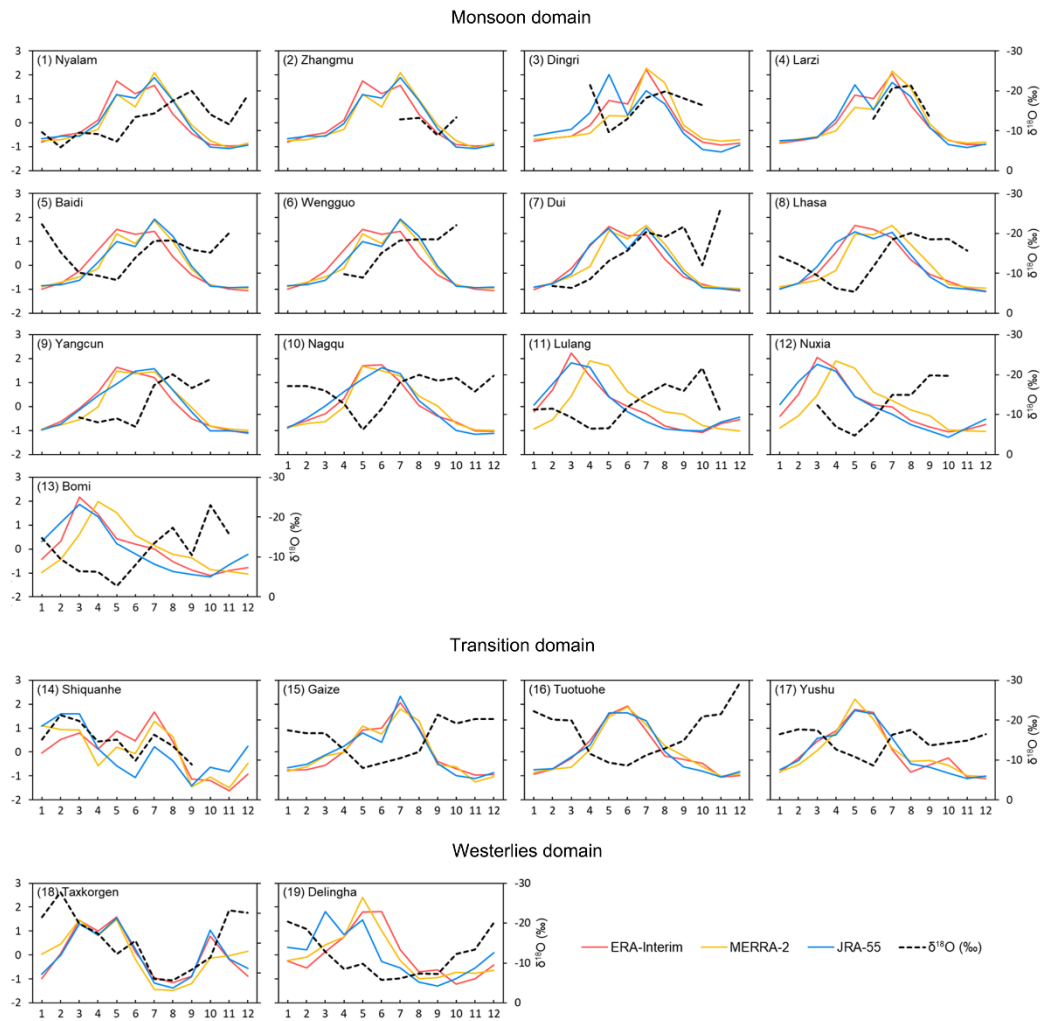
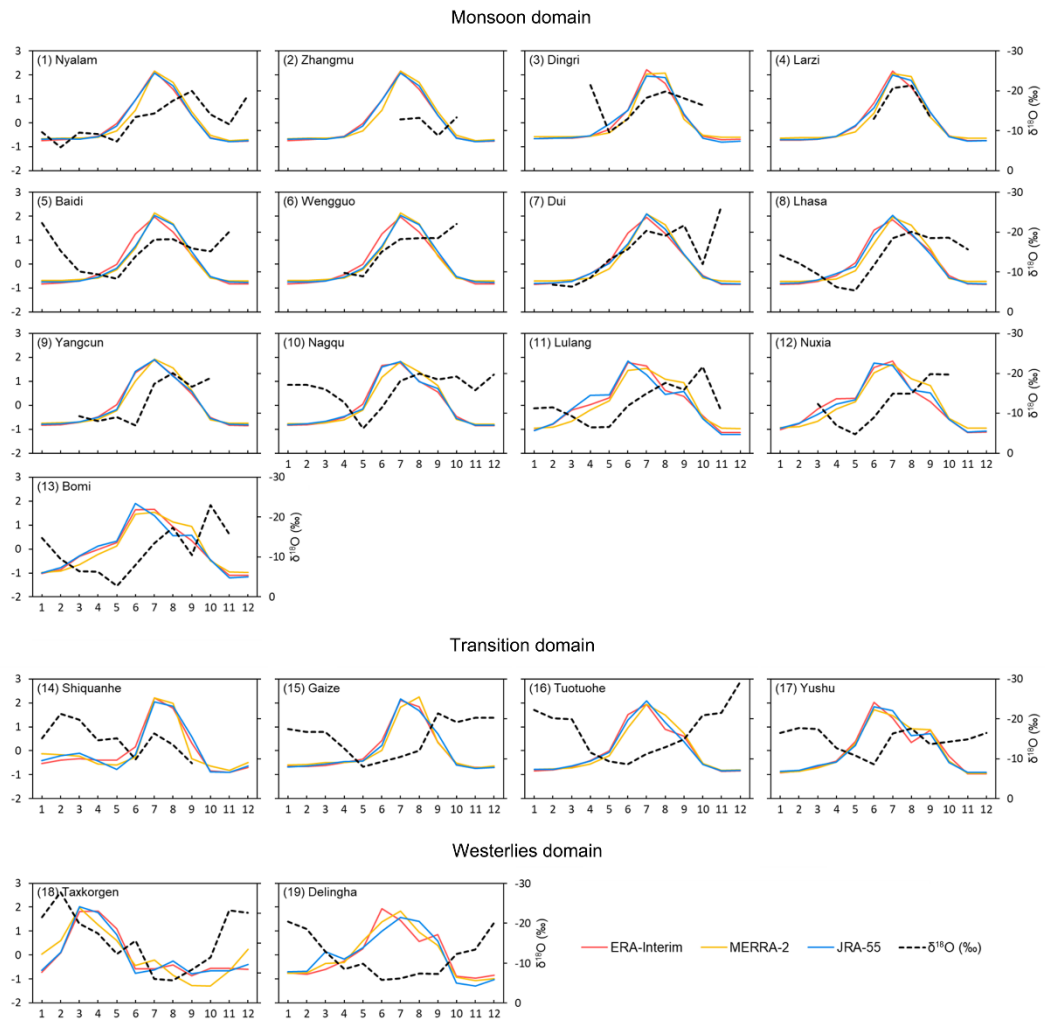


Figure S16: Same as Figure S14 but for absolute moisture contribution from WO. All the absolute contributions are standardized with Z-scores method.



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Figure S17: Same as Figure S14 but for absolute moisture contribution from IO. All the absolute contributions are standardized with Z-scores method.