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The Atlantic/Pacific atmospheric moisture budget asymmetry

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The contrast between basin-integrated precipitation minus evaporation (P-E) of the Atlantic and Pacific Oceans is about 0.4 Sv (1 Sv = 10^9 kg s^{-1}). The Atlantic is net evaporative and the Pacific near neutral – a result consistent across datasets. This asymmetry is linked to the higher sea surface salinity in the Atlantic than in the Pacific (at all latitudes) and the absence of deep-water formation in the Pacific. Here, we investigate the relationship between the inter-basin P-E contrast and the atmospheric moisture transports. First, it is shown that the P-E asymmetry is primarily a result of greater Pacific precipitation (notably south of 30^oN) rather than greater evaporation (per unit area) across the Atlantic. The combined analysis of moisture fluxes across the catchment boundaries of the basins and moisture-tracking Lagrangian technique reveals that the eastward moisture flux across South-East Asia, rather the often-invoked flux across Central America, is the key to the P-E asymmetry. The anomalous flux across South-East Asia (i.e. contrasting with the westward flux found in other basins at the same latitudes) is related to the Somali low-level jet and Asian Summer Monsoon. These circulation patterns, diverting trajectories away from Africa into the westerly flow towards the Pacific, explain the higher efficiency of the moisture import to the Pacific than to the Atlantic/Indian basins.