

Lagrangian tracking of the inter-ocean exchange of water through the atmosphere

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A new Lagrangian method of how to trace the water through the atmosphere from evaporation to precipitation will be presented. The method, based on conservation of water mass, enables the calculation of water mass fluxes, where precipitation is included. These water mass fluxes are then used to compute Lagrangian trajectories, which are otherwise normally calculated from the wind fields. The atmospheric freshwater transport from the Atlantic to the Pacific is traced with this method and shows both quantitatively and qualitatively the different pathways. The water trajectories are started at the ocean surface by evaporation in the Atlantic to the surface in the Pacific, where they are precipitated. Approximately half of the water is transported over America and half over Afroeurasia before precipitating in the Pacific. Zonal Lagrangian stream functions of the water masses are computed from the trajectories showing that the moisture advected over America precipitates in the Eastern Tropical Pacific, while the water flowing over Afroeurasia tends to precipitate in the North or South Pacific. The data used come from the Earth system model EC-Earth for past, present and possible future climates. This new and original way of dealing with the hydrological cycle has just commenced and will be extended to of the entire ocean-atmosphere system.