Dominant balances and exchanges of the atmospheric water cycle

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Reanalysis model output is passed through a broadband filter to determine the normalized covariances that describe the variance of the atmospheric water cycle at various time scales. The balance between precipitation, evaporation, precipitable water tendency, and vapor flux convergence holds at each time scale, allowing 100% of each variable's temporal variance to be described by its covariance with other water cycle components in the same variance category. Global and regional maps of these normalized covariances demonstrate unique balances and exchanges that govern temporal variations in the water cycle, with an emphasis on the variability that corresponds to precipitation. Model sensitivities and biases are also explored by substituting in high-resolution precipitation products.