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SMOS salinity and soil moisture to explain the magnitude and variability of the E-P atmospheric flux

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The role of the SMOS salinity and surface soil moisture data in understanding the magnitude and variability of the global water cycle in the years 2010-2011 is investigated using independent satellite based acquisitions of the Evaporation (E) (GLEAM and OAFlux) and Precipitation (P) (GPCP v2.2). While having a very different physical meaning (soil moisture is a part while salinity is an indirect indicator of the global water cycle), salinity and soil moisture were previously both demonstrated to relate to E-P atmospheric flux over some geographical regions. This study is innovative as it uses SMOS satellite acquisitions over both, land and ocean, and highlights similarities and differences in their relationships to the atmospheric fluxes E, P, and E-P in both domains. In particular, by computing correlations over time and by comparing frequency distributions of the normalized amplitudes of the separate parameters, we investigate on a global scale where and to what extent the salinity and soil moisture parameters match in amplitude or variability to the atmospheric fluxes.

The first results demonstrate the ability of the SMOS salinity data to detect the E-P magnitude over oceans (especially over subtropical anticyclones) and support so existing findings demonstrated with modelled data. Furthermore, the salinity correlates to the E-P flux over majority of areas with significant seasonal variability, while soil moisture correlates to the E-P flux only over transitional areas between very wet and very dry regions (R ranging between 0.6 and 0.8). Inversely, this suggests that over very dry or very wet areas over land surface soil moisture cannot be used in explaining variability of the atmospheric fluxes. Lastly, when comparing, P, E, and E-P fluxes, the P and E-P atmospheric fluxes were the most dominant in explaining variability in both salinity and soil moisture, leaving an insignificant portion of the global coverage where E explained the variability of soil moisture and salinity the best. An important restriction of our analyses is the limited temporal span of the SMOS time-series. As the temporal coverage of the SMOS time-series expands, its better potential to monitor seasonality of salinity observations as well as to detect changes in magnitude and variability of the global water cycle over time is expected.