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Surface hydrological cycle in Atlantic surface waters from stable isotopes

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We explore the potential of seawater stable isotope data (δ18O and δD) to investigate the surface hydrological cycle in surface waters of the Atlantic Ocean and the Mediterranean Sea during the period 2010-2016. Our approach which combines these seawater observations with salinity and stable isotope measurements in the atmospheric water vapor, identifies large scale mixing processes between different water masses. Moreover, based on reasonable assumptions on seawater sources, as well as properties of evaporative and precipitating water, the δ-S distribution gives qualitative indications on the dominant contribution of evaporation (E) and meteoric water input (MW). To provide quantitative estimates of the E:MW ratio, we use the box model from Craig and Gordon (1965) which identifies the subtropical gyre as a region where E:MW $\sim$2 and the tropical ocean as a region were MW:E $\sim$2. Finally, we show that the δ18O-δD distribution is better represented by a linear fit than the δ-S relationship, even in basins governed by different hydrological processes. In the tropical region where MW exceeds E, the δ18O-δD distribution identifies the MW inputs from their kinetic signature, whereas in regions where E exceeds MW, the δ18O-δD distribution traces the humidity at the sea surface.