Oceanic air-water exchange of persistent organic pollutants and aerosol organic carbon at a global scale.

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The estimation of the global oceanic air-water exchange of organic carbon is important to understand its fate, sink and implications for ocean biogeochemistry. On the other hand, persistent organic pollutants (POPs) are not only a stressor for aquatic ecosystems but their study provides clues on the cycling of organic carbon. In the present study we develop and apply a methodology to estimate the diffusive air-water exchange fluxes of POPs over the Atlantic Ocean. Furthermore, inferences of the dominant atmospheric depositional process are also obtained. The methodology is based on atmospheric field measurements of PCBs and PCDD/Fs during north-south Atlantic Ocean transects, satellite retrieved parameters (SST, wind speed, rain, aerosol size distributions,...) and novel parameterizations of size-dependent dry deposition velocities, air-water exchange and wet deposition. Those parameterizations account for the enhancement of diffusive gaseous air-water exchange due to the turbulence generated by rain and the adsorption of organics on the rain drops. Finally, after validating the estimations with measurements for individual organic compounds, the methodology is used to estimate the global atmosphere ocean exchange of organic carbon.