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Systematic and random uncertainties of HOAPS-3.2 evaporation

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The German Research Foundation (DFG) funds the research programme *"FOR1740 – Atlantic freshwater cycle"*, which aims at analysing and better understanding the freshwater budget of the Atlantic Ocean and the role of freshwater fluxes (evaporation minus precipitation) in context of oceanic surface salinity variability.

It is well-known that these freshwater fluxes play an essential role in the global hydrological cycle and thus act as a key boundary condition for coupled ocean-atmosphere general circulation models.

However, it remains unclear as to how uncertain evaporation (E) and precipitation (P) are. Once quantified, freshwater flux fields and their underlying total uncertainty (systematic plus random) may be assimilated into ocean models to compute ocean transports and run-off estimates, which in turn serve as a stringent test on the quality of the input data.

The Hamburg Ocean Atmosphere Parameters and Fluxes from Satellite Data (HOAPS) (Andersson et al. (2010), Fennig et al. (2012)) is an entirely satellite-based climatology, based on microwave radiometers, overcoming the lack of oceanic in-situ records.

Its most current version, HOAPS-3.2, comprises 21 years (1987–2008) of pixel-level resolution data of numerous geophysical parameters over the global ice-free oceans. Amongst others, these include wind speed (u), near-surface specific humidity (q), and sea surface temperature (SST). Their uncertainties essentially contribute to the uncertainty in latent heat flux (LHF) and consequently to that of evaporation (E).

Here, we will present HOAPS-3.2 pixel-level total uncertainty estimates of evaporation, based on a full error propagation of uncertainties in u, q, and SST. Both systematic and random uncertainty components are derived on the basis of collocated match-ups of satellite pixels, selected buoys, and ship records. The in-situ data is restricted to 1995 until 2008 and is provided by the Seewetteramt Hamburg as well as ICOADS Version 2.5 (Woodruff et al. (2011)).

Apart from focusing on spatial uncertainty hotspots, we will furthermore highlight the necessity of correcting the random error components with respect to collocation and in-situ uncertainties. The latter procedure is predicated on triple collocation analysis following O'Carroll et al. (2008), which allows for an error decomposition to isolate the satellite-based uncertainties from those owing to the methodology.