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AirSeaFluxCode: Open-source software for calculating turbulent air-sea fluxes from meteorological parameters

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The exchanges, or fluxes, of heat, moisture and momentum between the atmosphere and the Earth's surface play a crucial role in the Earth's climate system, but the quantification of these fluxes remains challenging due to the non-linearity of surface dynamics and turbulent processes. Bulk formulae are frequently used to estimate surface turbulent fluxes from observed mean (or bulk) meteorological quantities. Uncertainties are inherent in the parameterisations as they rely on observations that are themselves uncertain and may not sample the full range of important conditions or include all of the variables that may affect the fluxes. As a consequence, different parameterisations of the bulk formulae may give different estimates of the fluxes.

AirSeaFluxCode is an open-source software package implemented in Python 3.6 for the computation of surface turbulent fluxes of heat (latent and sensible) and momentum. It includes ten different parameterisations, each based on published algorithms. The parameterisations implemented in the new package can be used to calculate the fluxes using a small number of input parameters that are typically observed or available as model output: wind speed; air temperature; sea surface temperature; atmospheric pressure; and humidity. Some parameterisations require the input of a "skin" sea surface temperature so code to relate skin temperature to temperature at depth is included. In addition the code can be used to do height corrections of mean parameters.

This open-source software package is intended to be accessible, easy to use in its default implementation, and to provide a more informed choice of suitable parameterisations for particular applications.