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1-Dimensional Modelling of Heat and Gas Exchange in the Tropical Atlantic using the General Ocean Turbulence Model (GOTM)

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In order to quantify the air-sea exchange of heat and gases it is first necessary to have a clear understanding of the factors influencing transfer near the air-sea interface. Within the framework of a 1D model, processes near the air-sea interface can be examined in detail. Incoming solar radiation is a function of time of day, and as such the tropical oceans are particularly susceptible to strong diurnal warming. Thus diurnal changes in temperature will affect the amount of gas exchange taking place through changes in solubility, in addition free convection at night may enhance gas exchange. We propose the use of a combination of in situ and satellite derived radiometric measurements and the General Ocean Turbulence Model (GOTM) to investigate heat and gas exchange over the diurnal cycle in the Tropical Atlantic. Measurements of the temperature difference across the molecular boundary layer ('cool skin') of the ocean can be related to the interfacial gas transfer coefficient as similar laws govern the exchange of heat and gases. Meteorological data from the PIRATA array in the Tropical Atlantic are used in conjunction with cloud cover estimates from Meteosat-7, to calculate fluxes of longwave, latent and sensible heat along with a heat budget and temperature profiles for 2002. We aim to integrate satellite measurements of the oceanic skin temperature, in order to more accurately derive the cool skin temperature difference and hence estimate gas transfer. Through model experiments into the changes in heat, and gas flux over the course of the diurnal cycle we hope to quantify the net contribution from different processes in the Tropical Atlantic and improve regional estimates of gas exchange.