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Diurnal Warming Observations with ASIP in the subtropical Northern Atlantic

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Quantification of air-sea exchange fluxes of energy, moisture, momentum and gases require in situ-measurements of the near-surface layer of the ocean. In the framework of the Salinity Processes in the Upper Ocean Regional Study (SPURS) project, we participated in two cruises to the North Atlantic Salinity Maximum (NASM) region. Observations in the upper ocean are obtained with the Air Sea Interaction Profiler (ASIP), which is an upwardly-rising microstructure instrument designed to study processes in the mixing layer of the ocean. ASIP operates autonomously for up to two days, obtaining undisturbed profiles within the water column from depth to the immediate surface. During the SPURS experiment, ASIP was deployed on several occasions, resulting in a total of over 1000 profiles of the ocean surface boundary layer. ASIP is equipped with microstructure sensors for temperature (FP07), conductivity (SBE07), shear, accurate C-T sensors, a PAR and an oxygen sensor.

The high resolution temperature profiles obtained, combined with information on local meteorological variables, allow for an accurate study of the temporal and vertical variability of diurnal warming of the upper ocean boundary layer. Characteristics of the measured diurnal warming at the ocean surface and at specific depth levels are compared to physics-based models of near-surface warming.

Mixing rates in the upper ocean are determined from the turbulent dissipation rate, calculated from profiles of the turbulent shear. This information is used to quantify variability between the modeled and observed diurnal warming signal.