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Comparison of SMOS measurements of sea surface salinity during SPURS using a high-resolution, vertical profiler

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The European Space Agency's Soil Moisture and Ocean Salinity (SMOS) satellite was launched in 2009 and, for the first time, provides measurements of sea surface salinity on a global scale. Ocean salinity is a key parameter for climate change, being closely associated with the global hydrological cycle and an important driver in determining overall ocean circulation. This makes the advent of satellite measurements of salinity a significant advance.

During the Salinity Processes in the Upper Ocean Regional Study (SPURS) field experiments, in September 2012 and March 2013, a variety of in-situ platforms were deployed with the purpose of validating the salinity observations from SMOS. One of these platforms was the Air-Sea Interaction Profiler, a microstructure profiler which provides high-resolution profiles of salinity, temperature and turbulence right up to the surface.

This last capability is crucial. Most oceanic microstructure profilers operate when travelling downwards, and are therefore unable to accurately observe the layer of the ocean immediately below the surface. It is this top layer, approximately 1 cm in thickness, which satellites observe. In contrast, ASIP is upwardly-rising, allowing it to sample the same part of the water column as satellites, such as SMOS. This is important since large thermal and haline stratifications can develop close to the surface, particularly under conditions of strong evaporation.

Although sea surface salinity in the open ocean is largely determined by the balance between evaporation and precipitation, the effects of various vertical mixing processes also contribute. ASIP is extremely well-suited to understanding the impact of these on differences between ASIP and SMOS, and some results are also presented here which demonstrate the important effect of such processes.