Investigating feedbacks between atmospheric convection and near surface processes in the ocean

Through the exchange of heat and momentum at the sea interface, the ocean and the atmosphere communicate with each other and concur to determine the state of the climate system. But many of the involved processes happen on scales that are not explicitly resolved in state-of-the-art climate models. Such processes may be at best parameterized, which lead to model biases and energetic inconsistencies. Here, we propose to investigate these small-scale coupling mechanisms using coupled simulations on a global scale, based on resolutions allowing us, for the first time, to directly simulate the underlying key processes. We focus on the potential interactions between trade wind cumuli, which are ubiquitous over the tropical ocean and play a key role in determining the energetics of the climate system, and near surface processes in the ocean. In particular, on the ocean-side, we are interested at the dynamics of thin (meter-scale) "diurnal warm layers" and "rain layers" that can develop at the ocean surface, their role in mediating air-sea fluxes, and their feedback with atmospheric convection.