Geophysical Research Abstracts
Vol. 16, EGU2014-6901, 2014
EGU General Assembly 2014

Impact of a sea surface skin temperature scheme in coupled NWP and climate simulations

Livia Thorpe, José M. Rodríguez, Tim Johns, Alison McLaren, Chris Harris, Peter Sykes, Martin Best, and James Manners

Met Office, Exeter, United Kingdom (livia.thorpe@metoffice.gov.uk)

Coupled air-sea interaction plays a prominent role in the predictability of the climate system on seasonal and inter-annual time scales, and also has potential relevance for forecasting on NWP timescales. A key variable in air-sea interaction is the temperature at the air-sea interface, which is conventionally represented or prescribed in models in terms of a 'bulk' or 'foundation' sea surface temperature (SST), representative of the ocean at a few meters depth. In atmospheric NWP models SST is usually prescribed from observed data but without diurnal variability. A realistic simulation of mean SST and its variability is a crucial test of the model physics in coupled climate models.

In reality, air-sea fluxes are determined by the sea surface skin temperature (skin SST) rather than SST and, driven by the diurnal solar radiation flux, skin SST can exhibit a substantial diurnal variation that departs significantly from the SST of the top meter or so of the ocean under suitable conditions of strong insolation and light winds. In order to examine the significance of the skin SST and diurnal cycle effects we have therefore implemented a new prognostic scheme in the MetUM coupled model version GC2 (containing NEMO ocean and CICE sea ice components), in which the SST is used together with an effective thermal conductivity for the top meter of the ocean (either prescribed or potentially diagnosed from the model state) to calculate implicitly both the skin SST and non-solar surface heat fluxes on a timestep-by-timestep basis. We evaluate the new coupling scheme versus the conventional bulk SST coupling scheme by comparing the modelled diurnal cycle of SST in coupled NWP simulations against corresponding data from a MTSAT-1R satellite-based observed skin SST dataset for the tropical Warm Pool region (GHRSST Tropical Warm Pool Diurnal Variability Project, TWP+). We also assess the impact of the scheme on climate simulations. The coupled NWP and climate simulations are both run at $\sim$60km atmosphere and $\sim$25 km ocean resolution using the same model physics.