Geophysical Research Abstracts
Vol. 20, EGU2018-1890, 2018
EGU General Assembly 2018

From Surface to Atmosphere – Impact of sea surface temperature on formation of low level clouds and coastal fog

Joachim Fallmann (1,2) and Huw Lewis (2)

(1) University Mainz, Institute of Atmospheric Physics, Mainz, Germany (j.fallmann@gmx.de), (2) UK Met Office, Exeter

High impact weather is typically manifested through various interactions and feedbacks between different components of the Earth System. An accurate prediction and warning of the impacts of severe weather requires an integrated approach to forecasting and complex processes need to be understood for different weather situations from global to convective scale.
Sea surface temperature (SST) is an important factor in air sea interactions influencing local weather and climate but on the other hand however it is also controlled by atmospheric conditions. Ocean waves govern the exchange of momentum at the interface between ocean and atmosphere, modifying local wind speeds and vertical mixing in both ocean and atmosphere.
This presentation discusses results from a fully coupled state-of-the-art high resolution probabilistic forecast system for the UK at km-scale, consisting of configurations of the Unified Model atmosphere, including the JULES land surface model, coupled to the NEMO ocean model and WAVEWATCH III wave model.
Our study focuses in particular on the impact of changing surface forcing resulting from changes in sea surface temperature and ocean waves on the formation of low level clouds and coastal fog over a UK domain. The sensitivity of the ocean state to changes in the atmospheric evolution resulting from coupling is explored comparing the fully coupled system to its uncoupled atmosphere, ocean and wave configurations.
Results from different case studies indicate, that an increase of SST can modify heat and moisture fluxes at the interface between ocean and atmosphere, thus changing the dynamical properties of the marine boundary layer above. Depending on meteorological conditions and area of interest, a warmer sea surface can either intensify the formation of low level clouds or decrease coastal fog. Both effects represent air-sea interactions and are important for regional weather and environmental prediction. We use data from satellites, wave buoys and measurement towers to verify the model results.