



Modelling storm development and the impact when introducing waves, sea spray and heat fluxes

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In high wind speed conditions, sea spray generated due to intensity breaking waves have big influence on the wind stress and heat fluxes. Measurements show that drag coefficient will decrease in high wind speed. Sea spray generation function (SSGF), an important term of wind stress parameterization in high wind speed, usually treated as a function of wind speed/friction velocity. In this study, we introduce a wave state depended SSGG and wave age depended Charnock number into a high wind speed wind stress parameterization (Kudryavtsev et al., 2011; 2012). The proposed wind stress parameterization and sea spray heat fluxes parameterization from Andreas et al., (2014) were applied to an atmosphere-wave coupled model to test on four storm cases. Compared with measurements from the FINO1 platform in the North Sea, the new wind stress parameterization can reduce the forecast errors of wind in high wind speed range, but not in low wind speed. Only sea spray impacted on wind stress, it will intensify the storms (minimum sea level pressure and maximum wind speed) and lower the air temperature (increase the errors). Only the sea spray impacted on the heat fluxes, it can improve the model performance on storm tracks and the air temperature, but not change much in the storm intensity. If both of sea spray impacted on the wind stress and heat fluxes are taken into account, it has the best performance in all the experiment for minimum sea level pressure and maximum wind speed and air temperature.

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