The impact of Sea-Surface Temperatures on Numerical Weather Predictions

Ioannis PYTHAROULIS, Ioannis TEGOULIAS, Stelios KOTSOPOULOS, and Theodore KARACOSTAS
LABORATORY OF METEOROLOGY AND CLIMATOLOGY, SCHOOL OF GEOLOGY, FACULTY OF SCIENCES, ARISTOTLE UNIVERSITY OF THESSALONIKI, 54124 THESSALONIKI, GREECE (pyth@geo.auth.gr)

The sea surface temperatures (SSTs) seem to affect the meteorological conditions in different ways. Several studies have shown that depressions and convective storms are sensitive to SSTs. However, the eastern Mediterranean meteorological bomb of January 2004 was strongly affected by the upper air dynamics, and not by the SSTs. The goal of this research is to investigate the impact of the SST definition and parameterization on the operational numerical weather predictions produced in WaveForUs project, aiming to improve the model performance. The nonhydrostatic Weather Research and Forecasting model (WRF-ARW) is utilized in the operational forecasts and the numerical experiments. Three 2-way telescoping nests cover Europe and northern Africa (domain 1), the central and a large part of eastern Mediterranean (domain 2) and northern Greece – Thermaikos Gulf (domain 3) at grid-spacings of 15km, 5km and 1.667km, respectively. Experiments are performed for selected cases with synoptic and/or convective activity in the area of interest. In the control experiment, NCEP SSTs (1/12 x 1/12 deg.) are used, kept constant throughout the forecast. In the 2nd experiment the initial SSTs are the same with the control run, but vary with time according to the predicted meteorological conditions, using the parameterization of Zeng and Beljaars. In the 3rd experiment, very high-resolution JPL/NASA SSTs (0.01 x 0.01 deg.) are employed. The forecasts are evaluated and the mechanisms that influence the model performance are investigated. In general, the use of time-varying SST forcing seems to improve the model forecasts, but not significantly.