EMS Annual Meeting Abstracts
Vol. 14, EMS2017-391, 2017

Satellite data assimilation impact on short-term forecasts for the Sofia region

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It is noteworthy that 54% of the world's population (almost 4 billion people) now lives in urban, rather than rural areas. Sofia is the capital of Bulgaria and constitutes the largest city in the country, containing a sixth of the whole population. Global weather forecasting and regional models used by meteorological services are not capable of predicting and describing meso-meteorological processes well, especially in complex orography. Sofia city is located in a very complex terrain and has a specific local microclimate. The remote sense data assimilation was applied as a number of studies in recent years have demonstrated significant improvements in model results using this method

The objective of this study is to develop short-term high-resolution data assimilation capability that can provide local forecasts with improved analysis of atmospheric conditions, with sufficient detail and accuracy for supporting weather services, airport safe operations and local air quality assessment studies and forecasts. The impact of high-resolution data assimilation on short-term mesoscale numerical weather prediction using the Weather Research and Forecasting model was investigated. The primary focus of this effort was to design a system that optimally utilizes available weather data. Several case studies were investigated utilizing this model, including the analysis of the behavior of precipitation and convective systems for the Sofia region. These cases were comprehensively validated against observations, comparing model outputs with and without data assimilation. The effect data assimilation has on the improvement of model results for short range forecasts was examined.