

Regional Reanalysis – Why Bother?

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A model-based reanalysis of past weather can be obtained by combining observational datasets from surface stations and satellites with a comprehensive Numerical Weather Prediction (NWP) model. Using modern data assimilation methods, a complete estimate of the atmospheric state is computed that is both dynamically consistent and optimally close to the observations. The great benefit of a reanalysis is that it provides a complete picture of the atmosphere, covering the whole of the 3-dimensional domain, not only of the observed variables, but also of those that are not directly measured.

Regional model-based reanalyses attempt to provide high-resolution detail to supplement the synoptic-scale features resolved by the current generation of global reanalyses (e.g. ERA, JRA-25, MERRA). A particular focus for regional reanalysis is to provide mean/variability estimates of particular weather parameters (e.g. rainfall rates, cloud amounts, mean/minimum/maximum surface temperatures, etc). This talk will begin with a review of past and current regional reanalyses. The talk then attempts to justify the need for regional reanalyses using results from previous regional reanalyses (e.g. the North American Regional Reanalysis – NARR) as well as from recent Met Office regional NWP studies which attempt to answer the question ‘Regional NWP – Why Bother?’. Results indicate that although global reanalysis/NWP models may provide superior analyses of the synoptic-scale meteorological fields (e.g. PMSL, jet-level winds), regional reanalysis/NWP does indeed add value for those near-surface weather parameters that affect human populations most directly.

The **European Reanalysis and Observations for Monitoring (EURO4M)** project is funded by the EU to ‘provide timely and reliable information about the state and evolution of the European climate. It combines observations from satellites, ground-based stations and results from comprehensive model-based regional reanalyses’. The EURO4M project runs from April 2010 to March 2014. In this talk, we will focus on results to date from the Met Office’s contribution to the EURO4M project’s Work Package 2: Model-Based Reanalysis. The regional reanalysis framework is based on a European 12km configuration of the Met Office’s Unified Model, nesting within a global reanalysis provided by the ERA-CLIM project. The main observation database is common with ERA, but supplemented by additional high-resolution observations provided by EURO4M collaborators. The assimilation makes use of the state of the art four-dimensional variational data assimilation (4D-Var) approach. In the talk, further details of the regional reanalysis setup will be provided, together with initial results demonstrating the benefit gained from running the high-resolution nest within the global reanalysis. Finally, plans for further work within the EURO4M regional reanalysis will be outlined. Research areas include an assessment of the impact of data assimilation resolution (12 to 36km gridlength), demonstration of the direct assimilation of cloud and precipitation observations, evaluation of the impact of estimates of forecast error tuned for the regional reanalysis domain, and potential applications in other areas of the world.

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