

Quantifying lateral boundary spin-up in regional models using an age of air diagnostic

James Warner, UK Met Office

Regional high-resolution models often produce improved forecasts as they can resolve smaller scale processes such as convection. These models are driven at the lateral boundaries by an often-coarser model, with a step change in resolution. Weather systems ranging from mesoscale to synoptic scale passing through the boundary undergo spin-up into the higher resolution domain, which can impact on rainfall, mesoscale structures, and development of weather systems. From an ensemble perspective, the lateral boundaries and domain size can impact on ensemble spread, error growth, and spin-up properties. Choice of a sufficiently large domain are often subjective. We introduce an age of air diagnostic that characterises when air passes through the lateral boundaries and apply this to three case studies over Australia of varying weather type. We contrast the existing smaller ACCESS-C domains with the new pan-Australia domain, to examine lateral boundary spin-up in conjunction with this new diagnostic. The larger domain produces more realistic convective post-frontal features, which strongly correlate to the age of air within the domain. A generalisation of this diagnostic is applied to reanalysis to show typical age of air climatologically, encouraging future work with the diagnostic in terms of contrasting weather regimes, forecasts busts, and attributing errors in regional models from the driving model. To this extent, the diagnostic will shortly be deployed into the Convective Scale Evaluation Toolkit, providing a means for all partners to utilise the diagnostic as an evaluation tool for their modelling systems.