



Impact of stratospheric resolution on seasonal forecast skill for Europe

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The impact of stratospheric resolution on seasonal forecast skill for Europe is cleanly assessed in two versions of the Hadley Centre's atmospheric climate model HadGEM2-A. The standard version of the model with 38 levels extends to an altitude of 39km, while the extended version with 60 levels has enhanced stratospheric resolution and reaches 84km altitude. The horizontal resolution of both models is N96. We conduct 15-member ensemble hindcasts for a suite of 15 winters within the last 45 years to assess the forecast skill and atmospheric response of each model to stratospheric sudden warming (SSW) events, the El Nino Southern Oscillation (ENSO), and the Quasi-Biennial Oscillation (QBO).

Both models produce a similar strong Arctic Oscillation / North Atlantic Oscillation response to the QBO, while increased stratospheric resolution significantly improves the European surface response to ENSO and improves the predictability and strength of SSW events. On average, the L60 model captures SSWs earlier than the L38 model (12d before an event compared with 8d) and better predicts seasonal European surface temperature anomalies at these longer lead times, highlighting the benefit of vertical resolution and initialising the operational forecasts daily.