A global perspective on the limits of prediction skill of NWP models

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Abstract:

Many studies of the forecast-error growth focused on the extra-tropical quasi-geostrophic dynamics and often considered the error-free large-scale initial state. In contrast, the operational global numerical weather prediction and ensemble prediction systems are characterized by uncertainties in the initial state at all scales, especially in the tropics. In fact, the simulated analysis and forecast uncertainties in the global prediction system of ECMWF show that the larger the scale, the greater the initial uncertainties. Moreover, the growth of uncertainties at large scales appears dominant over the impact of errors cascading up from small scales; in other words, the upscale error cascade appears not the key process for the growth of the global forecast uncertainties in the medium range. In the seminar, I will present a new parametric model for the representation of the error growth. The model does not involve computation of the time derivatives of the empirical data and it provides the asymptotic error from the model constants. The results from the model application to several datasets from a global NWP system will be used to discuss evolving practical predictability limits over the past few years and their sensitivity to the reduction of analysis uncertainties at many scales.