

SESSION: (C2) Research to operation (includes seamless prediction)

(C2-01)

From reliable initialised forecasts to skilful climate projection: a dynamical systems approach

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While models for initialised forecasts can be rigorously tested by performing and evaluating many hindcasts, the limited observational record restricts the degree to which climate models and their projections can be evaluated. Therefore a key question of interest is: to what degree can we evaluate the potential skill of a climate model's projections by evaluating short-range initial value forecasts produced by the same model? We address this question using a dynamical systems framework. We derive the mean climate response of a general dynamical system to a small external forcing, and relate this response to the reliability of initial value forecasts. We find that in order to capture the mean climatic response, the forecast model must correctly represent the slowest modes in the system. Reliable forecasts on seasonal and longer timescales could therefore be indicative that the climate model of interest will respond correctly to an applied anthropogenic forcing. This indicates the potential of using the 'seamless prediction' framework in evaluating climate models. We also highlight some important caveats: an unreliable seasonal forecast does not necessarily indicate an incorrect climate projection, as correct representation of fast processes is also necessary for reliable seasonal forecasts.