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# Initial-Value vs. Model-Induced Forecast Errors: A New Perspective

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Numerical models of the atmosphere are based on the best theory available. Understandably, the theoretical assessment of errors produced by such models is confounding. Without clear theoretical guidance, the experimental separation of the model-induced part of the total forecast error variance is also challenging. In this study, forecast error and ensemble perturbation variances are decomposed. Independent smaller- and larger-scale components separated as a function of lead time are found to be associated with features that completely or only partially lost skill, respectively. For their phenomenological description, the larger-scale variance is further decomposed orthogonally into positional and structural components. An analysis of the various components reveals that chaotically amplifying initial perturbation and error variance predominantly leads to positional differences in forecasts, while structural differences are interpreted as an indicator of model-induced error. The relatively small amplitude of model-induced errors confirms earlier assumptions and limited empirical evidence that numerical models of the atmosphere may be near perfect on the scales they well resolve.