

Weather Forecast or Weather Generator Systems: Use Each as Needed

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Numerical Weather Prediction (NWP) involves the assessment of the state of the atmosphere and surrounding geospheres (data assimilation), and the projection of this “initial” state into the future (numerical integrations). Since the atmosphere is a chaotic system, errors in its initial state amplify in the numerical integrations. It is well understood that forecast skill strongly depends on spatiotemporal variability: fine scales lose predictability first, while larger scales retain information about the future state of the system longer. Integrations with numerical models that start with analyzed initial conditions are called forecasts. This reflects the intention of predicting the future state of natural systems. With longer lead time, an increasing part of (first the smaller, then also the larger scale) forecast variance, however, becomes decorrelated from reality. A numerical integration started as a forecast tool thus gradually becomes a weather (noise) generator. This presentation will review various applications including limited area forecasting, climate simulations, and ensemble prediction to distinguish between weather forecast and weather generator functionalities. Such an analysis may offer a rational basis for the choice of appropriate tools, identifying some potential new areas where more efficient, statistically based weather generators, if they can satisfy some additional requirements, may serve as viable alternatives to the more traditionally used numerical integrations.