

Title of Speech:

Numerical Weather Prediction (NWP) Deterministic or Stochastic?
Introduction to Ensemble Forecasting, a New Era of NWP

Speaker:

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Speech Introduction:

The current tradition in weather forecasting is deterministic and a forecast is usually expressed in a single value. However, given chaotic nature of highly nonlinear NWP models, initially tiny intrinsic errors can be significantly amplified with time under unstable conditions in model integration. Therefore, forecast uncertainty and predicability limit is a very real and important property of an NWP system. Without quantifying uncertainty, a forecast is incomplete. A complete forecast should be expressed in a probabilistic distribution associated with flow-dependent uncertainty information.

Ensemble forecasting is a dynamical approach to quantify forecast uncertainty. Quantifying and conveying forecast uncertainty is also important for end-users to make best decision to better serve society and people. Not only ensemble forecasting is able to quantify forecast uncertainty but also transforms an NWP from one-way to two-way interactive system. Traditionally, only observation impacts a model forecast (as initial condition input) but no feedback from forecast to observation. However, in this new two-way system, forecast information can also be used to modify how and what to be observed, a process called Adaptive or Targeted Observation.

Therefore, ensemble forecasting is fundamentally changing the current practice of weather forecasting and shaping the future of weather, climate and water prediction.

This talk will use the NCEP's Short-Range Ensemble Forecasting (SREF) system as an example to illustrate (1) how to capture uncertainty in an NWP system; (2) how to convey uncertainty information to forecasters and users and how end-users should use probability information in their decision-making process; and (3) how to use adaptive observation technique to possibly reduce forecast uncertainty.