Detection of Lognormal Signals in Different Atmospheric Flows

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An important assumption made in most variational, ensemble and hybrid-based data assimilation systems is that all minimised errors are Gaussian random variables. There has been theory developed at CIRA that enables for the Gaussian assumption for the different types of errors to be relaxed to a lognormally distributed random variable. While this is a first step towards using more consistent distributions to model the errors involved in numerical weather/ocean prediction, we still need to be able to identify when we need to assign a lognormal distribution in a mixed Gaussian-lognormal approach.

In this presentation, we present some new techniques that have been developed and tested in the Lorenz 63 model, as well as against 6-hour forecasts from the Global Forecasting System (GFS). GFS would be the initial background state for the next data assimilation cycle, to identify changes in the distribution of different components between a Gaussian to a lognormal behaviour, and vice-versa, but also to demonstrate that some variables change parameters of the same distribution for different flows.