Data Assimilation: what is the point?

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Abstract

Questions of data assimilation are often posed in the form of an inverse problem: given a series of observations and a dynamical model of the system which generated them, the problem of identifying plausible states for hindcasting, nowcasting and forecasting are well posed when the model is empirically adequate and the noise model relating model variables to observations is known. Inasmuch as an empirically adequate model admits trajectories with shadow the observations to within the noise, data assimilation has an aim even if this aim is a distribution, not a point. When the model is not empirically adequate the situation is somewhat different. It is not clear what the aim of data assimilation is as no consistent solution to the inverse problem is expected. Applications to laboratory systems, the Earth's atmosphere and the Earth's climate system are examined in this context.