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A comparison of 4DVAR with Kalman filter on the QG two-layer model

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Four dimensional variational data assimilation (4DVAR) and the Kalman filter (KF) are extensively compared with quasi-geostrophic (QG) two layer model. The model mimics a realistic dynamical system of extratropical transient eddies in a simplest possible manner.
The 4DVAR system is a smoothing system which satisfies all the restrictions in the assimilation window and uses the cost function as a measure of minimization. However, the KF system is a filtering system that revises the model variables and needs the calculation of the model error covariances at each observation time.
In this study, we examine the each characteristics of two data assimilation methods revealed on their algorithm through a series of numerical simulations. And sensitivity on the length of assimilation window, quality of observation and the regime dependency of initial condition has been presented for the both assimilation system.

Keywords: 4DVAR; Kalman filter; Error covariance modeling; minimization process

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