On two common localisation frameworks in ensemble Kalman filters.

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We investigate two common localisation frameworks. The first (global) framework can be formulated by replacing the background covariance by its Schur product with a global correlation matrix. In the second (local) framework the analysis for an element of the state vector is calculated using observations within certain distance from this element only. Both approaches are used in operational oceanographic and atmospheric data assimilation systems; however, their relation has not been studied.

In this work we provide analytical relationship between the two approaches that exposes their commonalities and differences. We show that localisation in global and local frameworks leads to different results, although in practice the difference can be insignificant. This difference is explained by contribution to the analysis of observations beyond the local domain in one case and lack of such contribution in the other case. We also show that the global framework can be inconsistent, resulting in the non-positive semidefinite analysed covariance, while the local framework is always consistent.