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An adaptive additive inflation scheme for Ensemble Kalman Filters

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Data assimilation for atmospheric dynamics requires an accurate estimate for the uncertainty of the forecast in order to obtain an optimal combination with available observations. This uncertainty has two components, firstly the uncertainty which originates in the the initial condition of that forecast itself and secondly the error of the numerical model used. While the former can be approximated quite successfully with an ensemble of forecasts (an additional sampling error will occur), little is known about the latter. For ensemble data assimilation, ad-hoc methods to address model error include multiplicative and additive inflation schemes, possibly also flow-dependent. The additive schemes rely on samples for the model error e.g. from short-term forecast tendencies or differences of forecasts with varying resolutions. However since these methods work in ensemble space (i.e. act directly on the ensemble perturbations) the sampling error is fixed and can be expected to affect the skill substiantially. In this contribution we show how inflation can be generalized to take into account more degrees of freedom and what improvements for future operational ensemble data assimilation can be expected from this, also in comparison with other inflation schemes.