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Particle filters for convective-scale assimilation

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Roland Potthast, Anne Walter, Andreas Rhodin, Nora Schenk, Liselotte Bach, Takemasa Miyoshi, Shunji Kotsuki, Peter Jan van Leeuwen

We discuss the development of non-linear filtering methods for very high-dimensional systems. In this talk, non-linear filtering is developed in the framework of the convective-scale ensemble data assimilation system ICON-KENDA of DWD with upcoming 2km operational resolution at DWD. ICON-KENDA will also be used by the COSMO consortium (Germany, Switzerland, Italy, Russia, Poland, Romania, Greece and Israel) and its partner countries to provide initial conditions for high-resolution ensemble forecasting systems. We have ported the particle filter to the new ICON-D2 model framework, also including incremental analysis update (IAU). We also discuss recent experiments with conventional plus SEVIRI all-sky Satellite data in the visible range.

In a broader framework, we discuss ongoing research and results on the localized adaptive particle filter (LAPF) and a Localized Mixture Coefficient Particle Filter (LMCPF). We discuss how to overcome filter collapse or divergence by adaptive rejuvenation by mapping into ensemble space and by using adaptive spread estimators. Recent progress is shown on the LMCPF particle filters for Lorenz 63 and 96 models, where now with Gaussian mixture particles and proper covariance inflation the particle filter usually shows comparable or better o-b statistics than the LETKF. We also discuss recent activities on localised particle filter implementations at RIKEN, Japan.

Primary author: Prof. POTTHAST, Roland (DWD)

Co-authors: Dr RHODIN, Andreas; Mrs WALTER, Anne (Deutscher Wetterdienst); Dr BACH, Liselotte; Mrs SCHENK, Nora (Deutscher Wetterdienst); Prof. VAN LEEUWEN, Peter-Jan; Dr KOTSUKI, Shunji; Prof. MIYOSHI, Takemasa

Presenter: Prof. POTTHAST, Roland (DWD)

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