Contribution ID: **25** Type: **not specified**

Situation-dependent inter-channel error correlations for all-sky data assimilation

Wednesday, 4 November 2020 11:30 (25 minutes)

Satellite observations sensitive to cloud and precipitation are assimilated in operational weather forecasting using the 'all-sky' approach. A key part of this is a situation-dependent model for observation error, which inflates the variances in cloudy conditions to represent large increases in model error and representation error. Observation error correlations are in general not yet represented, despite the fact that model error and representation error can generate strong error correlations between channels and between observations. To complicate the picture there are state-dependent biases associated with inadequate modelling of cloud and precipitation in forecast models. Further complication comes from the importance of variational quality control in all-sky assimilation, and the potential difficulty of combining this with the error correlations. This work explores two ways to account for situation-dependent error correlations. One is to use a single all-sky error covariance matrix with eigenvalue scaling to provide situation-dependence. This relies on the projection of most of the cloud signal onto the leading eigenvector of the error covariance matrix. The second approach selects from more than 100 situation-dependent error covariance matrices stored in a lookup table. This has advantages particularly for all-sky microwave assimilation, where channel usage is variable and cloud projects onto several of the eigenvectors. In both methods, systematic error patterns can be amplified in an undesirable way by the trailing eigenvectors, leading to degradation of the analysis. This can be addressed through reconditioning, and to understand such features of error covariance modelling, the "eigenjacobians" and "eigendepartures" proved to be useful tools. Although some issues remain, both the eigenvalue scaling and the lookup table approaches are viable ways of representing situation-dependent inter-channel error correlations.

Presenter: GEER, Alan (ECMWF)

Session Classification: Session 4 continued: Observation errors