



Local ensemble transform Kalman filtering with an AGCM at a T159/L48 resolution

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The local ensemble transform Kalman filter (LETKF) method of the atmospheric data assimilation is developed and assessed with AFES (AGCM for the Earth Simulator) at a T159 horizontal and 48-level vertical resolution, corresponding grid size of 480x240x48. Sensitivities with the ensemble size and localization scale are investigated. Experiments with various ensemble sizes are performed: up to 1000 members for the initial one-step assimilation and up to 80 members for cycle experiments. 10-member ensemble is large enough to stabilize the filter with an observational coverage of just 1% of the entire grid points and under the perfect model assumption, although the analysis errors are significantly larger than those of larger ensemble sizes. With larger ensemble sizes, the filter performs better, especially up to 80. There is non-negligible dependence on the localization scale, tuning is suggested for a chosen ensemble size. Computational time per analysis is operationally feasible, less than 4 minutes on the Earth Simulator, peak performance of 64GFlops per node, if as many computational nodes as the ensemble size are used and they are less than 80. The LETKF algorithm is efficient in parallel computers, the parallelization ratio as large as 99.99% has been achieved. Balancing the cost and performance, 40 may be a good choice of the ensemble size with the current experimental settings.