Deutscher Wetterdienst
Wetter und Klima aus einer Hand

VarETKF Exercises

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Exercises part 4: varETKF

In this part of the exercises we will use the hybrid method called varetkf. The standard settings for varetkf are

- `opt.which="3v"` (runs VarETKF and 3dVar for comparison)
- `opt.obsloc=1:40`
- `opt.obserr=1.0`
- set `b_inf=3.28` and `rho=1.0`

With this setting for `b_inf` the constant 3dvar **B** matrix is optimal tuned. We still have to fix the relative weights of the constant and ensemble part and start with

- `beta1h2=1.0`.

`beta1h2` is the weight of the ensemble **B** matrix (the weight for the constant part is given by the condition `beta1h2` + `beta1h1` = 1.0).

Exercises part 4: varETKF

Run the simulation with `run95(500,opt,10,5,5,1.0)` to use 5 ensemble members and first write down the RMSE of the 3dVar and the pure VarETKF. Can you find a value of `beta1h2` with a RMSE smaller than both the pure VarETKF and the 3dVar? Fix your results in the tabular.

β_{ens}	**rmse 3dvar**	**rmse varetkf**
1.0		
0.9		

Exercises part 4: varETKF

Now we use `rho = 1.05`; run the simulation with `run95(500,opt,10,5,5,1.05)`. How do the results change?

β_{ens}	**rms 3dvar**	**rms var**
1.0		
0.9		

Exercises part 4: varETKF

Next we use `N_ens = 10`, `rho = 1.05`. Run `run95(500,opt,10,10,5,1.05)`. Compare the result of VarETKF and 3dvar. With this settings, it is not possible to obtain better results by a mixing of the methods. Why is the VarETKF much better although the system is spatial and temporal inhomogenous? We want to try to figure this out by plotting the estimated and the true error for both methods. Set `plot_err = 1` and run the simulation. Two additional plots appear. They show the true RMSE of 3dVar and VarETKF as well as the estimated one. Can you explain why the VarETKF performs much better than 3dVar?

Exercises part 4: varETKF