Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Eidgenössisches Departement des Innern EDI
Bundesamt für Meteorologie und Klimatologie MeteoSchweiz

Introduction to the Scilab Exercises

Hendrik Reich, DWD

Daniel Leuenberger, MeteoSwiss

Michael Würsch, LMU München

DWD-HErZ winterschool on data assimilation

13-17. February 2012, DWD, Offenbach

Scilab Exercises

- Small assimilation testbed using the L95 toy model

- Assimilation methods
  - 3dVar
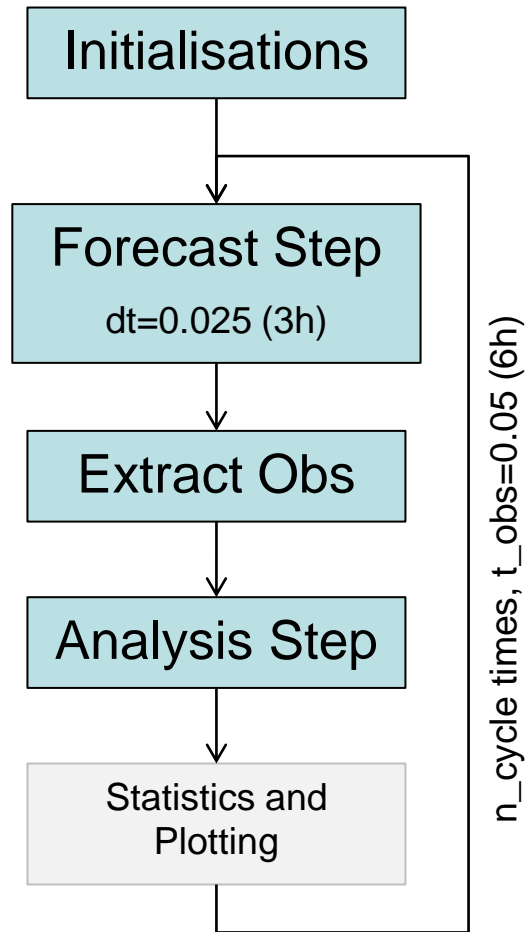 - LETKF
  - varETKF (hybrid 3dVar/LETKF)
  - Nudging

Scilab files

- getoptions.sce   defines settings
- run95.sce   runs the simulations
- c_traj.sci   integrates L95 trajectory in time
- rk4.sci   Runge Kutta time step of L95
- plot_results.sci   plots the simulation results
- plot_b.sci   plots the B-Matrices
- B6h1.r8   static 3dVar B-Matrix

Simulation Schematics

run95

- Main driving function
- Time step dt = 0.025 (corresponds to 3h)
- Obs frequency t_obs = 0.05 (corresponds to 6h)

- run95(n_cycle,options,g_nu,N_ens,a_letkf,rho)

  - n_cycle   number of assimilation cycles
  - options   struct of simulation settings
  - g_nu   Nudging constant   10
  - N_ens   number of ensemble members   10
  - a_letkf   localisation radius for LETKF   5
  - rho   covariance inflation parameter   1

getoptions

- Struct holding the most important options
- `opt = getoptions()`
- Options
  - **opt.modelerr**   model error   0
  - **opt.modelsize**   number of DOF in L95   40
  - **opt.obserr**   observation error   10
  - **opt.plotfreq**   plot update frequency   10
  - **opt.B**   show B-Matrix plot   0
  - **opt.seed**   random number seed   0
  - **opt.which**   which DA method?   «»
  - **opt.obsloc**   location of observations   1:40
  - **opt.plot_free**   plot the free forecast results   1

Getting started

- Open the files run95.sce and getoptions.sce with the scilab editor
- In each of the source files select
  «Execute -> …file with no echo»   (or ctrl-shift-e)
- In the console type

```
run95(200);
```
  A plotting window opens and shows the results of a L95 simulation (truth and free forecast). At the end, the avg. RMS error of the free forecast is displayed in the console.
- In the console type

```
opt = getoptions()
opt.modelerr = 2
run95(200,opt);
```

- Compare the RMS error with that of the first simulation