Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Eidgenössisches Departement des Innern EDI
Bundesamt für Meteorologie und Klimatologie MeteoSchweiz

Exercise Observation Nudging

Hendrik Reich, DWD
Daniel Leuenberger, MeteoSwiss
Michael Würsch, LMU München

DWD-HErZ winterschool on data assimilation
13-17. February 2012, DWD, Offenbach

Ex 1: First Simulation

- Set the default options for the simulation with
  `opt = getoptions`

- Type
  `opt.which='n'` to switch on nudging
  `opt.obsloc = 1:2:40;` to observe every 2nd grid point

- Run the simulation with `run95(200,opt);`

- What can you say about the RMS error of the nudging?

Ex 2: Observation density

- Start a second simulation with a reduced observation density with

```
opt.obsloc=1:5:40;
run95(200,opt);
```

- How did the RMS error change?

- Change the distribution of the observations (continents and sea) with

```
opt.obsloc=1:5,10:15,20:25,30:35;
run96(200,opt);
```

- How did the RMS error change?

Ex 3: Observation Error

- Start the reference simulation with
```
opt.obsloc=1:2:40;
run95(200,opt);
```

- Start a simulation with doubled observation error:
```
opt.obserr=2;
run95(200,opt);
```

- How has the RMS error changed?

- Start simulations with observation error 4,8 and 16

Ex 4: Model Error

- Start the reference simulation with

```
opt=getoptions();
opt.which='n';
opt.obsloc=1:2:40;
run95(200,opt);
```

- Set the model error to 1 and run the simulation

```
opt.modelerr = 1;
run96(200,opt);
```

- What can you say about the RMS error?

Ex 5: Nudging Constant

- Start the reference simulation with
```
opt=getoptions;
opt.which='nudging';
opt.obsloc=1:2:40;
run96(200,opt);
```
- Change the nudging constant from the default value of 10 to 100 and repeat the simulation
```
run96(200,opt,100);
```
- How has the error changed? Why?
- Change the nudging constant to 0.1 and repeat the simulation
```
run96(200,opt,0.1);
```
- How has the error changed? Why?
-

Ex 6: Tuning of the Nudging Constant

- Perform a brute force tuning of the nudging constant G with `tune_g([1:2:20],200,[1:2:40],1);`

- This sets a parameter range from 1 to 20 with step 2, uses 200 analysis cycles and the default observation distribution and 1 realization.

- Make a more robust tuning using multiple realizations with different initial conditions.