Regional Cooperation for
Limited Area Modeling in Central Europe

LACE
nwp central europe

Dispersion spectra of 3DVar with different setups

Antonín Bučánek, DAWD, Wien 18.-20. 9. 2013

DHMZ SHMU OMSZ ZAMG ROMANIA ANM

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1. Experiment setup

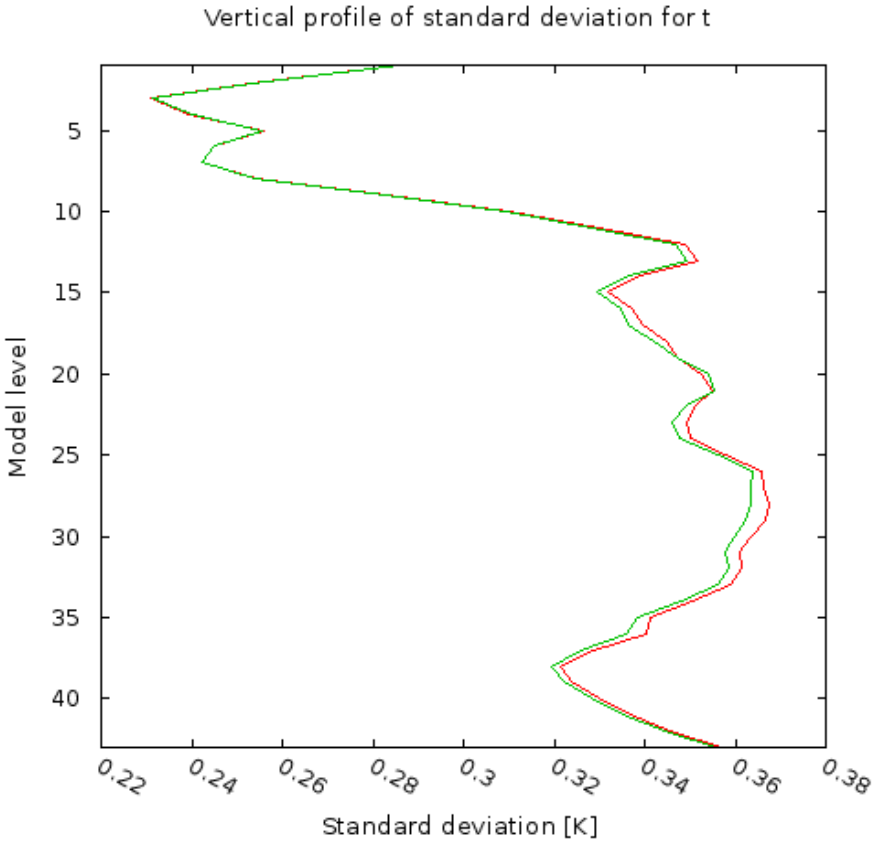
LAM Aladin ensemble coupled to AEARP is used to diagnose backgound error dispersion. Dispersion is measured by variance and stde of ensemble differences which should simulate background errors.

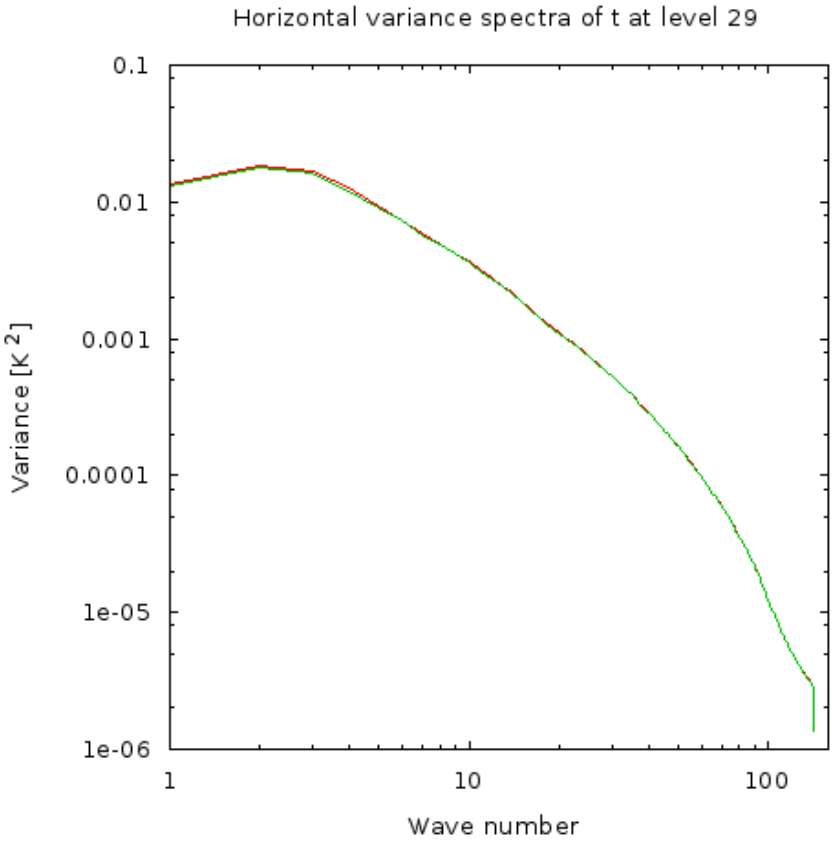
3DVar assimilation cycle with update every 6h is setup for all experiments. Incoming observations are pertubed. Perturbation are constructed as random draws from normal distribution with variance equal to assumed observation error variance.

- Aladin cycle 36t1ope, LACE domain, linear truncation E159x143, Δx ~ 9km, 43 vertical levels time step 360s, coupling interval 3h
- Experimental period 2.-28. 2. 2011, AEARP Δx~50km

2. Dispersion response to different number of observations

A) Single obs experiment, Red - guess aladin, green - 3dvar analysis





It seems that after minimization two members are closer to each other in stde profiles while their variance spectra seems really similar

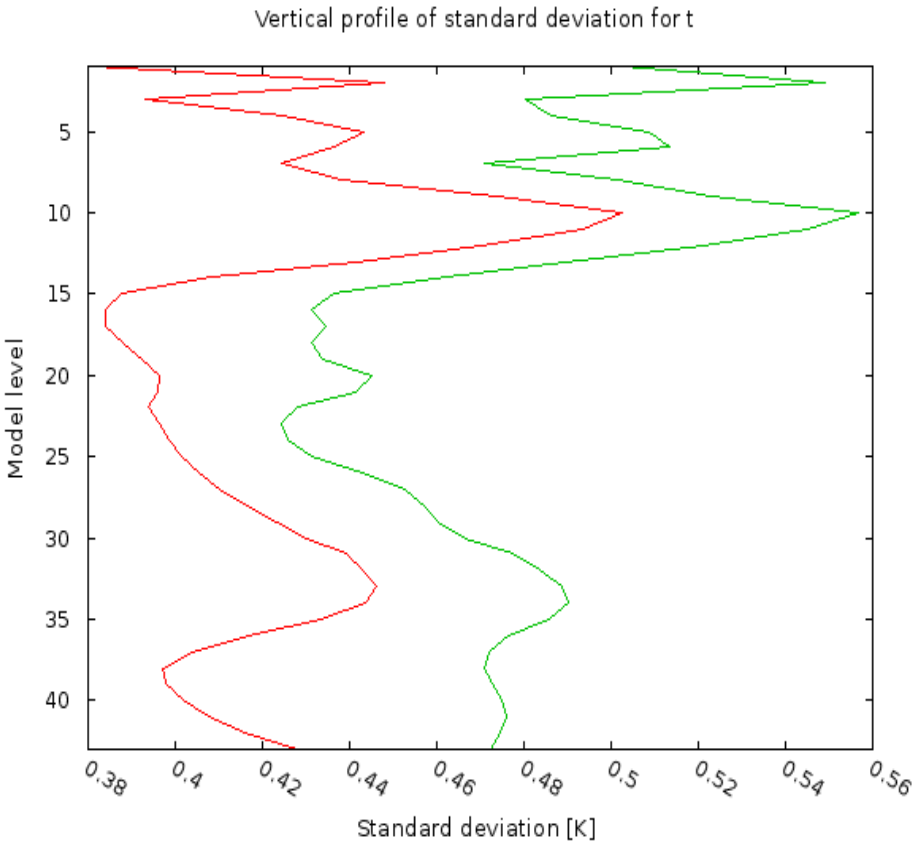
2. Dispersion response to different number of observations

B) Only Synop, Temp observations

red - guess aladin,
green - 3dvar analysis

Increase of stde after analysis is the most pronounced in temperature as well as in humidity. Vorticity and divergence stde is allmost the same for analysis and guess but in variance spectra there is the increase.

Larger variace of analysis is located in long waves (up to wave number 11)



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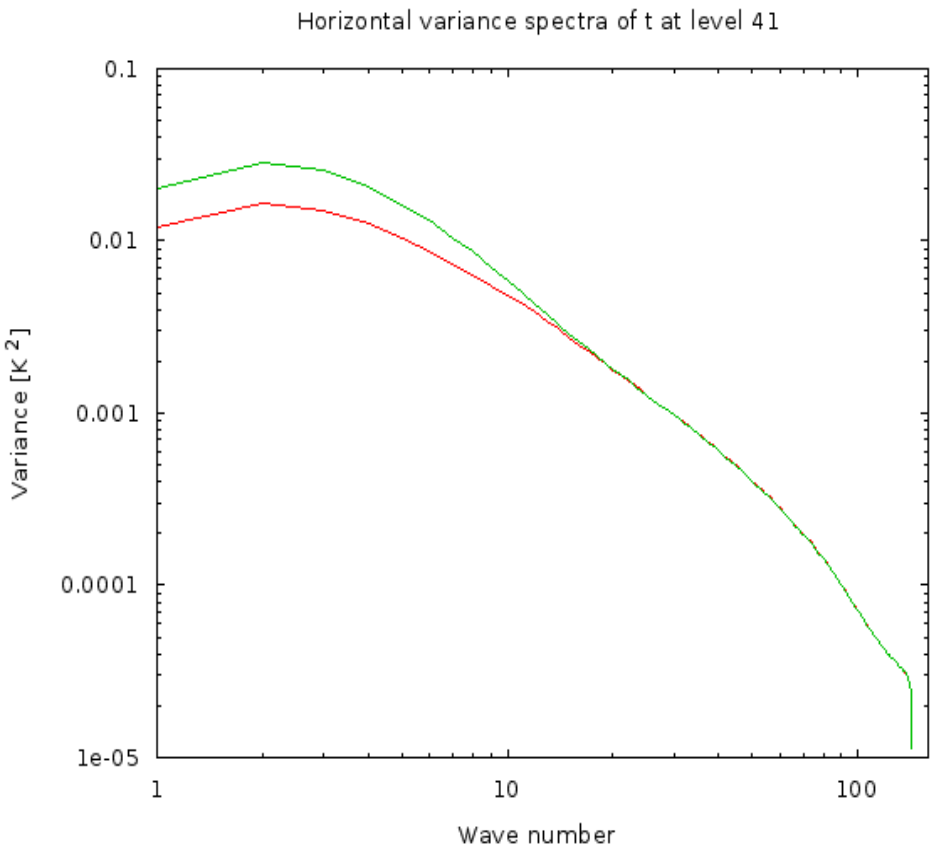
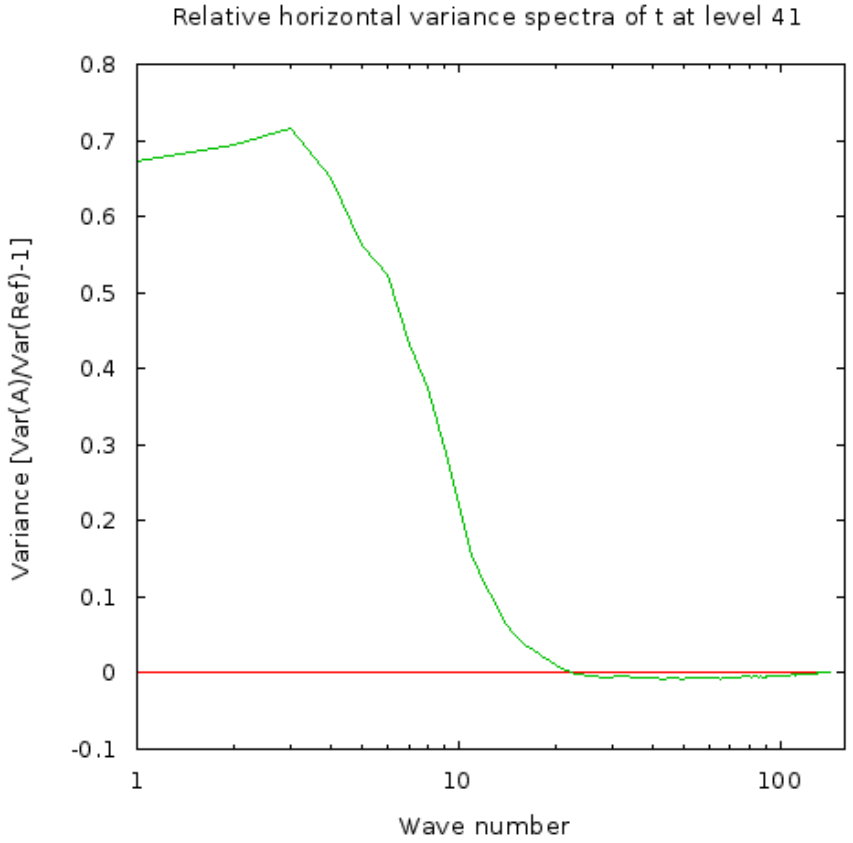




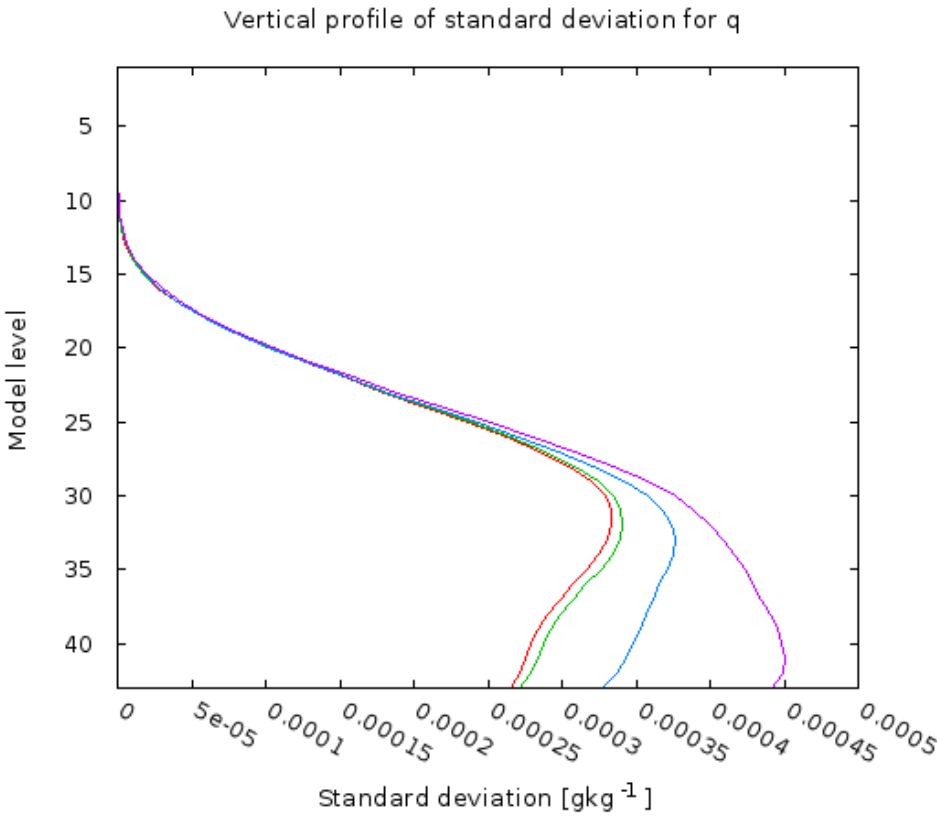
red - guess aladin, green - 3dvar analysis

2. Dispersion response to different number of observations

C) More obs (Synop,Temp, Amdar, Windprofiler, Satob)

Similar behavior as B). There is over all increase of variance and increase of variance in long waves is even more pronounced.

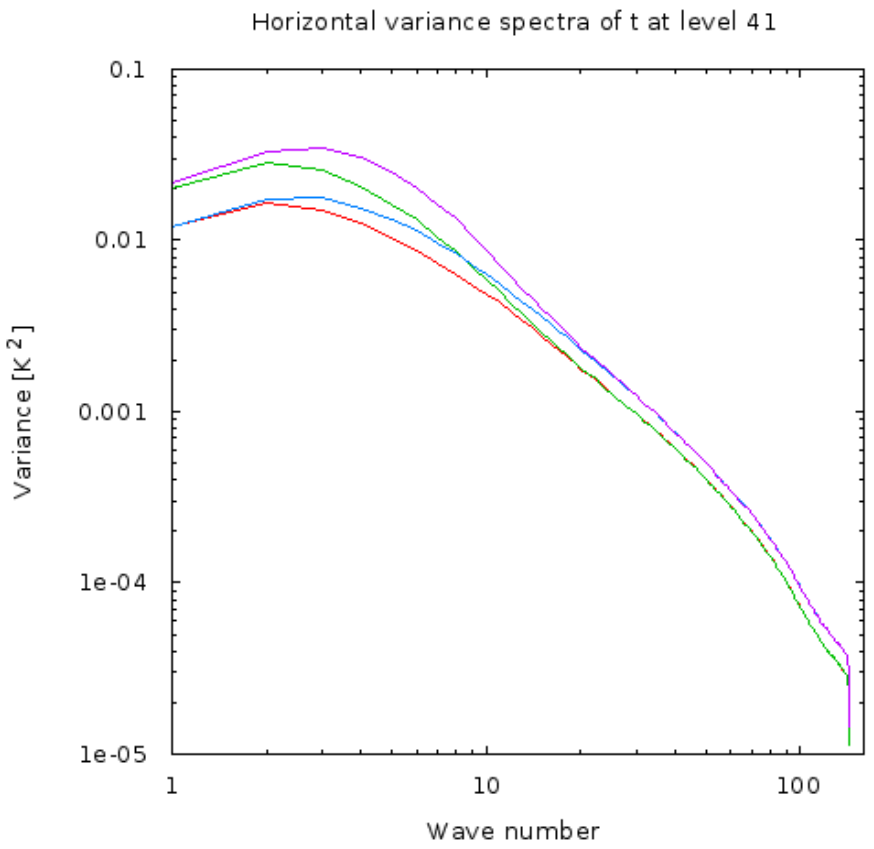
red – guess aladin,
green – 3dvar analysis
blue – guess aladin more obs,
purple – 3dvar analysis more obs

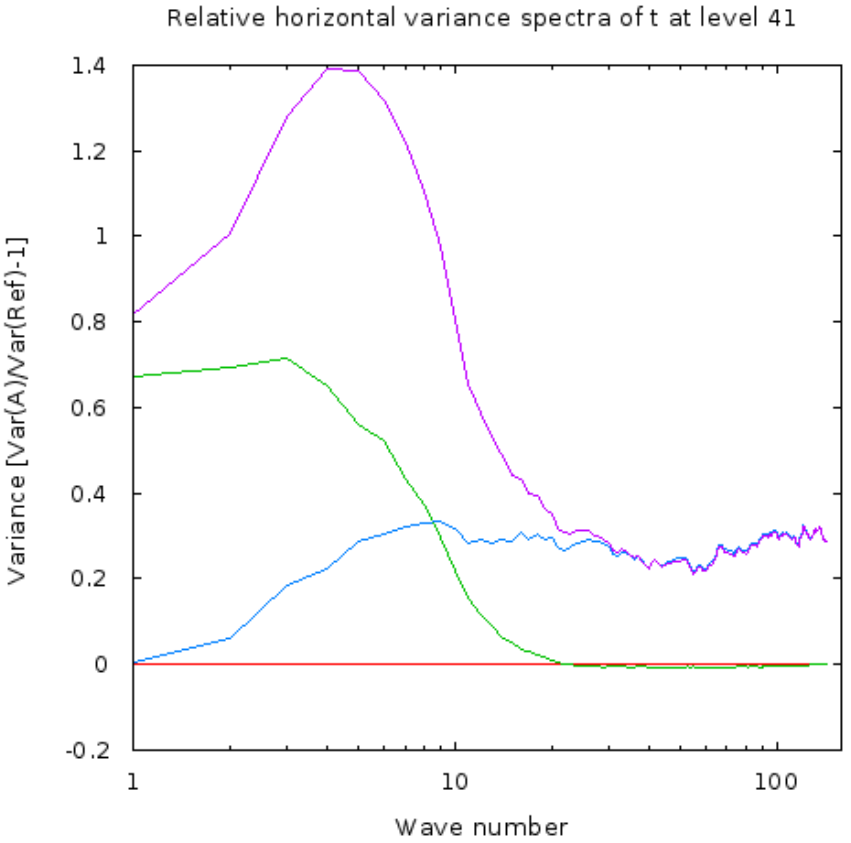


2. Dispersion response to different number of observations

C) More obs

red – guess aladin, green – 3dvar analysis
blue – guess aladin more obs, purple – 3dvar analysis more obs





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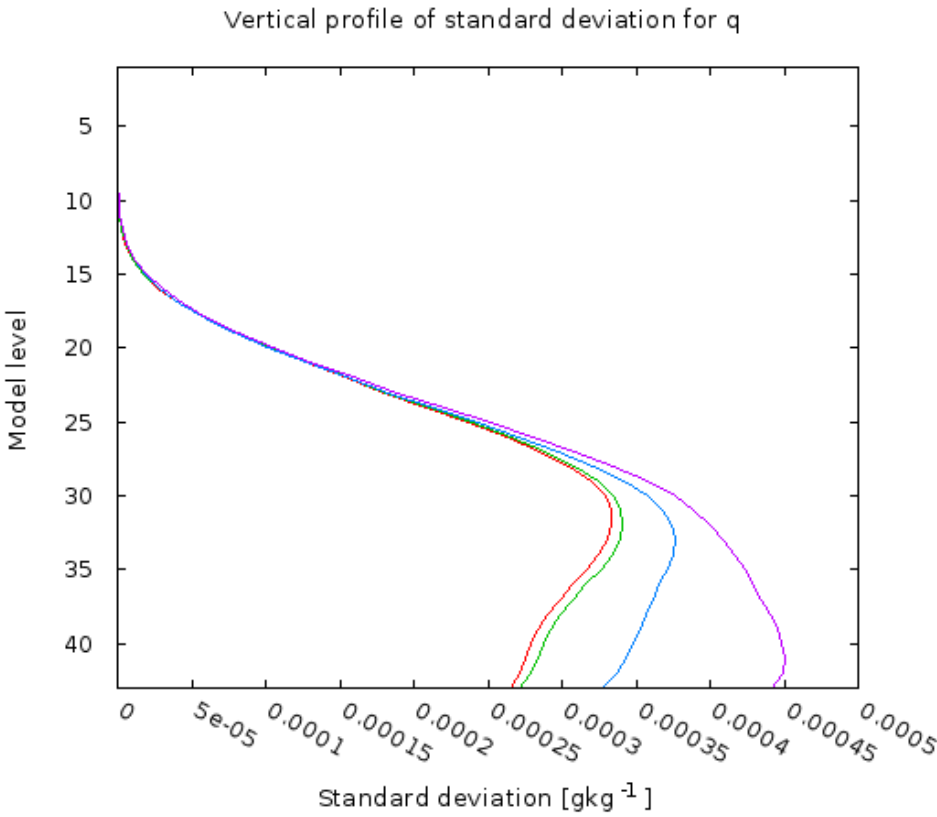
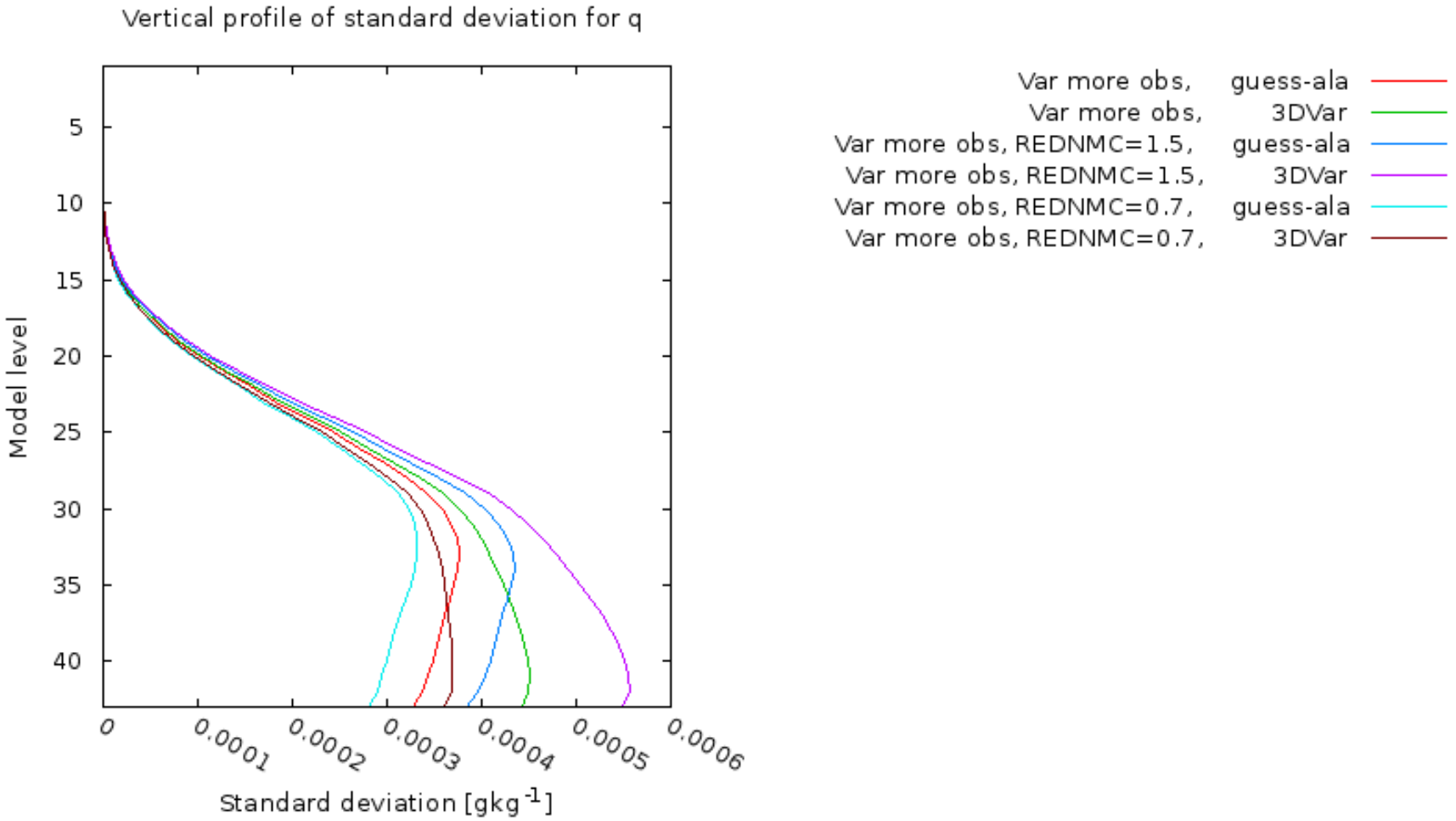


3. Influence of dispersion by increasing REDNMC

- REDNMC = 0.7, 1, 1.5
- Guess gets less weight for larger REDNMC
- It doesn't make difference in general behavior of 3DVar
- Larger REDNMC implies larger values of variance and standard deviation

3. Influence of dispersion by increasing REDNMC



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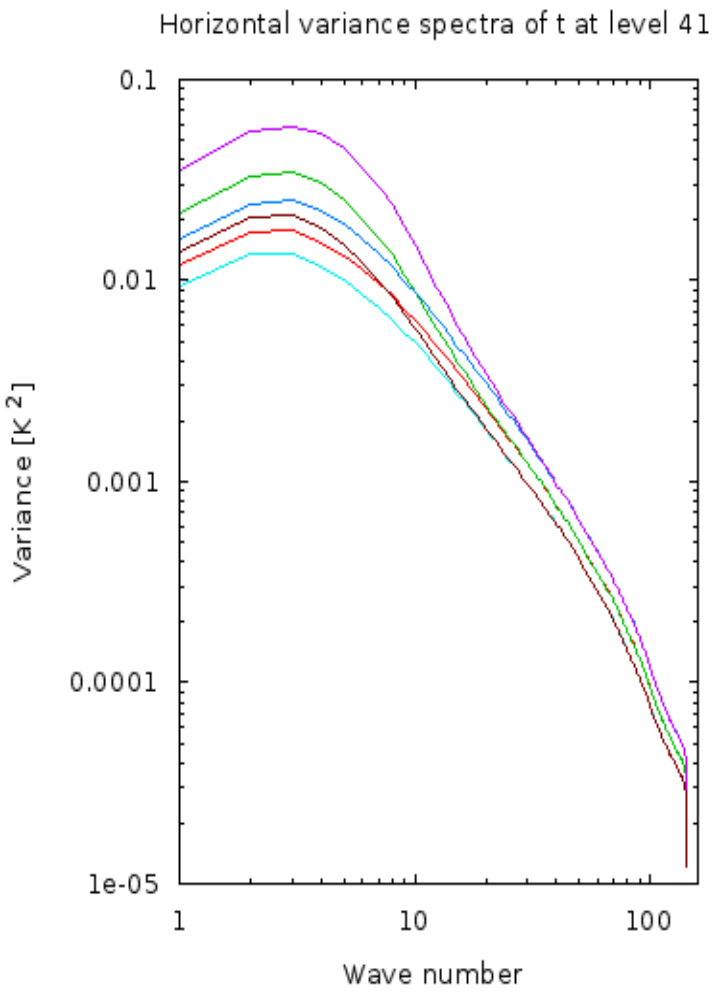
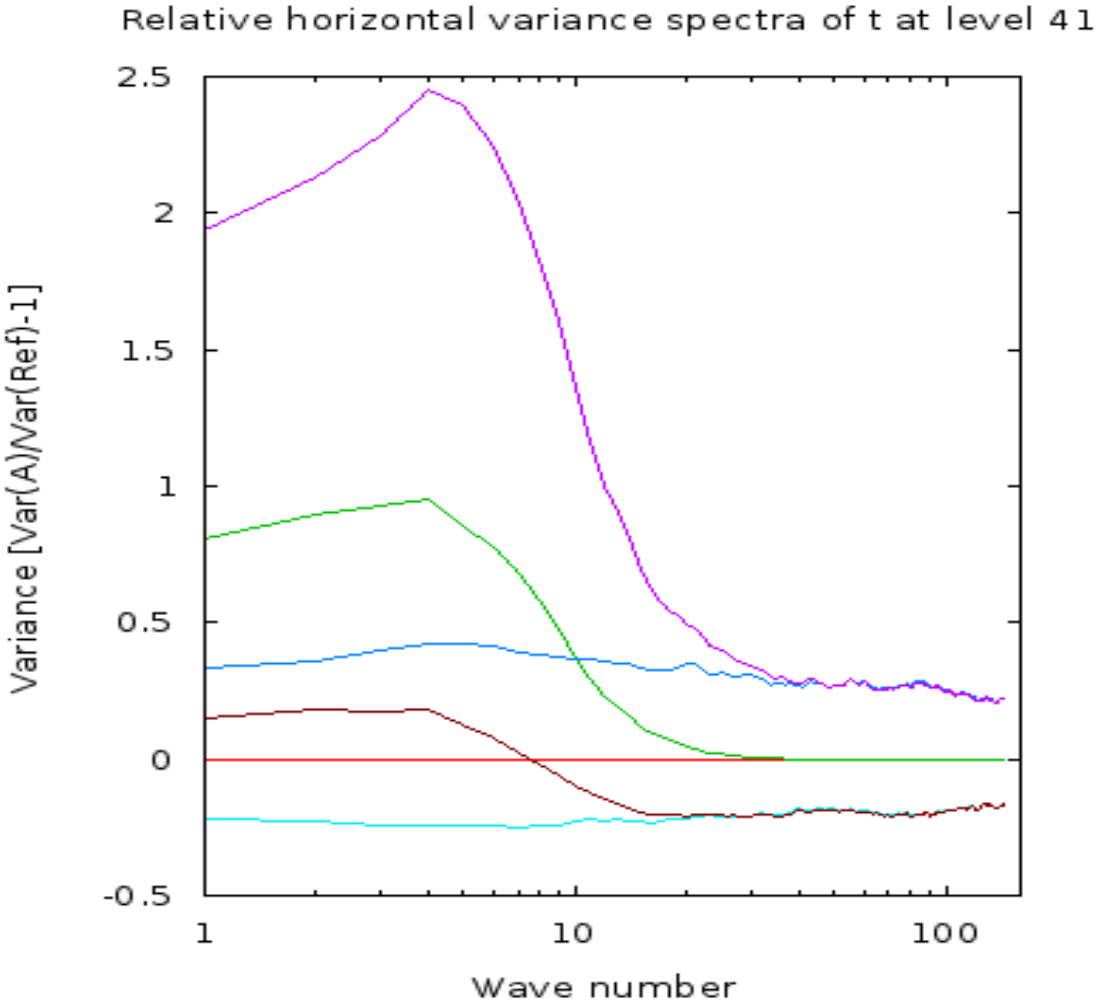
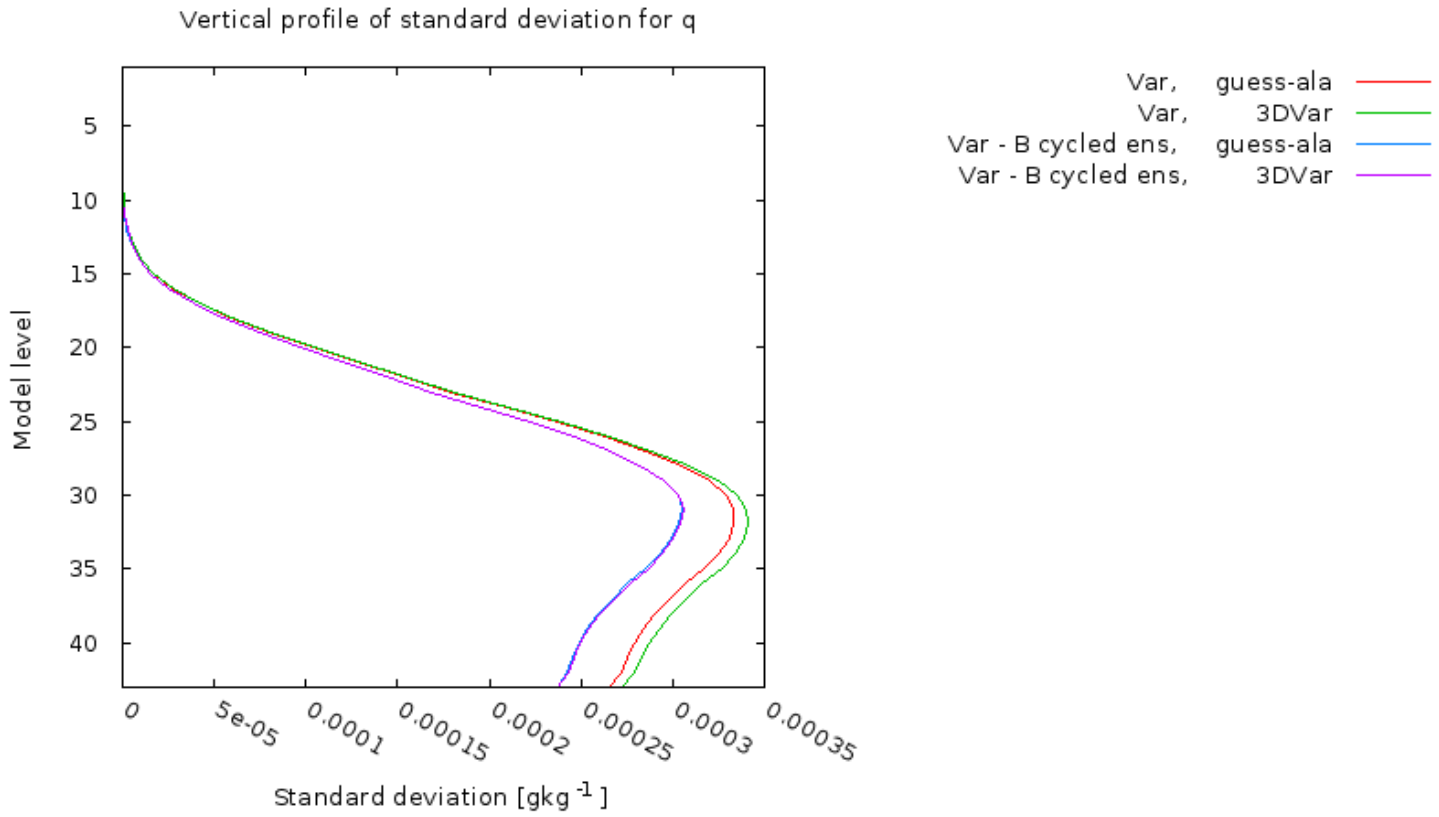




4. Effect of different covariance matrices

Ens B and consistent ens B



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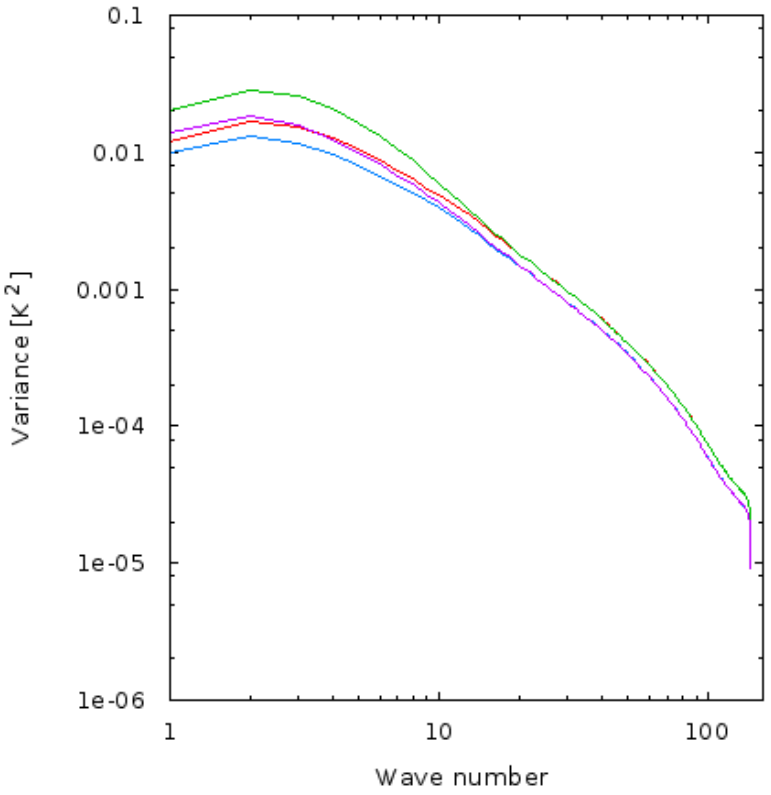
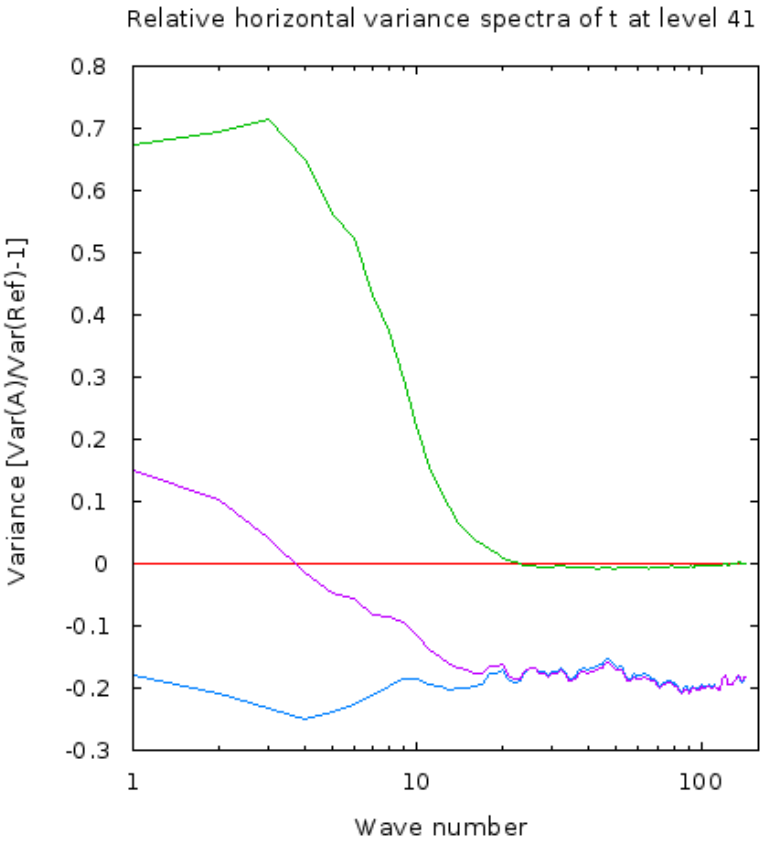
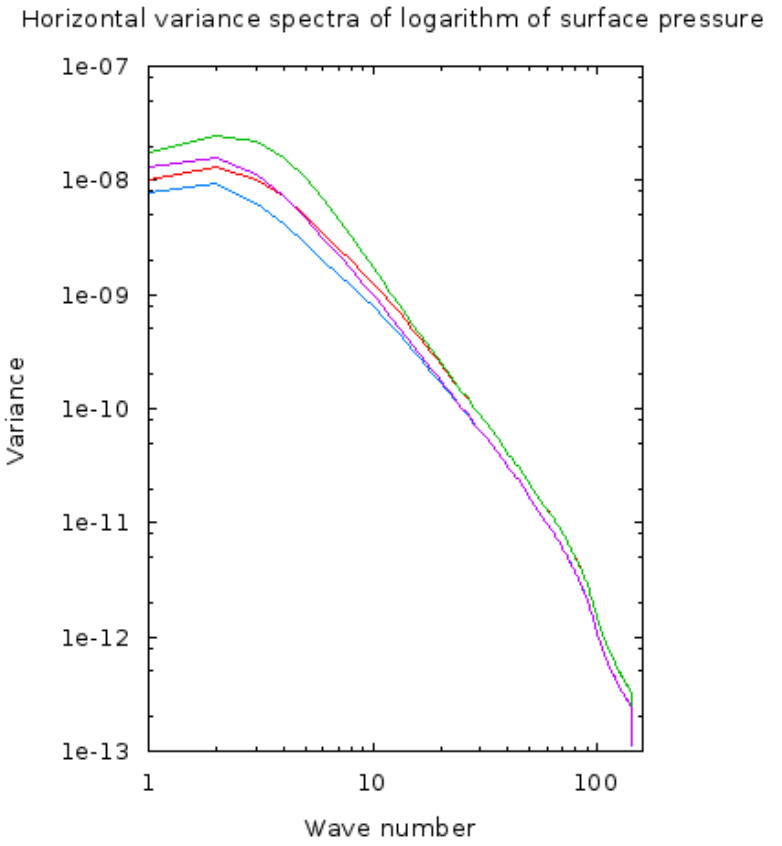
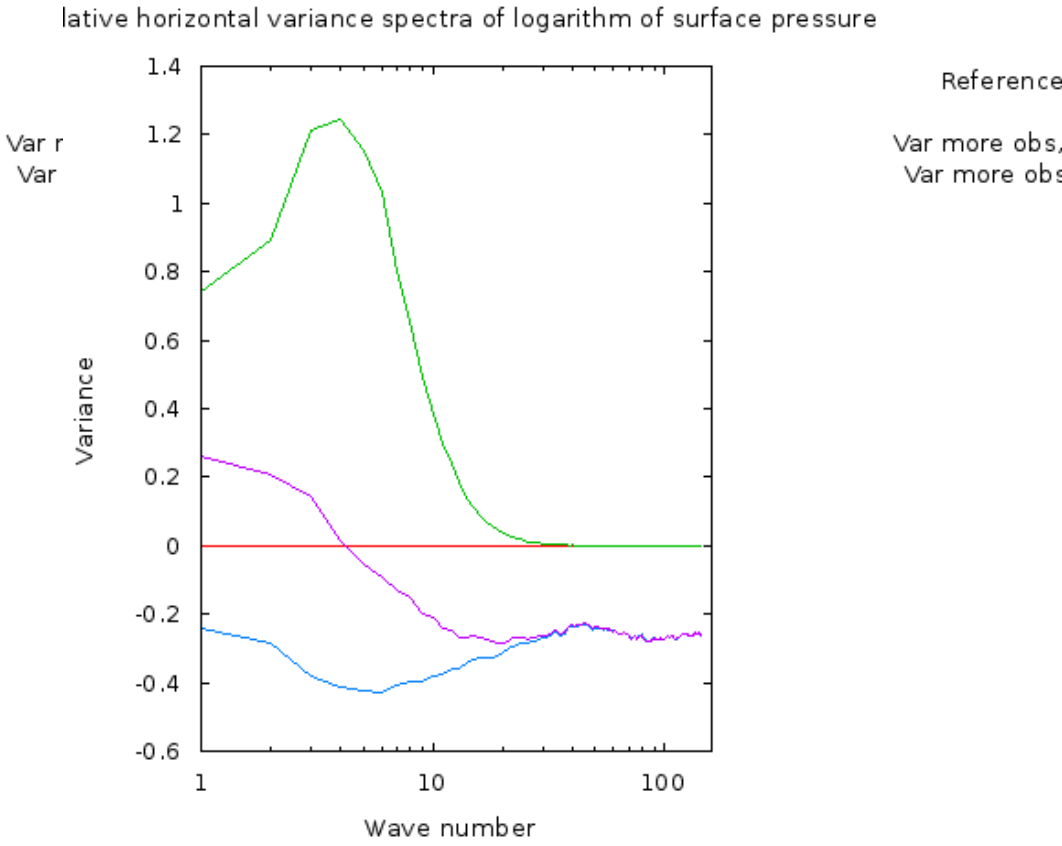




4. Effect of different covariance matrices

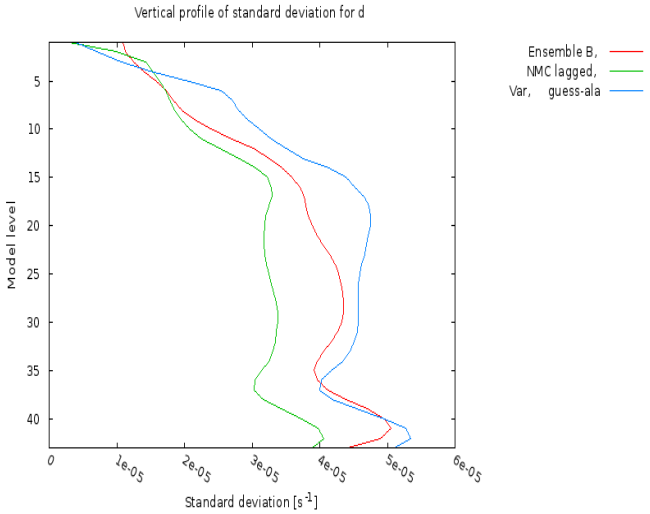
Ens B and Lagged B

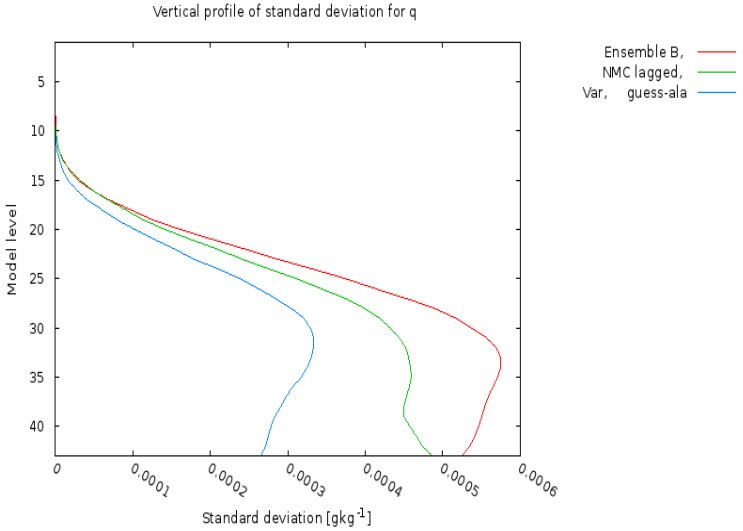


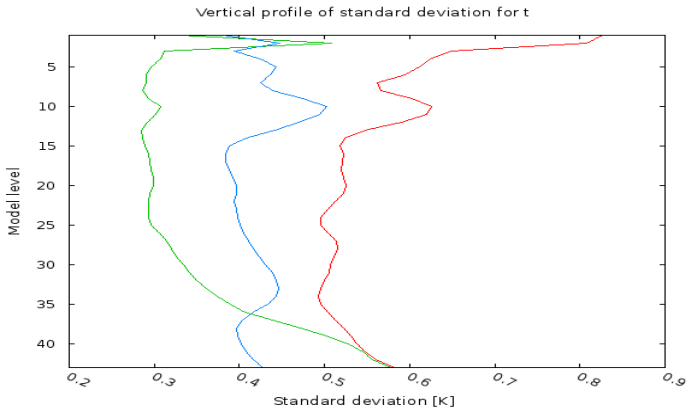


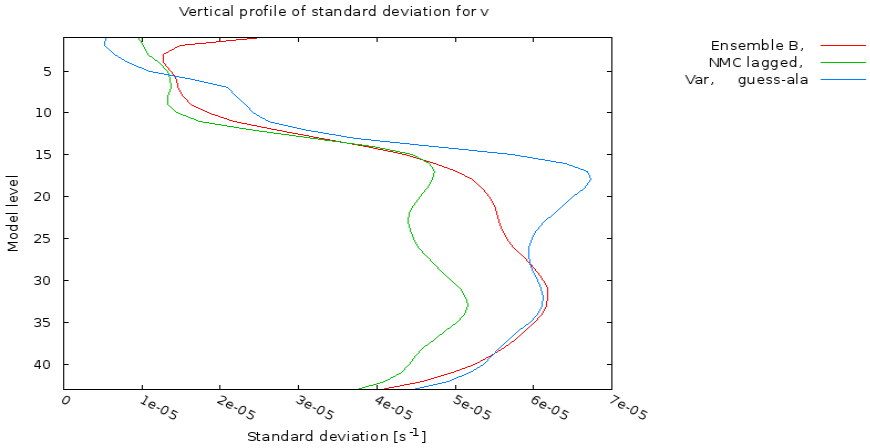
4 Effect of different covariance matrices

Compare variance of Bs



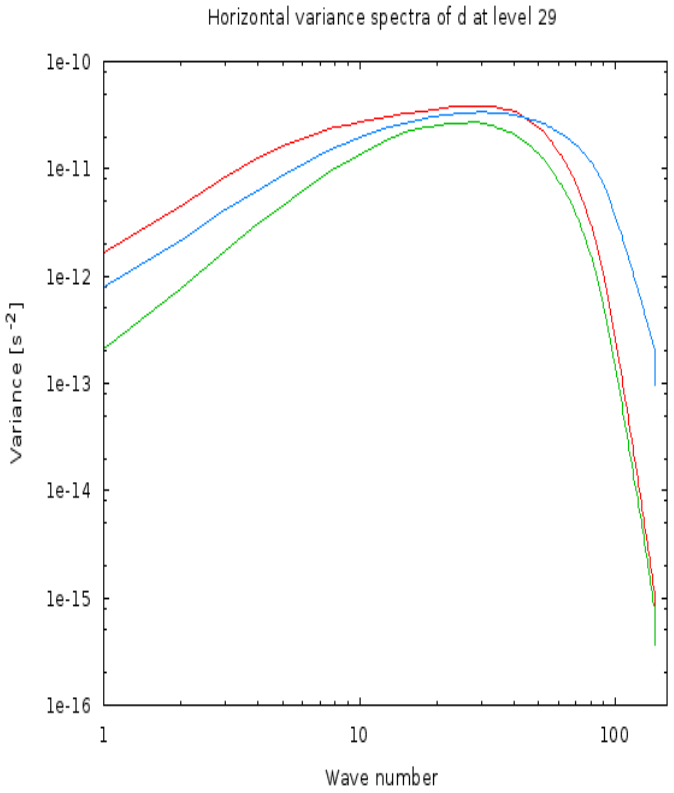


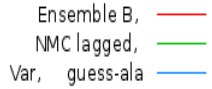


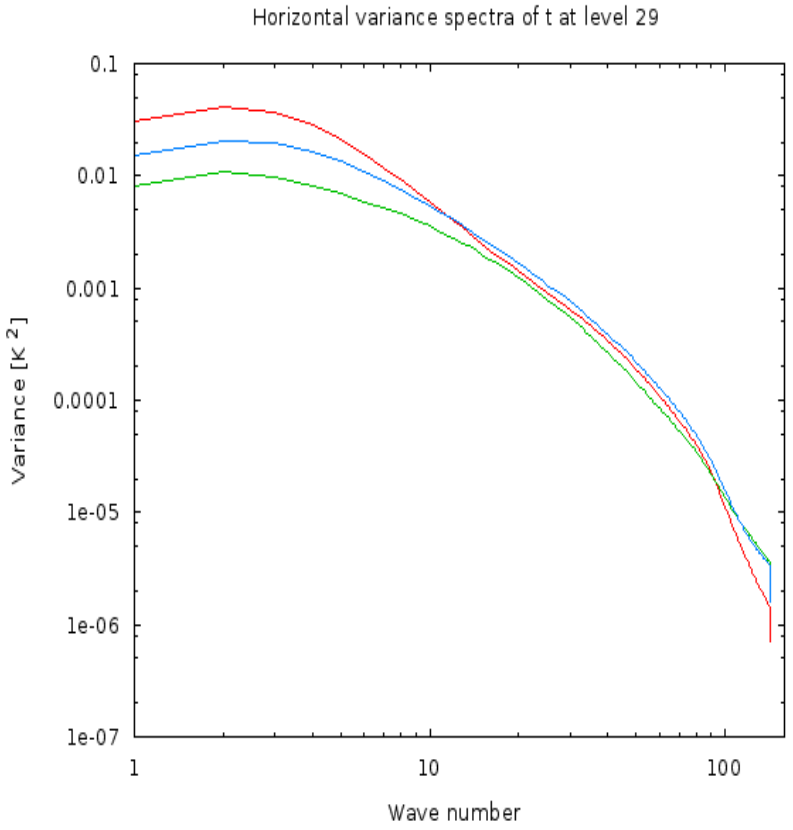


4. Effect of different covariance matrices

Compare variance of Bs (blue – ens consistent with exp, red-ens, green lagged)







6. Conclusion