Dynamics: Summary and plans for the future

Summary of the presentations

Generalization of the linear model used in the SI and ICI timeschemes :

- The idea is to introduce a set of parameters into the non-linear model M allowing a continuous transition from hydrostatic to non-hydrostatic system, then the linear system will inherits these parameters.

- Setting some of these parameters to values different than one in non-linear and linear model might induce more stability the same way the cold temperature in current SI system does.

- With some parameters set to values < 1, classical test cases flow such as Straka or NH gravity waves are very similar to reference simulations, but with an increased stability.

Vertical WENO interpolations in SL scheme

- WENO (Weighted, Essentially Non-Oscillatory) interpolations are used to remove spurious oscillations.

- Third or fifth order accuracy. Used in the vertical only after horizontal interpolations.

- ECMWF uses WENO in upper level with the benefit of reducing biases.

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Summary of the discussion during the side meeting

Several points were discussed

- The necessity of using spectral transforms for X term.

- Options LGWADV+LSETTLS+VESL seems not to work. That triggered a lot of discussion about these options. "Ex-Hirlam countries" still use SETTLS with LRDBBC, whereas on the "ex-ALADIN side" recommandations are to use PC with LGWADV. PC is definitely more stable and should lead to better results. LRDBBC could be remove from the code, if nobody uses it any longer.

- WENO option could be used, but is probably not more conservative than historic interpolation, then it will probably not solve conservations issues. Météo-France switched form cubic to linear interpolation, ECMWF did the opposite because linear interpolations seemed too diffusive.

- What are the best options to run a model at ~300m and beyond ? PC scheme, SITRA=100, for a better stability a new d5 variable is available in cy48.

- New ideas from Petra and Jozef have been developed in cy46t1 and compares well to PC with 3 iterations, with the cost of one iteration.

- The benefits of using a sponge layer as in "Klemp et al 2008" should be investigated.

- A case of simulations over USA exhibiting bad behaviour of the current "official" PC scheme has been discussed. The conclusion here is that such a domain with a huge mountain range should also be used for testing purposes.

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Short term plans

Short terms developments that have been discussed.

- Further developments around d5/W (linked with VFE and single precision).

- Further testing and development of new ideas from Petra and Jozef.

- Investigating the benefits of using a sponge layer as in "Klemp et al 2008".

- Agree on a common NH configuration (PC, LGWADV, SITRA=???), then clean LRDBBC.

- Investigate the impact of having a SI operator using horizontal geometry informations.

- Test impact of different options for interpolations, among them the WENO options.

Compared to a few years ago we may have more options available to increase stability and accuracy. Our common goal is to converge to a configuration able to make simulations at a resolution at least around 300m.

Other plans (should be discussed in future meetings)

➢ Compared to a few years ago focus is more on the stability problem than scalability : we are more confident on the possibility that our model could be run without spectral transforms, and we know that Fourier transformed are still performing well.

➢ What should the strategy be for grid point core : some work has been done, should we aim at having something that could be used in operations outside ATLAS ? Should we wait for ATLAS.

➢ Long term goal : developing a new expertise on ATLAS and FVM.

➢ How to work with the team : regular meetings should be organised with specific topics.

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