

Report of work during stay in Toulouse

Toulouse, 07/10/2007

Tomas Kral
Czech Hydrometeorological Institute
Na Sabatce 17, 143 06 Prague 4

Term: 7.10. - 21.10.2007

Subjects: 1) Improvements of diagnostic tools for physics packages
2) Testing ALARO physics in global model ARPEGE

Anotation: A developement of new separate physical packages brings a need to unify budget diagnostic tools that would be general enough to fulfil, for the time beings, the requirements of both the current Mereo-France physics and ALARO physics, and in the future, to fit the needs of physical packages from HIRLAM and AROME models as well.

Developement and testing of new ALARO-3MT physical package has been done by now preferably only at the scale of LAM. However testing of this package in global model is important essentially for the purpose of validation of 3MT parametrisation in the tropics and verifying scale independance of the parametrisation schemes.

Work: The aim of the first part of the stay was to unify a conception of new DDH budget tools that would fit the needs of both the Meteo-France and ALARO physical packages. A proposal of future developement was based on discussion between J.-M. Piriou, A. Deckmyn and T. Kral leading to a final design that basically comes out of a proposal of J.-M. Piriou (Meteo-France) to introduce a 'budget packages' approach, i.e. to have a separate files for each package of physical parametrisations with explicit list of tendencies and fluxes involved. The specification of the latest common view is as follows: i) to keep ddhr and ddht utilities unmodified, ii) to entirely rewrite ddhb tool integrating the ability to handle the 'budget packages' concept, iii) budget packages itself will be found in a directory specified by an envirometal variable and will be represented as a subdirectories (e.g. alaro, bp001) containing files (e.g. ct.fbl, qv.fbl) with all necessary items to make a budget of a corresponding prognostic variable. The syntax of these files as well as command line argumets for ddhb utility were still not determined and should be proposed during the technical realisation which was however not a subject of the stay. For more informations on the current status of the work contact one of the persons involved in developement of new DDH budget tools, namely: A. Deckmyn, J.-M. Piriou and T. Kral.

The second part of the stay was concerned with testing ALARO-3MT physics in GCM ARPEGE. At the first stage a run with current operational Meteo-France physics was choosed as a reference for all further experiments performed during the testing phase. This reference run, as well as all other experiments, was done on CY32t2 for +24h forecast. For the complete integration of ALARO physics into ARPEGE it was necessary to recompile updated sources with the latest modifications and prepare the corresponding executables and namelists. As a starting point we used a setting identical with the one used operationaly in ALADIN CHMU. In every experiment we performed a diagnostics of budgets of prognostic variables' tendency to compare the balance of the system with the reference one. This was done separately for the tropics and midlatitudes in order to keep

track of the behavior also in the outside of targeting region. First tests showed that default setting of 3MT scheme is not appropriate for the tropics as it puts the temperature tendency out of balance. Therefore a tests of sensitivity of the scheme to different tuning parameters had to be performed in order to obtain a new more advisable tuning. However, the available degrees of freedom showed to be insufficient in getting satisfactory results. A more detailed investigation of the problem led to the proposal of possible solution by modifying the ratio of resolved condensation rate introducing a new degree of freedom which allows us to modify the critical humidity depending on the spatial scale. This modification had possitive feedback to the overall temperature tendency budget in the tropics approaching more to the one of the reference run, however, the achieved balance was still not absolute. Unfortunately, further tunings using above mentioned modification were not possible due to dead-line of the stay and will be a subject of next experimentations.

Conclusion: A detailed design of new DDH budget tools have been proposed in cooperation with J.M. Piriou (Meteo-France) using a concept of 'budget packages' and is prepared for a technical realisation.

Tests of ALARO-3MT physics under GCM ARPEGE were performed with some encouraging results, but one must consider here that studied parametrisation scheme is still in a developement phase so obtained results are just a first step in porting ALARO physics into the ARPEGE and final version of the scheme will have to be necessarily a subjected of further testing. However, one can conclude that experiences acquired during the stay offer a good starting point for a next developement, and especially tuning of ALARO-3MT physics for global model ARPEGE.