ALARO-0 implementation problems, options, constrains

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ALARO Training, Radostovice, Czech Republic, March 2007

ALARO-0-tool status

- ALADIN/ALARO in consolidated state
  - there is logically closed subset of the whole concept ready to run
  - there are clear components to be tried and further developed
  - there is a reference code version as a basis for further development in line with other ALADIN
  - there are first case studies results and operational experience
  - there is a community knowledge about the tool functions, construction principles a properties
  - (there is still (at 08:46) not completely clear how the community will maintain and use the tool)

Motivations for ALARO-0 implementation

- there are expected and proven benefits for the weather forecast quality of current forecasting systems; addressing known major ALADIN weak points

- highly compatible with the current ALADIN implementation and tools; easy to implement; affordable

- security of the past investments: for a small cost the usefulness of the current tool (ALADIN) is secured for a resolution increase

- entering an open framework for scientific development and sharing experience and practices

ALARO-0 installation steps

- take the source code
  - if you have stable CY29T2 and want to have ALARO now take cy29t2alr00 library and 3mt bugfix from CHMI and install it over your cy29t2
  - if you are on an older cycle or can wait for a month wait for CY32T1 export
- add new keys and parameters to your namelist (NAMPHY, NAMPHY0, NAMGFL)
  - „LSTARPRO=.T., L3MT=.F." parameters set
  - „LSTRAPRO=.F., L3MT=.T." parameters set
- run the model and process its results as usual; beware of
  - model CPU cost increase (+27% STRAPRO or +36% 3MT)
  - significant historic file size increase in case of new hydrometeors or TKE write-outs (around +16% per field)
- consider trying other options presented during this training course
- share your experience with others, report the bugs (to JFG)

Installations (1)

- Croatia
  - cy29t2alr00
  - SGI Altix
  - run operationally 2/day up to +72h in parallel with pre-ALARO ALADIN, STRAPRO version
  - case studies

- Slovenia
  - cy29t2alr00
  - Linux cluster
  - run in parallel with main ALADIN operational
  - case studies

Installations (2)

- Belgium
  - cy29t2alr00_3mt
  - SGI Altix
  - development of 3MT and case studies

- Czech Rep.
  - cy29t2alr00, pre-cy32t1 (development)
  - NEC SX-6
  - after 6 months of parallel tests it is the main operational model
    - 4/day up to +54/+24h, LACE domain
    - 2/day up to +48h, Afghanistan territory
    - full blending/surface analysis cycle
  - case studies, development
  - LAM-EPS experiments

Implementation problems

- varying CPU time consumption per time step on SGI Altix system

- meteorologically significant dependency of results on compiler options of Intel compiler (some compiler switch missing?)

- OpenMP results dependency on number of threads for 3MT on NEC SX-6

- minor code porting issues

Experience, observed properties

- smoother and more realistic precipitation fields of ALARO-0
- significantly reduced so far too strong contrast upwind side / lee in the precipitation
- general reduction of precipitation maxima and domain average
- in some cases model still overestimates precipitation (Alps) but several cases of clear QPF improvement reported
- varying skill in snow forecast, maybe too short experience
- positive bias of MSL pressure
- ALARO-0 has not solved the problem of strong negative T2m bias in autumn/winter
- **NB**: ALARO-0 of the end of January 2007 is a result of a 10 months tuning, many weak points removed

Possible model tunings

- dynamics
  - option $\delta_m=1$ (NDPSFI) ready for tests, for extreme rainfall events
  - non-hydrostatic ALARO-0: currently NH interaction with relative fluxes still under checking; ready for tests in 2-3 months
  - SLHD
    - possible tests of SLHD impact on q_r,q_s and 3MT parameters (ω_u, σ_u, ω_d, σ_d)
  - SL advection: try spline interpolation (even if no SLHD) and/or wait for news from Filip and Jan
- pTKE
  - well tuned now, new tunings may arrive
- microphysics
  - tuning quite subtle, special care has to be given to surprising results, beware of consequences on long-term model behaviour (refer to Radmila's talk on methodology)
  - LPHSPSH recommended .T., but check first
- radiation
  - wait for new NER code, currently nothing to tune
  - rather take part in the development

Possible model tunings (2)

- surface scheme
  - ALARO-0 cannot call SURFEX due to missing split of ACDIFUS, further tuning of SURFEX will follow then
- convection
  - try 3MT and compare with STRAPRO
  - LENTCH=.T. will need retuning of other namelist parameters
  - be ready for code updates

Options for implementation

- horizontal resolution for grey zone exploring: 4 km
- vertical resolution issue
- condensates initialization issue: do we need it?
  - blending provides initial fields by copying them from guess
  - 3DVAR?
  - a poor-man's initialization (take condensates from 6h forecast of rich-man's 4 runs/day)
  - DFI retuning? New method will come and will need to be retuned.
  - a more rigorous spin-up study of initialization of condensates needed

Known limitations

- fullpos of new fields
  - currently bug in cy29t2alr00 – it will be checked on cy32t1 and fixed
- file size

Further open issues

- validation of (new) parameters
  - qr/qs against radar (obs operator?)
  - ql/qi radiation fluxes validation
- development of new products
  - TKE
  - icing diagnostic
  - consistent cloudiness

Good luck.