ALARO overview of last two years

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(or ‘more progress in depth than speedy advances’)

J.-F. Geleyn

A1WD, Vienna, Austria, 12-14/05/2014

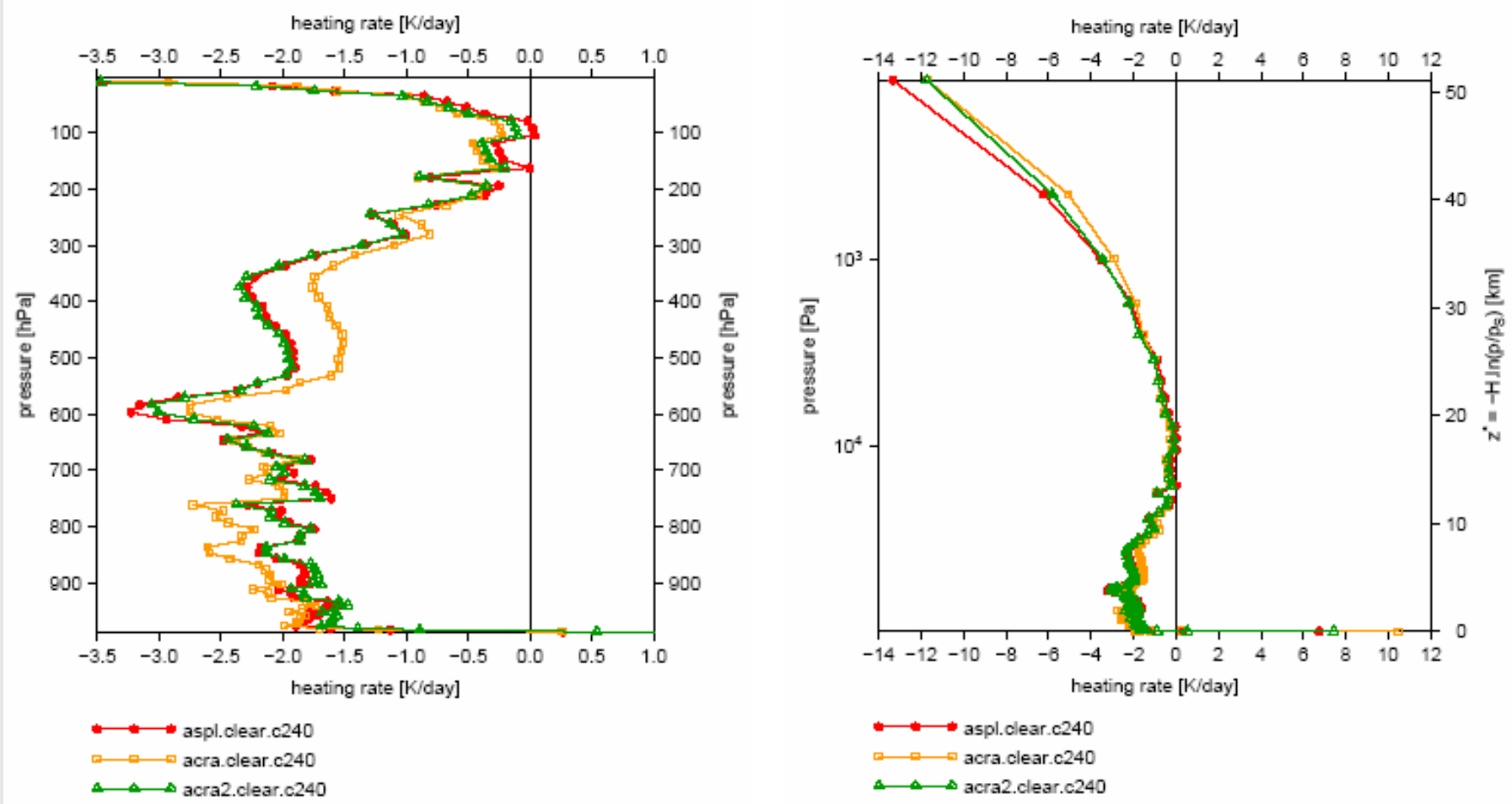
Conclusions (two years ago)

- ALARO-0 was a success in organisation, scientific progress and operational integration (perhaps with a bit of luck for the latter).
- It was logical that ALARO-1 should follow a somewhat different path.
- It might however (we do not know yet) have happened in an exaggerated way.
- In these 2nd ALARO-1 Working Days we should thus possibly aim at innovative:
  - Integration and Validation steps;
  - Proposals for extending an already partly existing algorithmic (two level) ‘strategy’;
  - Back-up possibilities.
- But don’t forget to appreciate the quality of the science!

Chosen targets (two years ago) and brief sketch of what happened

- New gaseous transmission functions for ACRANEB
  - It turned out that the ‘remaining hurdles’ were far more complex to get rid of than anticipated.
  - Furthermore, once we finally got excellent broadband transmissivities, the core validation revealed some compensating errors in ACRANEB. This called for a revision of several aspects of the NER implementation (statistical model and its links with clouds’ influences, Planck function’s weighting, ice-clouds optical properties, Rayleigh scattering, surface albedo, …).
  - Hence we now have a fully new code, ACRANEB2, with nearly all problems solved!
- TOUCANS fully stabilised set-up
- Unsaturated downdrafts

Thermal gaseous effects, single grid-point, single time-step

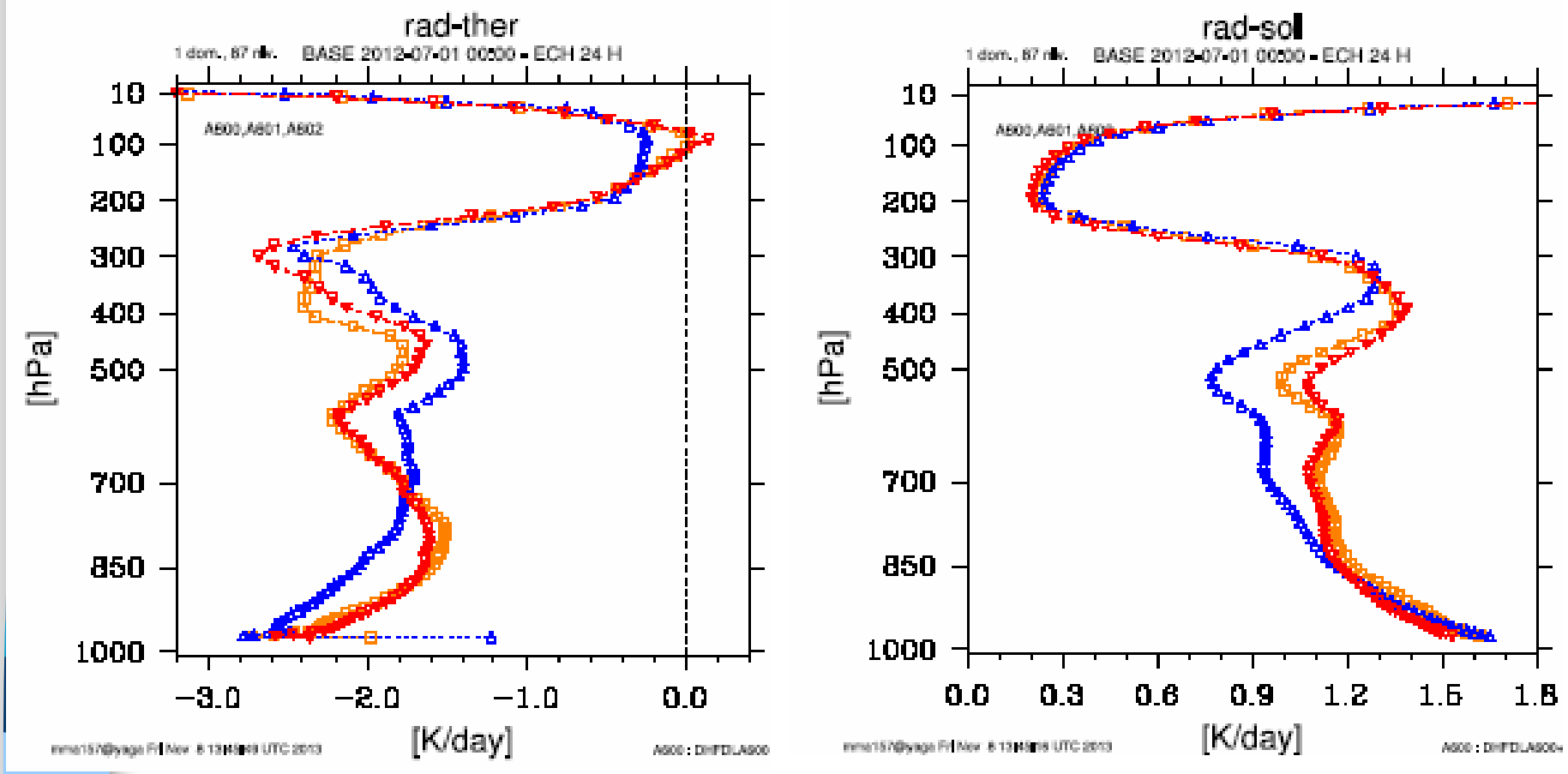


Narrow Band Model

ACRANEB

ACRANEB2

Thermal and solar radiative effects, 24h integration with clouds and aerosols



RRTM-FMR

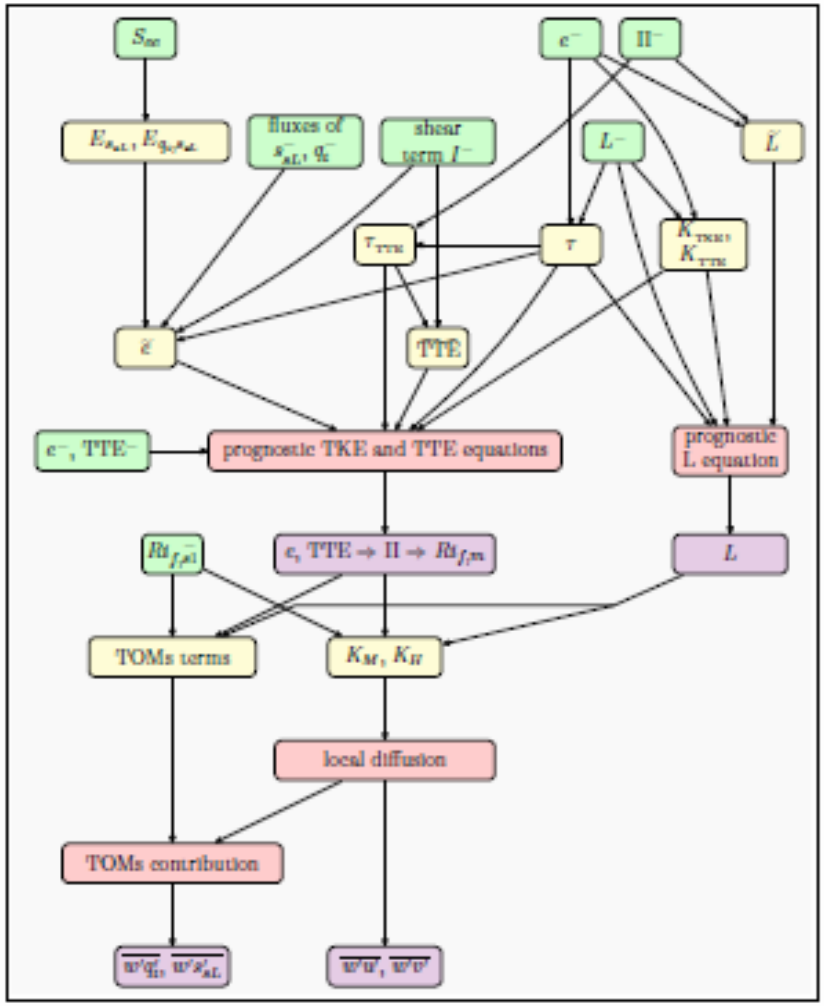
ACRANEB

ACRANEB2

Chosen targets (two years ago) and brief sketch of what happened

- New gaseous transmission functions for ACRANEB
- TOUCANS fully stabilised set-up
  - In the six months following the Ljubljana A1WD it was realised that the chosen development strategy for TOUCANS was far too 'open-ended' ('*end of the Roman empire*' syndrome => in short, flexibility was more a target for itself than an opportunity to make the whole construction consistent).
  - An in-depth refurbishing took then place on (at least) some three key issues:
    - Prognostic TTE handling;
    - Separated view of heat-related and moisture-related TOMs terms;
    - Shallow convection closure issue and its time-step to time-step handling.
  - Re-creating a consistent picture happened only recently and validation of a safe base-line configuration is just ongoing.
- Unsaturated downdrafts

TOUCANS time-step organisation (in its most prognostic and complex set-up)



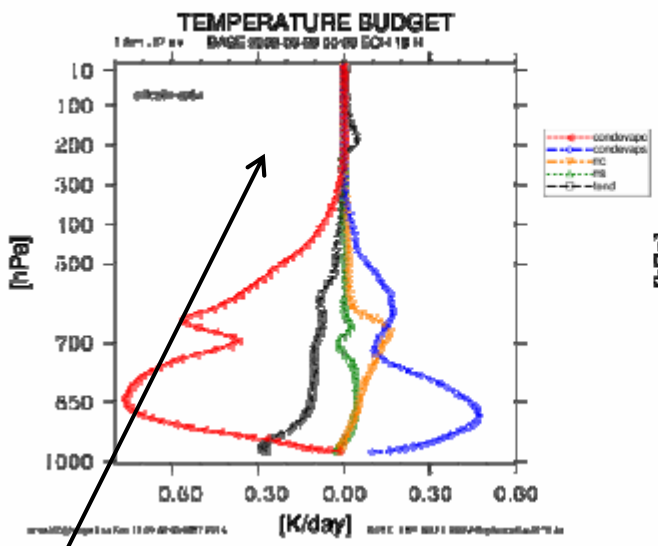
TOUCANS is now surely more a framework than a scheme, even if being both.

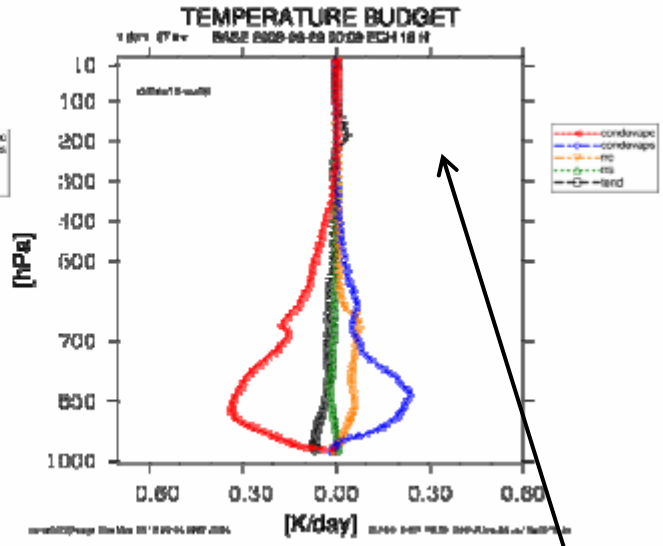
The discretisation-solving method and the unifying system for stability dependency functions have been accepted for publication in JAS

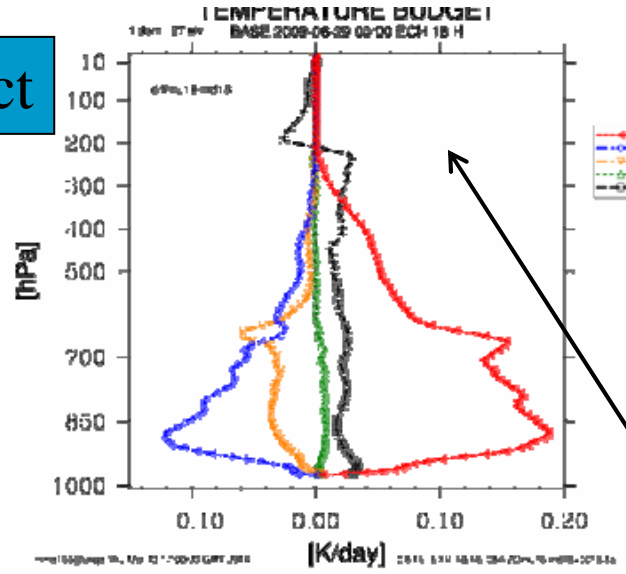
Chosen targets (two years ago) and brief sketch of what happened

- New gaseous transmission functions for ACRANEB
- TOUCANS fully stabilised set-up
- Unsaturated downdrafts
  - The alternative code to ACMODO (ACNSDO) is now ready for pre-implementation testing, but …
    - (I) Some modifications to the updraft and microphysics parts seem to be necessary to get a good performance of the new code;
    - (II) There is less possibility to tune the overall intensity of the downdraft's impact (self regulating character of the unsaturated downdrafts formulation).
  - Hence the merge with ACRANEB2 + TOUCANS baseline might be problematic.
  - But a good surprise is not excluded either.

First results related to unsaturated downdrafts







Present dd's impact

Unsat. dd's impact

Impact of additional corrections (different scale)

SOME TUNING NEEDED !!!

Validation (present situation)

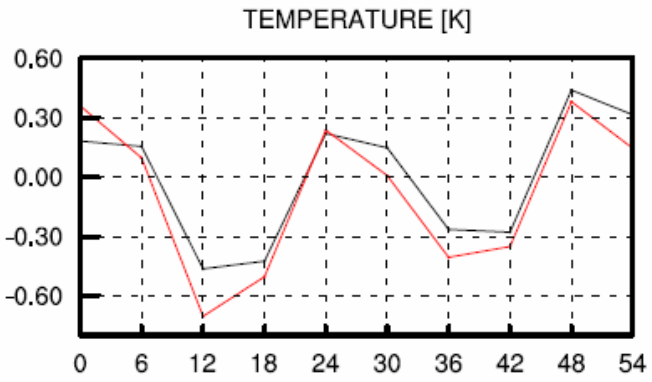
- *ALARO-0 baseline, plus the closure and entrainment specification modifications, plus ACRANEB2 'as is', plus some minor associated re-tunings were used to search for a 'safe' starting point inside the huge amount of possible TOUCANS configurations.*
- What was judged already 'OK':
  - The MY-type tuned CCH02 'Model II' for the stability dependency;
  - The new TOMs formulation (separated heat and moisture equations -with explicit cross terms-; logical extension of the CCH07 equations to the moist case; …);
  - The turbulent transport of condensates;
  - The computation of the energy source-terms from past-time step values of fluxes (and wind shear terms);
  - The new formulation for the shallow convection closure.

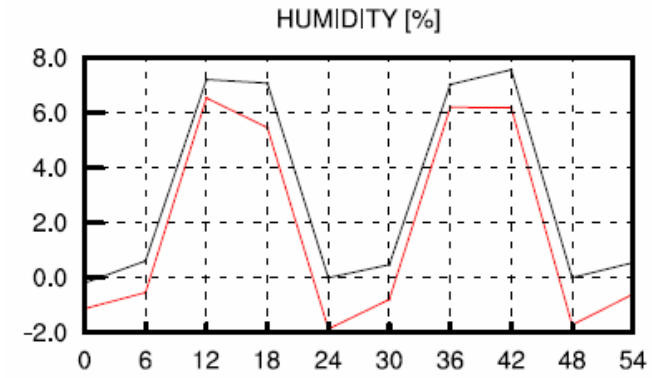
Validation (present situation)

- *ALARO-0 baseline, plus the closure and entrainment specification modifications, plus ACRANEB2 'as is', plus some minor associated re-tunings were used to search for a 'safe' starting point inside the huge amount of possible TOUCANS configurations.*
- What is probably 'OK' (but not yet fully validated):
  - The prognostic treatment of TTE.
- What surely needs further efforts:
  - The hybrid configuration for using specific moist entropy as a marker of anisotropy-related stability aspects;
  - The whole problem of the interactivity for the length scale L (specification with respect to TKE, prognostic handling, moisture influenced computation).

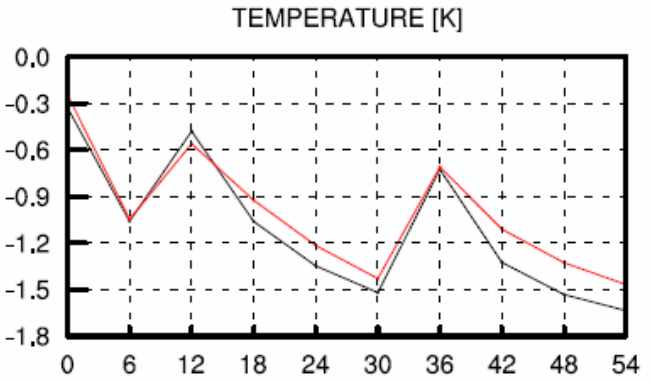
Some (first) validation results: 'safe' configuration vs. ALARO-0

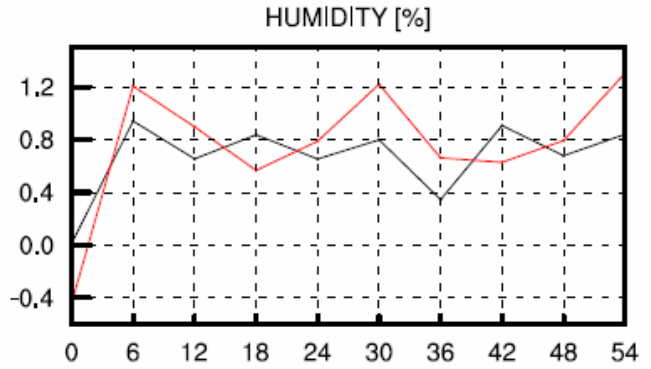
Summer – 11 days





Winter – 10 days





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test

Surface biases

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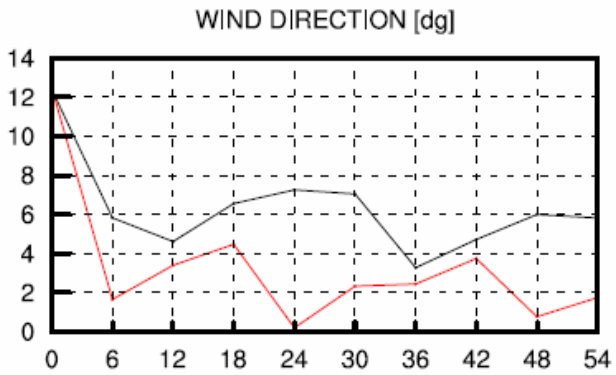

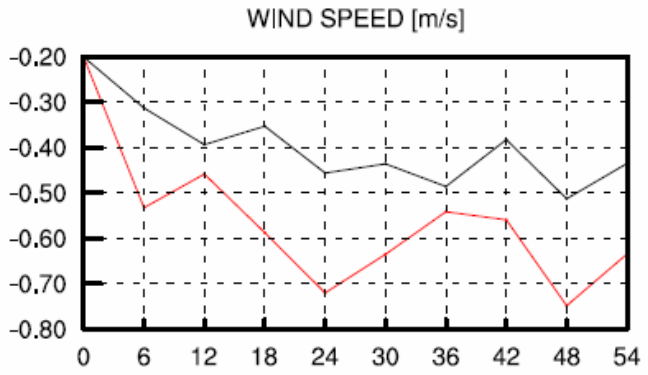

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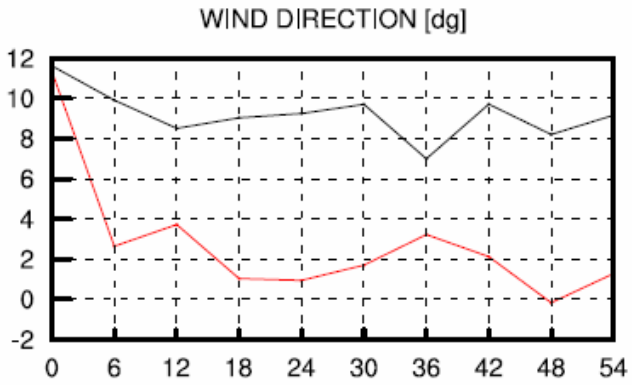

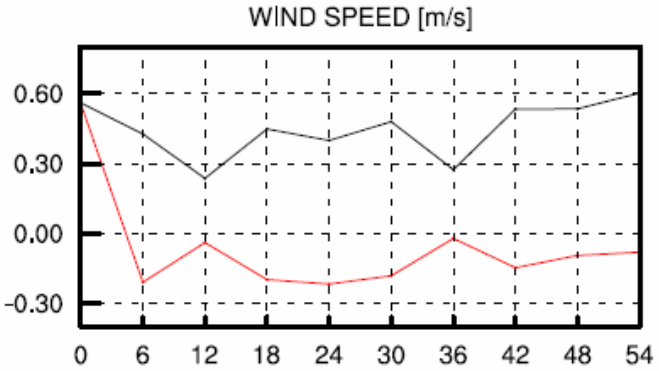

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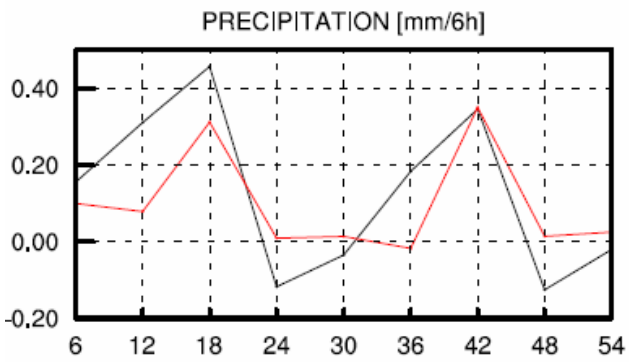

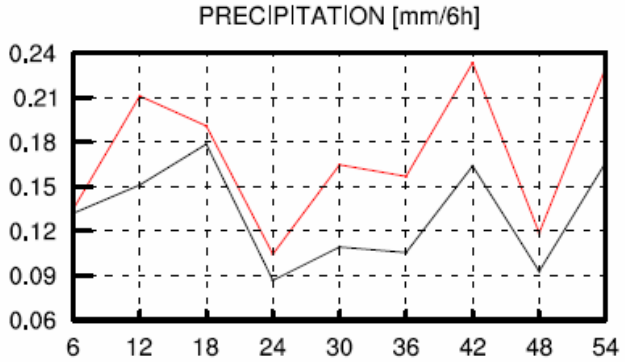

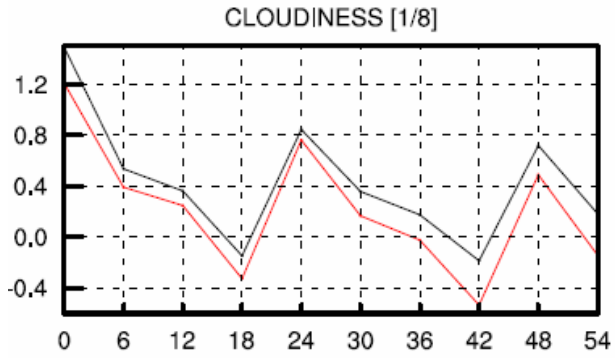

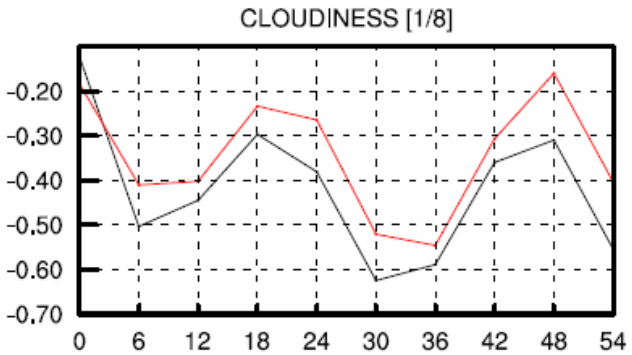

ref

test

Surface biases

Conclusions (now)

- The past two years showed a lot of progress, but not of the type expected in Ljubljana …
- We believe to be quite safe with what ACRANEB2 brings in.
- For TOUCANS the situation is topic-dependent (or sometimes even sub-topic-dependent), which is at the same time worrying and promising.
- For unsaturated downdrafts we do not know yet, alas.
- We have a quasi-neutral intermediate baseline capitalising on the best of ACRANEB2 and TOUCANS.
- We spoke here only about NWP-type development (climate downscaling also brought in very good news).
- We miss a structure in which developers can get some help during validation for integration phases (after that it is a bit late, for all sides …).