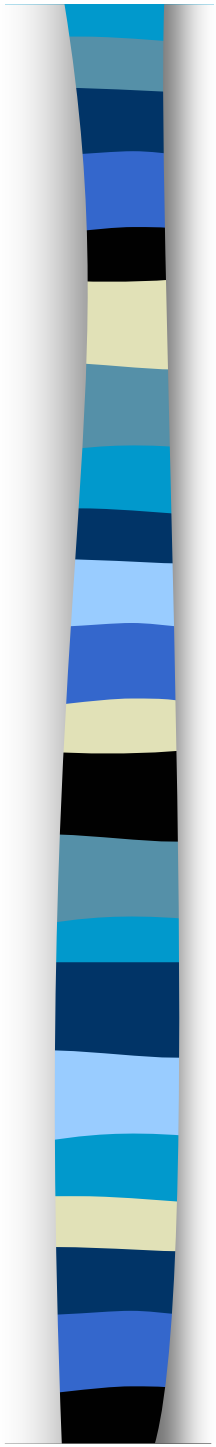
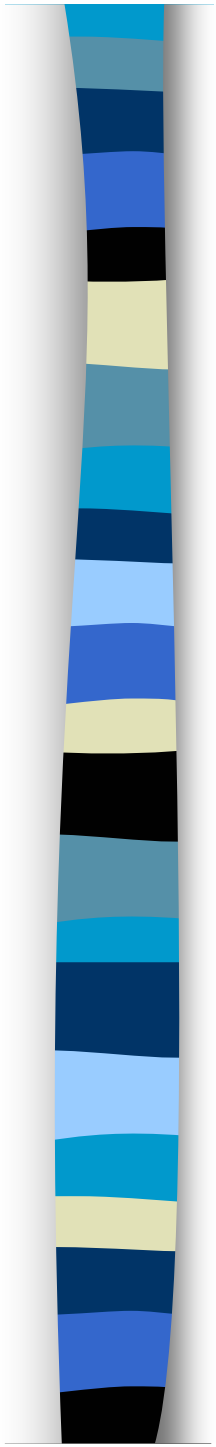


ALARO-0

Why, when, how, where?

J.-F. Geleyn, ALADIN PM

TCA0, Radostovice, Czech Republic, 26-30/3/2007



Why, when,
how, where?

Why ALARO-0? (1/4)

- (i) Because most ALADIN Partners need an operational application on a sub-synoptic domain with ~double the resolution of ARPEGE. Neither AROME nor a ‘synoptic-type’ solution can answer this need on a ten year time-scale. Thus, dealing with the ‘grey-zone’ problem never was a luxury for ALADIN Partners, but doing it with a long-term perspective required a lot of coordinated efforts (the chain is always as weak as its more doubtful link) especially when left-alone to face this challenge.

Why ALARO-0? (2/4)

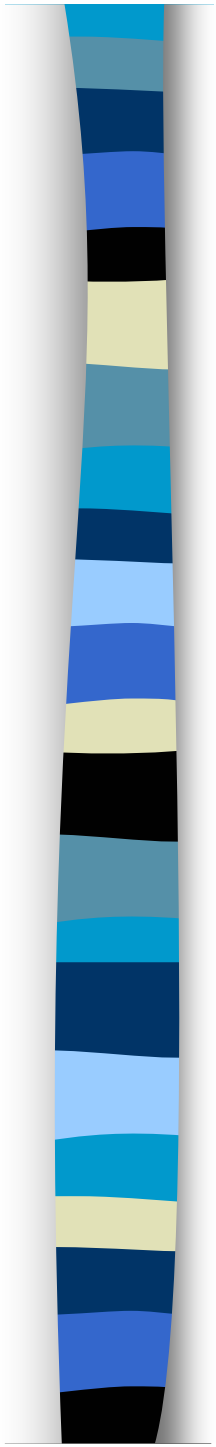
- (ii) Because continuing, like in the good-old ALADIN work, to insist on stable (for longer δt) and cost-efficient algorithmic solutions is of paramount importance. Even if this makes scientific maintenance more complex, ALADIN Partners cannot either consider this as a luxury.
- (iii) Because aims (i) & (ii) require a balance: first one must go on progressing in NWP with the well-proven method of stepwise developments, even when integrating ambitious novelties like 3MT.

Why ALARO-0? (3/4)

- (iv) Because aims (i) & (ii) require a balance: second one must be able to adapt the degree of sophistication of the used ‘science’ to any need, up to the level of what should be used in AROME, if one wants a truly multi-scale solution.
- (v) Because the conjunction of aims (iii) & (iv) cannot be left to approximate methods of scientific harmonisation and of code handling. A methodology is absolutely necessary, starting with governing equations, continuing with general but strict coding rules and finishing with scientific modularity put low down in the code.

Why ALARO-0? (4/4)

- (vi) Because working in a truly international and very distributed team on highly transversal topics makes it an absolute necessity to ‘over-use’ the methodology outlined in aim (v).
- (vii) Because models with additional parameters (and hence new products) is fascinating for some deciders. If one may satisfy this demand without loosing the other tracks, why not.
- (viii) Because of the ‘alpinist motivation’: attacking the challenges (like the ‘grey-zone’ one) that other deemed unfeasible is attractive to any scientist.



Why, **when**,
how, where?

A short history of ALARO-0 related ALADIN events

- *Warning N°1*: the history presented here is done so with **hindsight**; most of the chosen events took their 'current' meaning only afterwards and some intermediate steps without consequences have been omitted.
- *Warning N°2*: the presentation is **subjective** and might for instance not reflect the opinion of some people in Toulouse; but the PM is ready to defend all its interpretations, if needed.
- *Warning N°3*: this item is **not marginal**, on the contrary: understanding the complex history of ALARO is a prerequisite to any good TCA0 work.

ALARO-0 relevant dates and events (1/6)

In black “dimensioning ideas’ birth”

In red “official decisions on policy”

In green “policy implementation steps”

In blue “special 3MT-related events”

In purple “operational-type events”

- 13/4/95: SLHD (ported by Filip, triggered by M. Batka)
- 13/12/02: CIPN in Toulouse => ALARO (not yet named so) = AROME-10km

ALARO-0 relevant dates and events (2/6)

- 27/12/02: Link Xu-Randall ⇔ moist adjustment (developed by Radmila, invented by Jean-François, inspired by E. Bazile)
- 12/4/03: So called AROME-ALADIN meeting in Prague: ALADIN-2 gets conceptualised around the 'tool-box' and 'convergence' issues but 'ALARO' remains untouched
- 25/06/03: Correct orographic lift force (developed by Bart, invented by Jean-François, inspired by P. Bougeault)
- Grey-zone approach's consolidation (Luc, July 03)

ALARO-0 relevant dates and events (3/6)

- 11/12/03: NER statistical scheme for thermal radiative exchanges (developed by Neva, invented by Jean-François, inspired by R. Fournier)
- 7/9/04: Thanks to the MFSTEP support, what will later be called pre-ALARO-0 gets its basic content, for non-Meso-NH-type physics (radiation, mountain drag, surface exchanges)
- 13/9/04: Conservative moist prognostic governing equations (developed and invented by Bart, inspired by Martina)
- Microphysics-Transport separation (Jean-Marcel, 3/10/04)

ALARO-0 relevant dates and events (4/6)

- 30/10/04: Assembly of ALADIN Partners in Split: reorientation of the ALADIN-2 plan for ALARO, redefined as ALARO-10 (i.e. still the same scale but with the AROME physics in an ALADIN environment)
- 26/11/04: The TCWGPDI meeting in Prague fails to find any reasonable way to concretise the Split ALADIN Assembly decision
- 19/1/05: Meeting in Toulouse approving the 'work-stream' approach => ALARO finally gets ALARO-0 as backbone
- Statistical sedimentation (Jean-François, 7/4/05)

ALARO-0 relevant dates and events (5/6)

- 23/5/05: p-TKE (developed by Filip, invented by Jean-François, inspired by J.-L. Redelsperger)
- 7/6/05: At one working group session during the ALADIN Workshop in Bratislava, ALARO-0 gets its stable shape
- 3MT (the whole year 2005, but triggered on 23/1, conceptualised on 29/7 and officialised on 7/12)
- 17/9/05: Absolute optical depth fitting for the cloud radiative saturation effect (developed and invented by Jan, inspired by Jean-François)

ALARO-0 relevant dates and events (6/6)

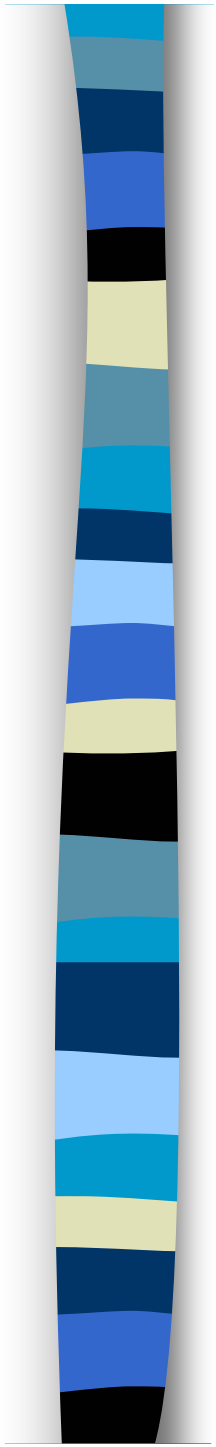
- 10/11/06: ALADIN General Assembly in Budapest: approval of the (Météo-France born) idea of a clearer separation between ALARO research and implementation aspects => need of a scientific maintenance team => plan of a Training Course
- 30/1/07: First operational application of ALARO-0-minus-3MT
- 26/3/07: The Radostovice TCA0 starts! Let us hope it will be more successful than the TCWGPDI of November 2004

And now: 'Quo Vadis ALARO-0' (1/2)

- We have got four rather parallel but interlaced challenges:
  - Finishing the short-term work to get the full ALARO-0 at the level now reached by ALARO-0-minus-3MT, both at scientific and code maintenance levels;
  - Further building the 'scientific maintenance' capacity that the present Training Course is triggering;
  - Starting to work on the next scientific steps:
    - Extension of 3MT to dry and shallow convection features;
    - Extension of the modularisation to radiation, turbulence and 'cloud-business';
    - Non-hydrostatic use of the governing equations;
    - Closing the left-over gaps;
    - Identifying new weaknesses and their causes.
  - Starting the (pre-)operational tasks in Toulouse.

And now: 'Quo Vadis ALARO-0' (2/2)

- The key to further success seems to be:
  - To consider the fourth challenge as the prolongation of the three other ones (if any of them fails, we are not in line with the level of ambitions set by our Directors; if all three are well tackled, the concretisation of the fourth one is nothing new with respect of what was done in ALADIN for 10 years now);
  - To thus correctly share our forces and available time between the three basic challenges;
  - To monitor that indeed progress is happening on all fronts.



Why, when,
how, where?

ALARO-0 how? (1(+4)/3)

- The next four viewgraphs are copy of those presented in Bratislava on 7/6/05, i.e. nearly two years ago.
- The fact that there is nothing to say more than what they contained may be the main strength of ALARO-0: we did what we said would be done.
- In other words, we may be late with the anticipated time-table but we never gave up our guidelines, because ALARO without them would fall back in its previous ‘fluctuations’.
- This is also a lesson for the future …

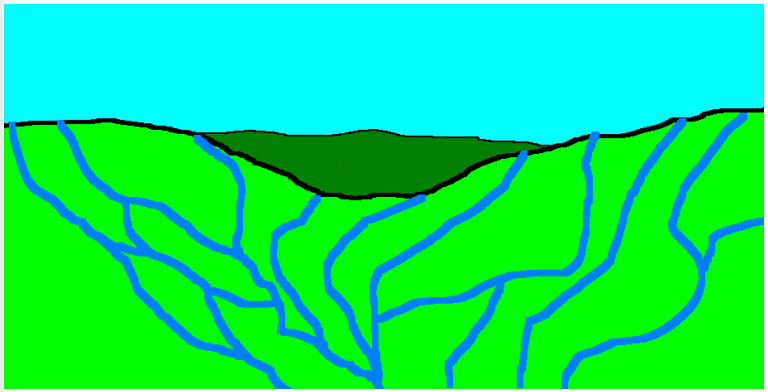
About the title of the talk (1/3)

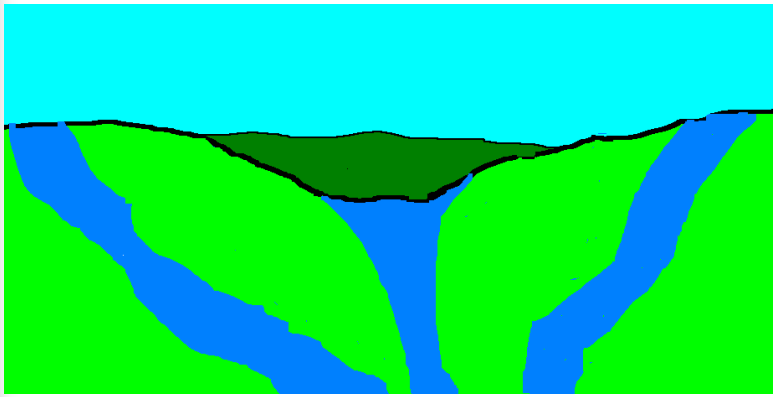
The ‘zero’ after ‘ALARO’ does not mean that we are aiming at the sub-kilometric scale!!!

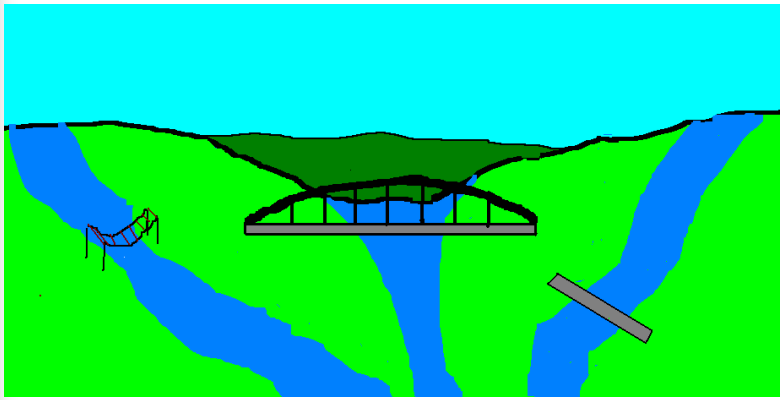
ALARO being now a development concept rather than a modelling goal, the ‘zero’ indeed means ‘beta-version’, fully in the spirit of the new interfacing equations.

Concerning the spirit of the work, it is neither AROME-10 nor ALADIN-2.5, but …

About the title of the talk (2/3)







We had confusion.

We went to ….

(Work) ***streams****.*

But with streams

you need …

Bridges*,*

big and small ones.

About the title of the talk (3/3)

The idea is indeed to build a bridge between techniques used to develop and operationalise parameterisation schemes at large & meso scales.

In a nutshell, the (low) sophistication and the long time-steps of the current ALADIN together with the algorithmic challenges of AROME.

No competition with AROME. Simply a proposal to look differently at the long term

Should please deciders who are believing that NH-model = having the same output as MM5

Conclusion

- There is at last an ALARO-physics' definition and structure of work that is driven by longer-term considerations !
- Let us not:
  - Underestimate the immediate challenge;
  - Forget the link with interfacing;
  - Be diverted by 'fun-bringing' considerations;
  - Compromise on the specificities:
    - Long time-steps test-bed;
    - Upward operational compatibility;
    - First brick for a potential new view of physics' development and maintenance.
- Volunteers welcome (& seriously needed).

ALARO-0 how? (2(+2)/3)

- The next two viewgraphs are copy of those presented in Sofia on 16/5/06, i.e. nearly one year ago.
- The first one (concentrating on physical aspects, but that could have been used when talking about SLHD's debuts, if they were not so long ago) echoes all the "why" questions raised earlier in this presentation.
- The second one, after one year of hard fight against NWP reality, shows the challenges which are, for most of them, still ongoing today.
- These are adaptation steps, but surely not denials of what was started one year earlier in Bratislava.

Principles of the 'physical' design of ALARO-0

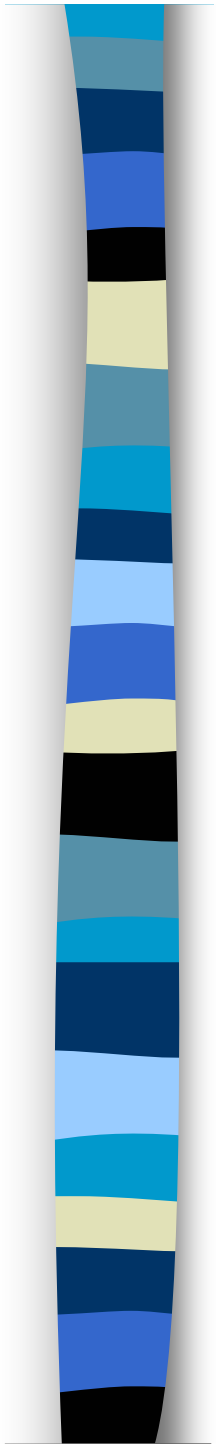
- Economy, whenever easily achievable;
- Modularity/Flexibility, as the main motto;
- Security (reuse what is working well in ALADIN implementations);
- Transversal compatibility (among schemes, plus between their ensemble and the so-called 'AROME equations');
- Decoupling: between 'general' algorithmic choices and 'locally' produced code of a given physical problem;
- Prognostic character favoured in all aspects;
- Selective short-term ambitions (in 3MT).

Conclusions

- ALARO is at the same time:
  - A concept, with trust in algorithmics put first among other design rules;
  - A hope for less yes/no choices in operational matters;
  - A way to ‘think NWP’ before jumping to conclusions, for its design and build-up phases;
  - A forthcoming nitty-gritty challenge for its validation and tuning phases;
  - A proposal for mutualised, well-controlled and scientifically-open future developments.

ALARO-0 how? (3/3)

- We are here in Radostovice for one week:
  - Not to improve ALARO-0
  - Not to catch up on basic NWP knowledge
  - Not to learn ‘black-box-type’ operational recipes
  - Not to create a ‘competitor’ to AROME
  - Not to U-turn on what we did in the past 2 to 3 years
- But:
  - To learn how to better do scientific maintenance
  - To start working as a true network in front of our main challenges
  - To understand that we are not old-fashioned when trying to apply classical NWP methods to modern scientific questions



Why, when,
how, **where**?

Where? (1/2)

- We shall only be successful if the future work is done both everywhere and nowhere!
- Toulouse is of course the obvious place for central IFS/ARPEGE/ALADIN/ALARO/AROME code maintenance.
- Both because of historical circumstances and because Martin Janousek is now ALADIN-2 officer for networking aspects, Prague will continue to be a crucial place for something between scientific and technical maintenance.
- Nine ALADIN Partners committed themselves to do scientific maintenance. This does not necessary imply to run ALARO-0 at once, but it asks an uninterrupted dedication after this Training Course.

Where? (2/2)

- Be it only thanks to the interest of people like Jean-Marcel Piriou, Toulouse will not remain isolated from the trends we shall set.
- The key to make this ‘variable geometry’ structure working well is to find a balance:
  - Neither staying too monolithic (we had to go through such a phase up to now, but it should not last more than necessary);
  - Nor dispersing efforts by putting them outside the guidelines that have been mentioned in the ‘why’ and ‘how’ sections.
- This balance has a counterpart: there should be a good harmony between supervision and reporting. Neither should be too ‘official’ nor too ‘diversified’. This is perhaps our biggest challenge, given a not so impressive track record in the past on this issue …

The special case of **3MT**

Modular Multi-scale Microphysics & Transport (3MT) (1/3)

- Why:
  - Because this is the best hope we have to tackle the grey-zone challenge;
  - Because it is in itself a mini-concept, as a kind of ‘internal laboratory’ for the ideas we try to promote in a wider context;
  - Because this is at the same time the only truly risky part of ALARO-0 and its ‘signature’ in terms of ambition (alpinist motivation).

Modular Multi-scale Microphysics & Transport (3MT) (2/3)

- When:
  - Since 1998, work by Luc on prognostic convection and on non-vanishing area fractions impact;
  - Since July 2003, idea about unique source of condensation and joint forcing for downdrafts (for the same work);
  - Since October 2004, M-T separation as central idea of Jean-Marcel's thesis => no need to parameterise detrainment if area fractions are forecast;
  - Since January 2005 (Tartu Workshop), merging of the 2 tracks;
  - Since April 2005 (independently), cascading solution for avoiding double accountings (Luc) & statistical sedimentation proposed by Jean-François to simplify the interaction with microphysics;
  - Since July 2005 (in the wake of the Bratislava Workshop), planning for integration to ALARO-0, with the associated rules;
  - Since December 2005, the acronym is popularised, with some positive and negative consequences …

Modular Multi-scale Microphysics & Transport (3MT) (3/3)

- How:
  - Exactly like the rest, just a bit later owing to the additional complexity!
- Where:
  - Like the rest but with the Toulouse ‘singularity’ and evidently more emphasis up to now in Brussels;
  - One has to carefully monitor the fluctuating position of CNRM people with respect to 3MT;
  - One also has to diversify the (yet limited) transversal expertise on this special but fully integral part of ALARO-0 => one of the goals of TCA0!

Why/when/how/where => Outlook

- It will be better made after the TCA0, but a few obvious recommendations already stand out.
- Please use the correct terminology
  - ALARO is a concept (and surely not a model). It might become a kind of Project, but we are only at the first steps of it.
  - ALARO-0 is a realisation on the basis of the spirit of the ALARO concept, in its various declinations.
  - Our models are still ALADIN ones.
- Do not forget why we need ALARO-0 and tell it to your bosses!
- Do not privilege any of our three basic challenges.
- Participate to the build-up of a better supervising and reporting structure, using ALARO-0 as a chance to do better there than previously.