Debriefing of the TCA0 (Training Course on ALARO-0), Radostovice, 26-30/3/07

http://www.rclace.eu/?page=99

ALADIN Workshop, Oslo, 25/4/2007

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Time-table

	Monday	Tuesday	Wednesday	Thursday	Friday
08.45-09.45		L06	L09	E6	L15
10.00-11.00	L01	L07	E4	L12	L16
11.15-12.15	L02	E2	L10	E7	L17
13.30-14.30	L03	WGA2	WGB2	L13	
14.45-15.45	E1			E8	
16.00-17.00	L04	L08	E5	L14	
17.15-18.15	L05	E3	L11	E9	
19.45-20.45	WGA1 & realisations	WGB1 & realisations	WGC1 & realisations	WGC2	
21.00-22.00					

Lectures' programme

L01	Introduction	Jean-Francois
L02	Governing equations	Bart
L03	SLHD	Filip
L04	Moist physics generalities	Radmila
L05	Microphysical processes	Bart
L06	Radiation: basic and NER	Jean-Francois
L07	p-TKE scheme	Filip
L08	Radiation: gas. stats.- & cloud satur. models	Jean-Francois
L09	Code status	Martin
L10	Existing validations and associated problms.	Radmila
L11	3MT: the grey-zone challenge	Luc
L12	3MT: the equation's historical evolution	Jean-Marcel
L13	3MT: the core concepts	Jean-Marcel & Luc
L14	3MT: the up- & downdrafts' handling	Luc
L15	3MT: the certainties and the perspectives	Jean-Marcel
L16	Implementation problems, options, constrnts.	Martin
L17	Wrapping-up and preparing KIT work	Neva

Working group arrangements (1/3)

- Working Group A: (Martina => Bart), Christoph and Luc (***coding structures for modularity-flexibility and associated scientific constraints***)
- Working Group B: Jan, Filip and *Joao* (***rather convection-independent parameterisation issues***)
- Working Group C: Neva/Jure, (Siham) and Doina (***roughly speaking 3MT***)

Working group arrangements (2/3)

- The evening working group sessions are of the mixed type, with also presentations about implementations' results. Plus the addition on 'time-schemes' in one afternoon and the discussion about CVPP in one evening.
- There was intentionally no strong guideline for the preparatory (documentation) part of the WG part. There is none either for how the WG sessions will happen.

Working group arrangements (3/3)

- The exercise did mean to ultimately produce some special documentation about the specificities of ALARO-0. Obviously we are not at that stage, but it is not the main point now.
- We are here to UNDERSTAND, COMPARE, HARMONISE and IMAGINE a transversal documentation form that will be well shaped with respect to the reinforced ‘scientific maintenance’ new goals of ALARO-0.
- Let see empirically how we proceed to that along the six WG sessions.

Exercise sessions arrangements (1/2)

- There will be five types of exercises:

1) ***algorithmic recognition***: 2 pieces of code and one basic 'document': the aim is to find the right one between the two codes and to explain why;

2) ***bug search***: in a single similar piece of code to the previous case; this time the declination is correct on the paper but intentionally ill-coded;

3) ***algorithmic anticipation***: like in the first case (2 codes), but the difference is situated in the consequences for stability or accuracy; thus no reference document provided;

4) ***results' interpretation***: cases study results made available, with in principle all necessary information available for the multi-source diagnostic of a weakness;

5) ***modularity (in 'passive mode')***: to create the equivalent of an existing code sub-item, starting from some non-ALARO-0 scientific and/or technical documentation.

Exercise sessions arrangements (2/2)

- The exercise sessions should be classical, but clearly '***scientific maintenance***' oriented.
- Each type of exercise will be practiced, however not on a very structured and coordinated basis.
- For the code exercises please do not cheat. We are here to learn, not to do a beauty contest in debugging.
- What we are here to learn is a better methodology of scientific maintenance. Hopefully the exercises will help to it.

Type N°1 mini-example (1/4)

- Routine, APLPAR.
- Document, governing equations paper Catry et al., 2007 => consistency between various thermodynamical processes contributing to the thermodynamic equation (see Lecture L02).
- Which of the two ensuing solutions is “equations’ compatible”.

Type N°1 mini-example (2/4)

- First code version

```
DO JLEV=KTDIA,KLEV
  DO JLON=KIDIA,KFDIA
    ZQX1=ZQR(JLON,JLEV)-ZIPOI(JLON,JLEV)*(0.0_JPRB &
      & -(PFPFPL(JLON,JLEV) - PFPFPL(JLON,JLEV-1)) &
      & +(PFPLSL(JLON,JLEV) - PFPLSL(JLON,JLEV-1)) &
      & +(PFPEVPL(JLON,JLEV)-PFPEVPL(JLON,JLEV-1)) )
    ZQR(JLON,JLEV)=MAX(0.0_JPRB,ZQX1)
    ZDQR=MAX(0.0_JPRB,ZQX1)-ZQX1
    ZFCQRNG(JLON,JLEV)=ZFCQRNG(JLON,JLEV-1)-ZDQR*ZPOID(JLON,JLEV)
    PFCQRNG(JLON,JLEV)=PFCQRNG(JLON,JLEV)+ZFCQRNG(JLON,JLEV)

    ZQX1=ZQS(JLON,JLEV)- etc.
    ZDQS=MAX(0.0_JPRB,ZQX1)-ZQX1
      etc.
    ZDQC=ZDQR+ZDQS

    ZDFCQL=ZFCQL(JLON,JLEV)-ZFCQL(JLON,JLEV-1)  &
      & - PFCSQL(JLON,JLEV)+PFCSQL(JLON,JLEV-1) &
      & - PFCCQL(JLON,JLEV)+PFCCQL(JLON,JLEV-1)
    ZFCQLDM(JLON,JLEV)=ZFCQLDM(JLON,JLEV-1)+ZDFCQL
    ZDFCQI= etc.

    ZQL(JLON,JLEV)=ZQL(JLON,JLEV)-ZIPOI(JLON,JLEV)*( &
      & (PFPFPL(JLON,JLEV)-PFPFPL(JLON,JLEV-1)) &
      & -ZDFCQL )
    ZQI(JLON,JLEV)= etc.

    PFCSQL(JLON,JLEV)=PFCSQL(JLON,JLEV)+ZFCQLDM(JLON,JLEV)
    PFCSQN(JLON,JLEV)=PFCSQN(JLON,JLEV)+ZFCQIDM(JLON,JLEV)
  ENDDO
ENDDO
```

Type N°1 mini-example (3/4)

- Second code version

```
DO JLEV=KTDIA,KLEV
    DO JLON=KIDIA,KFDIA
      ZQX1=ZQR(JLON,JLEV)-ZIPOI(JLON,JLEV)*(0.0_JPRB &
        & -(PFPFPL(JLON,JLEV) - PFPFPL(JLON,JLEV-1)) &
        & +(PFPLSL(JLON,JLEV) - PFPLSL(JLON,JLEV-1)) &
        & +(PFPEVPL(JLON,JLEV)-PFPEVPL(JLON,JLEV-1)) )
      ZQR(JLON,JLEV)=MAX(0.0_JPRB,ZQX1)
      ZDQR=MAX(0.0_JPRB,ZQX1)-ZQX1
      ZFCQRNG(JLON,JLEV)=ZFCQRNG(JLON,JLEV-1)-ZDQR*ZPOID(JLON,JLEV)
      PFCQRNG(JLON,JLEV)=PFCQRNG(JLON,JLEV)+ZFCQRNG(JLON,JLEV)

      ZQX1=ZQS(JLON,JLEv)- etc.
       ZDQS=MAX(0.0_JPRB,ZQX1)-ZQX1
         etc.
       ZDQC=ZDQR+ZDQS

      ZDFCQL=ZFCQL(JLON,JLEV)-ZFCQL(JLON,JLEV-1)  &
        & - PFCSQL(JLON,JLEV)+PFCSQL(JLON,JLEV-1) &
        & - PFCCQL(JLON,JLEV)+PFCCQL(JLON,JLEV-1)
      ZFCQLDM(JLON,JLEV)=ZFCQLDM(JLON,JLEV-1)+ZDFCQL
      ZDFCQI= etc.

       ZQL(JLON,JLEV)=ZQL(JLON,JLEV)-ZIPOI(JLON,JLEV)*( &
         & (PFPFPL(JLON,JLEV)-PFPFPL(JLON,JLEV-1)) &
          & -ZDFCQL )
      ZQI(JLON,JLEV)= etc.

    ZT(JLON,JLEV)=ZT(JLON,JLEV)-ZIPOI(JLON,JLEV)/PCP(JLON,JLEV)* &
      & (0.0_JPRB-ZLHV(JLON,JLEV)*ZDFCQL-ZLHS(JLON,JLEV)*ZDFCQI)

     PFCSQL(JLON,JLEV)=PFCSQL(JLON,JLEV)+ZFCQLDM(JLON,JLEV)
     PFCSQN(JLON,JLEV)=PFCSQN(JLON,JLEV)+ZFCQIDM(JLON,JLEV)
  ENDDO
ENDDO
```

Type N°1 mini-example (4/4)

- The second code version is correct. Indeed, when doing the cascading approach, the process catalogued in the ‘auto-conversion’ part of the equations set (true auto-conversion and collection) have two meanings:
  - going from cloud to precipitating species => no thermodynamical impact, only a ‘dynamical’ one;
  - for Wegener-Bergeron-Findeisen process, for collection of cloud liquid water by snow and of cloud ice water by rain, there is an associated implicit phase change before the change of species-type => there is also a thermodynamical impact.
- This has to be reflected in the cascade.

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

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

Priority list

- 3MT
- Link SURFEX – turbulent diffusion
- Cloudiness
- Radiation

focus point:
2m temperature in winter anticyclonic situation

Validation

- Well documented cases
  - Input files
- Initial conditions for operational implementation
  - Cycling (3Dvar, blending, first guess from previous run)
  - Initialization with value 0.
- Comparison with INCA precipitation analysis
  - Recent time period

Networking

- Toulouse is centre for IFS/ARPEGE/ALADIN/ALARO/AROME code maintenance
- Prague is centre for scientific, technical maintenance of ALARO code
- 9 ALADIN partners for scientific maintenance
  - 3 working group (continuity,flexibility)
- Interested people

to build up a flexible structure for supervision, reporting, ...

Exercises - discussion

Types:

- Algorithmic recognition (3+1)
- Bug search (6+1)
- Algorithm stability (3+1)
- Results interpretation (3)
- Modularity (3)

To put on web site?

WG session - discussion

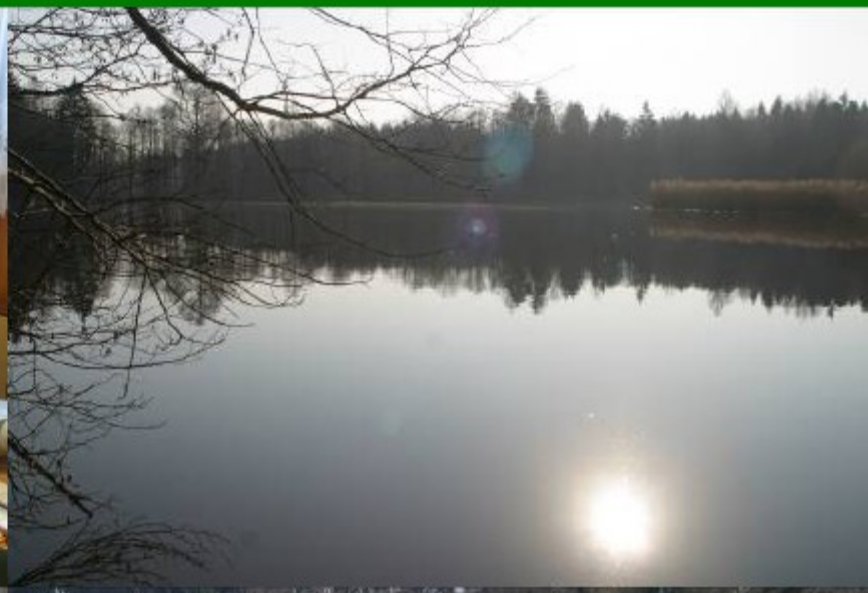
- Documentation presentation (congratulations for a “homework”)
- ALARO-0 experience at services
- Other topics: time-step organization, shallow convection, calculating humidity convergence with finite differences

Documentation - discussion

Shape of documentation - harmonization

- Content depends on topic
  - Scientific background
  - Implementation in the code
  - Float chart
  - input/output variables
  - Tuning parameters
- One document ?
- LaTex format
- Available on web page
- Regular update

Good luck.




Formal mathematical reason
sufficient to be represented by