



## **Report on the Physics session ASWS2021**

Jeanette Onvlee, Eric Bazile, Martina Tudor, 16<sup>th</sup> Apr 2021, video-conference

# Physics session part 1

- ❖ **BOUTELOUP Yves “Description of the proposed modifications in physics for the 2021 Arpege e-suite”**
  - New physics in Arpege (deep IFS convection, ECUME v6, SRTM+MclCa, Gelato sea ice) and their impact (also on Arome)
- ❖ **SEITY Yann, “Recent developments in AROME physics”**
  - Next Arome e-suite; new physics developments, focus on fog & microphysics
- ❖ **TIJM Sander “HARMONIE-AROME physics developments”**
  - Stable BL, fog and microphysics; stochastic parametrization to kick off convection?
- ❖ **BOCHENEK Bogdan “LACE physics developments”**
  - Surface-related changes, diagnostics for stratus/ CANOPY, TKE-based mixing length, prognostic graupel and 2 problem cases (VHR outflow, big T2m errors over snow)
- ❖ **MAŠEK Ján “Improvement of TOUCANS two-energy scheme”**
  - 2 shortcomings (oscillations, tendency to penetrate stable BL), 1 solution (iterated TKE/TTE solvers)



# Session Two

## . MARQUET Pascal - Impacts of changes in the conservation of pseudo-enthalpy (Arpege/Alaro) and the turbulent mixing length (Arpege/Arome)

- Removing local conservation of pseudo enthalpy changes temperature biases
- Non local mixing length as two inverses uses alpha coefficient of 2/3, changing it to 7/6 in a debug test improves temperature biases

## .SBII Siham - A new parametrization of the boundary layer forcing in the deep convection scheme of Bechold et al., 2014 and its implementation

- Explored ARPEGE and ALADIN NORAF deep convection scheme, primarily surface driven, tested over Atlas mountains, delays precipitation diurnal cycle to the right time of the day (with respect to Bougeault scheme) to the right time as compared with GPM data, AROME had good timing but overestimates prec

## .de ROOY Wim Open cell convection

- Modifications allow transfer from parametrized to resolved scales and formation of cloudiness and clear sky areas related to the open cell convection over the North Sea and Netherlands. Shallow convection mixing can destroy the cells. Reduced evaporation leads to less precipitation.

## .IVARSSON Karl-Ivar New developments of cloud physics etc. in Metcoop

- Explores recent modifications introduced in HARMONIE physics too much fog and too little low clouds, explores a problem with too few cases with ice-supersaturation etc.



# Session Three and Four

- ❖ **ENGAHL Bjørg Jenny - Aircraft icing forecasts with the ICE-T microphysics scheme.**
  - more supercooled LW and better profile for IWC and LWC however still underestimation of LWC below 800hPa. Higher hit rate but with higher false alarm
  - ICE-T not available yet in h or t cycle.
- ❖ **THEEUWES Natalie - Implementation of a wind-farm wake model in HARMONIE-AROME**
  - Ficht et 2012 param. called in apl\_arome in cy40h1.2 and 43h1.2, wind profile is improved near the wind farms, → potential impact in PBL (low cloud, LLJ..) issue with input data
- ❖ **TUDOR Martina - Modelling wave height and sea surface current direction using neural networks**
  - Accurate forecast of currents if “primarily” driven by wind however required good input data and not transferable in other regions without re-doing all the process. suitable for limited areas.
- ❖ **RONTU Laura - Status of ACCORD cloud-aerosol-radiation task PH6**
  - history since 2011 and not an easy ride ! → required many modifications for the input data in climate and LBC files (GL is used) and in the 4 rad.scheme and in micro-physics
- ❖ **MARTIN Daniel - Impact of CAMS aerosols in HARM-ARO and update**
  - 14 aer. species are used in HARMONIE-AROME from hourly LBC, positive impact, required some retuning in microphysics → very encouraging results
- ❖ **NIELSEN Kristian Pagh - Improved cloud optical properties**
  - Cloud emissivity is too high --> new spectral LW liquid cloud optical properties → for overforecast is reduced with also a reduce CDNC to 50 cm<sup>-3</sup>



# Discussion

- ◆ **Convergence in radiation/cloud/microphysics**
  - The general ACCORD goal is to have more interoperability and enable exchanging individual parametrisations between the CSCs. The PH6 work helps in this direction
  - Aerosol data flow is implemented and common, changes in individual parametrisations to be implemented and tested, compared and discussed
  - Impact of aerosols already studied in AROME microphysics, while ALARO microphysics to be developed in that direction
  - Not discussed but there is now two versions of ICE-3
  - physics convergence WG will discuss with physics experts
- ◆ **Vertical discretisation:**
  - height of 1st level → numerical stability, cost, challenge over complex orography (slope).
  - Surface issues - representation and building/vegetation height with respect to the lowest model level. Will roughness sublayer help?
- ◆ **Hectometric scales: no talks ... but need to consider scientific approach...**
  - Need for 3D- Turbulence: technical and scientific issues: horizontal gradient available in cy48 but not the divergence part....so still issues for a full 3D turb. The code is “almost” ready to study the impact of horizontal wind gradient in the TKE following Goger 2018 (R. Honnert, R. ElKhatib).
  - For 3D-radiation: several possible ways forward
  - What about e.g. microphysics, GWD, ...?
  - Need for good metrics!
  - Learn from LES experiences
  - Proposed solution: start a working group on hectometric/3D physics across 3CSCs

# Physics AL position & Working Group

- ❖ The PM proposes to close the position of the Physics AL until end of 2022. The position may be reopened in 2023, with updated ToRs, upon proposal by the PM.
- ❖ For 2021-2022, the PM proposes a WG to study the main issues of interoperability in the physics codes.
- ❖ Composition: PM, 3 CSC Leaders, P. Termonia, D. Degrauwe, S. Malardel
- ❖ Time line and delivery: propose a roadmap for end 2022, beginning of 2023 latest
- ❖ The Assembly is invited to approve the proposal as described in the preparatory document, and give mandate to the PM for continuing with the WG.