CALMO-MAX Meeting, HNMS, Athens, 7-9th January 2019

Monday, 7th

Attendees: Jean-Marie Bettems (JB)-MCH, Euripides Avgoustoglou (EA)-HNMS, Antigoni Voudouri (AV)-HNMS, Eduardo Bucchignani (EB)-CIRA, Silje Soerland (SS)-ETHZ, Izthak Carmona (IC)-IMS, Andreas Will (AW)-COTTBUS

Introduction to CALMO-MAX [AV]

- Calibration almost finished over the 1km MCH domain, with (3yrs) TERRA spin-up simulation (a couple of months missing for some of the interaction terms)
- 5 parameters selected, tkhmin, v0snow,rlam_heat, uc1 and radfac and at least one interaction term for each pair of parameters is available to fit MM
- HNMS is transferring generated data from Daint to ECMWF
- No available resources for further simulations at Piz Daint.
- Documentation and dissemination of information is fundamental for the projects, both through TR and manuscripts submitted to peer review journals.

Update on performance and meta model [IC]

- 5 new fields added to the COSI score: sunshine duration (will not be used, i.e. weight=0, because correlation with observation is too bad), mean / max / min of dew point temperature (only min and max will be used, similarly to 2m temperature), FSS (will replace ETS for precipitation)
- **Which weight should be given to the new fields? Or generally how to define the weights used in the performance function?**
- Proposed interaction terms for the COSMO-1 calibration are different when ETS is replaced by FSS in performance score
- **The set of optimal parameters values is a function of weather and season.**
- MM code translated to Octave to be compatible with ECMWF platform is still pending (IMS working on this)

Update calibration done at ETH [SS]

- Methodology applied on 8 tuning parameters, 10 years period (5 for spin-up), crClim model version
- Results of comparison of different calibration, different model versions & different calibration period presented
    - large differences in quality of reference & optimum
    - **significant differences in quality of match between MM optimum and model optimum, reason unclear**

Update from activities at CIRA [EB]
- EB presented calibration at CIRA for 7 parameters over a small domain (too small?)

- Case study: High precipitation event during the beginning of November analysed over Italy using COSMO-1 km. The analysis of the results show that parameters that have influence on this test case are: tkhmin, rlam_heat, v0snow, uc1.
- radfac, kexpdec, fac_rootdp have almost no impact on the solution, so the number of parameters could be reduced to 4.
- CIRA will provide output data to IMS for fitting the MM.

Improvements in the experiment design [EA]

- The spider graphs with the largest parameter range can potentially denote the most sensitive parameter for a particular field.
- The relative sensitivity of the other considered parameters can be estimated by employing the scale with the largest parameter range for the remaining spider-graphs.
- Yearly versus monthly spider graphs provide a transparent documentation of the seasonal dependence of the model sensitivity on the chosen parameters.
- A first tentative application of the methodology in reference to observations raises interesting questions.

Discussion on the COSMO-1 calibration
- IMS to run MM to find optimum using existing simulations
- Use kesch resources to compute OPT for 2013 and OPT and REF for a different year
- Compare results with ETH and proceed on submitting a manuscript at a peer reviewed international journal
- AV to submit the final report required by CSCS (Daint allocation project)

Miscelleanous
- Proposal to extend project by one year, depending on available human resources

Tuesday, 8th

New dynamical core [AW]

- AW presented his work on the new dynamical core
- **CALMO methodology will be applied at COTTBUS to calibrate turbulence parameters associated with the new dynamical core**
- In a first step, calibration of COSMO for 5 parameters will take place with the same setting as the C1 calibration, using COTTBUS computer resources
- Optimisation through MM application by IMS colleagues, but possibly on COTTBUS computer

Proposed developments of MM [JB, AW]

- Which are the consequences of using a non Euclidean norm (FFS in performance score)?
- Play with the FSS weight (0, 0.5, 1, 2) and with the total weight of vertical profiles to gain insight on role played by these weights in the optimization process
- Objective way to define the weights could be :
    - each independent event gets the same weight and
    - an independent event is defined by using the autocorrelation length

Find a way to optimize the computational cost of the method [proposed by IMS, AW]

- Partition parameters space in sets of independent parameters (e.g. v0snow, tkhmin), optimize each set independently
- Run only case studies (cold starts for 30 hour, including 6 hour for spin up) (if soil memory can be neglected, or if the soil is not running freely in the model configuration to be optimized); create an algorithm to select "typical" cases.
- Use coarser resolution than target configuration (e.g. 2.2 km), with a small high resolution (e.g. 1.1 km) nested sub-domain.

Additional decision on MM
- IC will transfer MM latest code version to COSMO-ORG repository, however two different branches for CLM and NWP respectively will remain.
- AW suggested MM code to be installed at B-TU (Cottbus), once agreed with their IP department (they have large Linux clusters, and MM can be much accelerated using coarse grain parallelism)
- Weights given to performance score remain at the time as they are

Wednesday, 9th
Database of unconfined model parameters

- AV presented the parameter list used for calibration within CALMO and CALMO-MAX. A list forwarded by DWD (C. Marsigli) was also presented.
- A first exhaustive list of unconfined model parameters has been made available in the COSMO TR 32, section 9.
- Model parameters should never be harcoded!
- **A list of unconfined model parameters, both exposed in the model namelists and hidden in the model code, should be maintained (COSMO, but also ICON); this list should at least document for each parameter: its meaning (comprehensible by others than the developer of the parameterization), its reference value, its uncertainty range, some compact information about the associated model sensitivity.**
- **Cooperation with model developers is required to create and maintain this list; changes in model development process should be proposed for that purpose.**
- AW presented the on-line namelist tool available for CLM. This tool supports password protected on-line editing of information (go first to AW for review)
- AW suggested that the tool could be extended to add internal model parameters, with a new attribute about model sensitivity.
- A proposal for compact way to describe model sensitivity has to be worked out.
- If the CLM tool is used, the information should also be accessible (mirrored) from the COSMO web site (password protected access, unique COSMO password).
- CLM community / A. Will would support this action.
- JMB will take this point at the next SMC.

Suggestions / Questions
- AW suggests to add surface pressure to the set of control variables (from observations or from driving model); this could be a way to prevent sampling unphysical parameters subspace.
- SS suggests to use bias instead of real value when completing the MM correlation check (as performed by ETH)

- To gain understanding about the dependency of the parameters optimum on the date, one could correlate the optimum with the dominant weather class (using e.g. MCH weather classification).

Other
- A Web conference has been scheduled at 11.02.2019 10:30 UTC (WebEX)