Minutes WG3b Parallel Sessions

COSMO GM 2020, 02.09 - 11.09

Soil & Surface main developments (WG3 a & b)

- Reformulation of land surface processes – implicit approach, consistency [PT ConSAT —> 2021Q1]
- Revision of interception storage [PT ConSAT]
- Revision of TERRA hydrology [MCH, DWD —> COSMO v6.0]
- Effect of vegetation canopy (skin layer, resistance formulation, semi-transparent layer) [DWD, PT ConSAT; skin layer available now]
- Improved vegetation phenology and stomatal conductance [PT VAINT —> 2022Q3]
- New urban model [PT AEVUS 2 —> COSMO v6.0] [PP Città —> 2023Q4]
- Advanced snow model [PT SAINT —> COSMO v6.0] [PT SAINT 2 —> 2022Q3]
- Common snow analysis [New PP (kick off 18.11)]
- (Tool) Model calibration [PP CALMO-MAX —> 2020Q4] [trCLIM@ETHZ, new PT/PP —> 2023Q3]
- (Tool) TERRA standalone (consolidate & extend) [DWD, PT SAINT —> 2020Q4] [PP Città ?]
- (COSMO software) EXTPAR (code & infrastructure, land use, topography, urban parameters, soil, pollen) [DWD, ETHZ, MPI-H —> running task]

Critical aspects not to be underestimated (planing & resources!)

- New / consolidated external parameters (new parameterizations, higher resolution, global)
- Tuning (application specific, CALMO methodology)
- Testing (global, multiple resolutions)

PT SAINT, goals till end of PT (12.2020)

- Add IMS satellite product (contact Martin Lange) to mask inter-comparison
- SNOWPOLINO included in TSA
- COSMO v5.9 09.2020 (incl. GPU support, GRIB inout, restart file)
- Validation incl. soil thermal forcing
- Adapt T2m diagnostic over snow
- Operational (@MCH) by the end of the year
- Scientific paper, COSMO User Guide, COSMO Scientific documentation (2 pages)

PT SAINT 2, start 01.2021

- PT draft and meeting with Guenther asap, then final PT proposal till mid October (lead Varun)
- Focus: migration to ICON (in particular integration in tiles framework, heat equation solver), advanced features
  - integration with Matthias developments should only be done once his code is available in an official ICON version
  - do not change the soil layering (many dependencies outside of TERRA)!
- Advanced features: snow & aerosols, snow & forest, snow & sea ice, snow & urban…
- Albedo developments by KIT (Anika) possibly implemented by Varun, under Anika supervision
- Coordination with urban developments (PP Citta)
- Coordination with VAINT (2 leaves approach for the vegetation)
- ICON testing is quite expensive
- ICON-LAM SCA is Uli S. (coordinate technical developments with him)
- Run time cost of new developments is an important factor to consider, also compatibility with GPU & vector architectures

PT AEVUS 2, PP Città (see also WG3b_minutes_urban.pdf)

- AEVUS 2 : coordinate COSMO code reviewing and testing with Uli S. (09.2020)
- AEVUS 2 : prepare COSMO User Guide, COSMO Scientific documentation
- Città : external parameters: coordinate with EXTPAR SCA
- Città : snow cover: coordinate with SAINT 2
- Città : includes urban model in TERRA standalone (in particular the support for the new external parameters, and the support for the tiles; any resources available?)

PT VAINT

- Accepted by StC, with the following conditions:
  - establish contact with ICON ART (Jochen F.) to evaluate usefulness of this development for pollen forecast
  - a plan for ICON implementation should come out of this project
- Some open questions
  - How to get (near-)real time information about crop?
  - Implementing a 2-leaves approach should be coordinate with other developments on canopy layer at DWD
  - Derive the correct plant functional types (PFT) from external data sets, and define the key parameters for each of these PFT's
  - What is the relationship between LAI and biomass?
  - How to get CO2 information for NWP applications?
  - How to calibrate / validate for PFT distinct from grass?
- Topic is very broad! It will be crucial to keep focus on the most important aspects! Note als that LAI assimilation is *not* part of the project
- Advertize this development in the COSMO / ICON community to attract new resources!
- The scheme should be cheap in terms of computing capacity and memory footprint (a couple of % more to the time to solution of a 24 hour forecast is reasonable)
- Contact MeteoSwiss for porting the scheme on GPU / accelerator once implementation start

TERRA (see WG3b_minutes_TERRA.pdf)

Model calibration

- Organize meeting with C.Schaer group (ETHZ) to coordinate work, in particular trCLIM 2nd PhD tasks
  - suggest a hackaton to work on code consolidation (1 week)
  - any possibility to get resources from C2SM (at least for code maintenance)?
- Consider funding proposal for project hosted at Cottbus (convergence aspects)
- Work to be done till end of C-MAX
  - Med calibration: get observations over GR and IS, calibrate (MM), compute independent year, validate, write paper
  - Optimum stability: large flow dependency also observed at ETHZ?
  - Optimum stability: is incremental computation of the optimum a problem (when a scheme is inactive in a 10 days period, the optimum can be any value and the a posteriori aggregation is corrupted by this arbitrary value)?
  - Final report
  - Draft follow-up project proposal
- Possible tasks for a new project (MM = Meta-Model, in [ ] the assigned resources)
  - (top) Comprehensive documentation of all significant ICON tunable model parameters (meaning, default value, meaningful range, model sensitivity)… CLM community also very much interested… Permanent task … Preliminary documents from Linda (ICON) and from COSMO TR (COSMO) are available
  - (top) MM: analyse and merge NWP (PP CALMO-MAX) and RCM (ETHZ) codes (all on GitHub in COSMO-ORG/CALMO-MM, public repo)
  - (top) MM: (where missing) define & implement a modular code structure, to properly separate observation import & processing, model import & processing, definition & fit of meta-model, definition of the performance function, computation of performance function optimum
  - (top) MM: consider open issues like screening of bad observations, strong flow dependency of optimum ...
  - (top) MM: provide comprehensive user guide ('how to install', 'how to use', list of suitable observations...) [HNMS]
  - MM: analyse and improve convergence aspects
  - MM: translate code into Python (?)
  - MM: further code and algorithm optimisations (?)
  - Understand stability issues of optimun
    - Are we sure that it is not a method artefact?
    - What can we learn about the different parameterizations?
  - Calibration of ICON-LAM at MCH (?)

TERRA standalone (TSA)

- DWD will provide resources estimation to include TSA functionality in ICON framework (Martin K), inbetween pragmatic approach is followed
  - according to Varun, current code is in a good shape
- Coordinate TSA development
  - latest improvements by Uli & Doerte
  - TERRA v6.0
  - new snow model (PT SAINT)
  - new urban model (PP Citta? poor man tiles?)
  - integrate ICON tiles mechanism (?)
  - integrate ICON external parameters processing (?)
  - support of ICON grid (?)

- upgrade transfer scheme (?)
- Define TSA as an official consortium code (—> SMC)

EXTPAR

- Permanent task, run smoothly
- ESA CCI is currently in experimental mode
- Module processing data which provide derived parameters (e.g, topography, land-use) will not be re-implemented with CDO (currently F90, problems occured when trying to process derived parameters, e.g. SSO or vegetation with CDO)
- Inter-consortium collaboration is very much meaningful and must be encouraged (experience about raw data sets, contact with and influence on data providers)
- See https://github.com/C2SM-RCM/extpar/issues for list of issues

Fieldextra

- Strong signal from the community to support full ICON support (Daniel R, Innes, Lucio, Anastasia. i.e. DWD, ITAF, RHM, CLEPS)
