

Minutes, WG3b, TERRA: Monday 07 September 2020

Attendees: Jean-Marie Bettems, Merja Tölle, Evgeny Churiulin, Jan-Peter Schulz, Ivan ?, Sascha Bellaire, Martin Lange, Linda Schlemmer, VV Kopeikin, Jürgen Helmert, Varun Sharma, Valeria Egorova, Ulrich Schättler, Inna Rozinkina, Christian Steger, Marco Arpagaus, Antigoni Voudouri, Mikael Varentsov, Gernot Geppert, Dmitrii Mironov, Anika Rohde, Katie Osterried, Guy de Morsier

Presentation: Marco Arpagaus from MeteoSwiss: Verification Highlights

- MeteoSwiss recently activated a new operational setup, moving to an 11 member ensemble COSMO-1E 1 km domain in addition to the existing 20 member COSMO-2E 2km setup.
- In addition, the new operational setup entailed a switch from an older version of COSMO (5.0 ++) to COSMO 5.07. There were no fundamental differences from the old operational setup.
- Initial verification of the newer model version (5.07) showed problems particularly with too much soil moisture in the spring season. This issue was so severe that it was not possible to switch to operations with the new model version in that state.
- Investigation into the issue revealed that a recent bug fix in the soil model had resulted in more soil moisture in general in the model. Because this change was due to a bug fix (and therefore more representative of reality), this indicated the need to re-tune the model and adjust the soil parameterizations to account for the soil moisture amounts.
- With the support of Jan-Peter Schulz and Gerd Vogel, it was decided to implement the improved bare soil evaporation and new skin layer temperature parameterizations in the operational setup, in the hope that this would improve the representation of soil moisture.
- Some tweaking of parameters was required to make the skin layer temperature scheme stable for the high resolution 1 km domain.
- Once the new soil parameterizations were running stably, verification of the adjusted model version showed much better



results for the soil moisture, and acceptable values for all required metrics. MeteoSwiss was therefore able to go operational with the new setup and model version in the beginning of August 2020.

- In addition the new COSMO-1E ensemble forecast shows an improvement over the previous operational system, despite the ensemble consisting of only 11 members.
- Questions/Discussion:
 - Jean-Marie comments that this is a good advertisement for CALMO and the mathematically rigorous process of tuning the model after changes to parameterizations. He also points out that this is a good demonstration of the benefits that can be achieved by increasing the resolution of forecast model runs.
 - Linda comments that the bug, the fix of which caused such a big change in the soil moisture, was only present in a few COSMO versions before it was fixed. As many people may be interested in knowing if their version of COSMO contains this bug or not, Linda offers that people can send her the code and she will tell them if it contains the bug or not.

Presentation: Jürgen Helmert from DWD: TERRA Activities

- As described in the previous presentation of Marco Arpagaus, TERRA development at DWD has been comprised of improvement of the land-surface process representations including the improved bare soil evaporation and new skin layer temperature worked on by Jan-Peter Schulz.
- Additionally, Jürgen has performed experiments with the landuse dataset ESA CCI in ICON. ESA CCI has improved representation of peatlands, full global coverage, and higher granularity compared with the currently used landuse datasets. Additionally, the ESA CCI dataset is updated periodically.
- Forecast experiments using initialization from operational analysis with the ESA CCI dataset in ICON showed some problems in the region of Antarctica leading to a warm bias in the Southern Hemisphere. Further investigation of the problem shows that the



land-sea mask of the older landuse dataset represents the Weddell Sea as glacial land with snow over it, while the land-sea mask of the ESA CCI data set represents the same area as open water with no ice. This leads to unrealistically high surface heat fluxes and the unrealistic surface temperatures in the ICON simulations.

- Further investigation is needed into this issue. Most likely, the representation of snow ice, glacier, and open ocean in the TERRA snow model is not sophisticated enough and needs to be revised.
- Questions/Discussion:
 - Jean-Marie remarks that this issue with ESA CCI demonstrates the external parameters become more important as model setups move to higher resolution.
 - Jean-Marie wonders if it is possible to apply the SAINT snow-model to operate over the sea-ice.
 - Jean-Marie asks that someone should be in charge of coordinating the efforts between all the new TERRA developments (SAINT, VAINT, new canopy developments, etc.). Jürgen responds that, as head of the physics team at DWD, Linda Schlemmer would be the best person for this role.
 - Mikhail asks if the ESA CCI land-use data set is supported in the web interfaces PAMORE and/or WebPEP for generating Extpar files. Jürgen responds that as it is still in an experimental state, it has not yet been incorporated into the web interfaces. If someone would like to test the new dataset, they can request it directly from Jürgen.
 - Linda Schlemmer comments that the new hydrology developments are available in a branch of the COSMO model and are awaiting review. The contact person for questions about this scheme is Daniel Reganass.
 - Varun Sharma introduces himself as someone with experience in snow-ice modeling and reports some success with resolving a similar problem to the snow-ice problem Jürgen described with the new ESA CCI dataset. He will



coordinate with Jürgen directly to provide further information about possible resolutions for the problem.