

# **EuroMed-CORDEX FPS Convection Kick Off**

## **November 3-4, Trieste, Italy**

### **MEETING MINUTES**

#### **November 3<sup>rd</sup>**

**Participants:** Stefan Sobolowski (UniRes), Erika Coppola (ICTP)

**Modeling systems represented:** WRF, RegCM, HARMONIE, AROME-Climate, COSMO-CLM, REMO, Unified Model (regional configuration)

#### **Introductions / State-of-the-art**

After introduction and brief discussion of the reviews, which will have to be addressed in the first annual reporting, Filippo Giorgi had a few words.

- Emphasized the importance of guiding scientific questions and motivation
- Well stated the need for these simulations

Stefan gave a brief summary of the Boulder CO workshop on convection permitting modeling. There is high interest in our effort to build a multi model ensemble at convection permitting scales.

Three presentations of the current state of the Art (see agenda), some take home messages:

- Shallow convection is not resolved at the scale we are talking about ~2-3km;
- Issues related to model validation due to observation quality, sparseness, biases (especially with respect to interpolated gridded observation products);
- Need for large enough domains to allow development, propagation and system interactions (e.g. systems merging, splitting, etc.);
- Diurnal cycles improved and processes resolved that were heretofore not captured (gust fronts, cold pools, low-level wind convergence, mcs development and shape, etc.);
- Many issues have been confronted before in an NWP context but not in a climate or climate change context;
- With the increase of the resolution at these scales new problems arise like biases over the topography show a characteristic of wet peaks and dry valley due probably to the lack of gravitational runoff.
- Due to the big amount of data storage needed the alternative could be on-line analysis or save restart files and rerun the simulation in parallel.
- Attention needed to the actual against nominal resolution. For example semi-lagrangian has a coarser resolution compared to the Eulerian.
- At those resolution sub daily changes of precipitation amount are expected. Flash floods in the Mediterranean basin need time scale analysis of 6-10 hours.
- Need of adoption evaluation metrics from NWP to avoid the double penalty problem.

#### **Refinements of scientific questions/aims (additions to original aims from proposal)**

**Science Aim 1: How do Convective events and associated damaging phenomena (heavy precipitation, wind storms, flash-floods) respond to changing climate conditions in different climatic regions of Europe?**

- Include additional processes/phenomena such as high altitude snow and related hydro climatic impacts, mesoscale processes like low-level wind convergence, orographic phenomena;
- Where to look for the added value of the scenario simulation.
- Life cycles of convective phenomena and related processes in the context of a changing climate;
- Land-atmosphere interactions and hydrological impacts.

**Science Aim 2: Does an improved representation of convective processes and precipitation at convection permitting scales lead to upscaled added value?**

- Consider improvements in the aggregate statistics of other near-surface variables such as temperature and wind.
- Use convective permitting models to help the development of convective parameterization
- We do not need necessary to show added value at large scale.

**Science Aim 3: Is it possible to augment costly convection-permitting experiments with physically defensible statistical downscaling approaches such as “convection emulators” that mimic CPMs and are fed by output of conventional-scale RCMs?**

- Include temporal discretization to elucidate sub-daily rainfall;
- Expand to include temperature and wind.

**Discussion around Mandatory Domain and optional subdomains**

**Mandatory Domain:** Extended Alpine Region 1-17E, 40-50N @ 3km (see attachments sent earlier for experiment protocol and domain specifications for modeling groups and experiment protocol)

*All participating groups are expected to contribute simulations and/or analysis on the mandatory domain*

Some groups are keen to work on optional sub-domains. Smaller sub-groups were formed to discuss and motivate these. It is agreed that the possibility for optional domains remain but that the focus for the first stage of the FPS is on the mandatory domain.

**Sub-domains:** Lowlands 0-10E, 48-55N (contact: Hylke de Vries, [vries@knmi.nl](mailto:vries@knmi.nl))  
Southeast Mediterranean 18-40 E, 32-42 N (contact: Baris Onol, [onolba@itu.edu.tr](mailto:onolba@itu.edu.tr), Eleni Katragkou [katragou@auth.gr](mailto:katragou@auth.gr)) [PENDING CONFIRMATION FROM BARIS/ELENI]

**Variables:** Start with CORDEX “Core” and add additional hourly fields such as tas, pr, u10, v10 (see attached CORDEX variable spreadsheet)

**Data sharing:** The goal is to provide data for analysis on a common 3km lat-lon grid with a common land-sea mask, in an ESGF compliant format. Intermediate solutions are to use in-house FTP/SFTP solutions for sharing data.

**November 4<sup>th</sup>**

The second day began with a recap of day 1, had short discussion on optional domains, finalized the mandatory domain discussion and moved on to discussion on observations and evaluation metrics. This led to selection of time periods for the evaluation simulations (i.e. ERA-interim). We also made preliminary selections of future time slices and discussed various statistical approaches related to scientific aim 3.

**Observations:** Sven Kotlarski and Veronique Ducrocq presented an overview of available high-resolution observation data sets available over parts of the mandatory domain. They delved into issues surrounding these data (e.g. gridded products in mountainous and/or station sparse areas may be worse than the models). Emphasized the need for focused study on how the observations are utilized and developing process-based metrics for evaluating our simulations. Some take home points:

- The observations/reanalyses will have varying utility for CPM applications
- Observation biases and uncertainties must be accounted for
- A few of the available datasets, their resolutions, type, time periods:
  - E-Obs (25km, station based optimal interpolation, 1950-2016)
  - Euro4M-MESAN (4km, reanalysis, 1989-2010)
  - HERZ COSMO-REA6 (6km, reanalysis, 1995-2014)
  - HERZ COSMO-REA2 (2km, reanalysis, 2007-2014)
  - COMEPHORE (1km, radar-based reanalysis, 1997-2006)
  - SAFRAN (8km, reanalysis, 1958-2008?)
  - WegnerNet (2km, gridded high density station net, 2007-present)
  - Others?
- Motivation for using a particular dataset must be clear (effective resolution, underlying assumptions, etc.)
- Veronique strongly suggested to use station data and radar measurements to evaluate convection at these scales
- For station-based products obtaining information about underlying stations is critical
- Many products are for surface variables only; what are best solutions for dynamical fields?

**Evaluation/Performance Metrics:** There is quite a lot of guidance on these from the NWP community. No need to reinvent the wheel, just adapt it to the climate scales we are interested in. e.g., <http://www.cawcr.gov.au/projects/verification/> Also, Cost-VALUE has quite a lot of evaluation metrics.

### **Time Periods (also see experiment protocol document)**

- ERA-interim evaluation run **2000-2014** (if possible), minimum 10 years
- Aim for groups to have 1yr of evaluation run done by June 2017
- Tentative CMIP5 simulation time slices:
  - HIST: **1996-2005**
  - RCP85: **2041-2050**
  - RCP85: **2090-2099**

**Publications/analyses:** The aim is for ensemble simulations to be available first and foremost for use by consortium members. It is not a race to make simulations publically available as soon as possible.

### **Points of Contact**

We discussed that there should be points of contact to help motivate and guide essential elements of the project such as: specific issues related to scientific aims, observations

(evaluation/validation), statistical modeling. These persons can be the same as the institutional p.o.c's or different. Volunteers welcomed ☺

- Scientific Aim 1: **????**
- Scientific Aim 2: Upscaled added value (**Samuel Somot?**)
- Scientific Aim 3: Statically emulators (Douglas Maraun, [douglas.maraun@uni-graz.at](mailto:douglas.maraun@uni-graz.at))
- Scientific Topic POCs: High Elevation, orographic and snow processes (Stefan Sobolowski, [stefan.sobolowski@uni.no](mailto:stefan.sobolowski@uni.no)), Heavy Precipitation Events (Erika Coppola, [coppolae@ictp.it](mailto:coppolae@ictp.it)), ...
- Working group on observations/reanalyses: **Sven Kotlarski?**
- Working group on evaluation and performance metrics: **????**

### **Timeline**

- Begin testing model configurations (a.s.a.p.)
- Finalize variable list (a.s.a.p.)
- Presentation at EGU (April)
- Splinter meeting at EGU (April)
- Ensemble of 1-2 year ERA-interim simulations (early summer)
- Side FPS event at the Med-CORDEX meeting in 4-7 July Barcelona
- Article for special issue on CPM in Climate Dynamics (late summer)

### **Action Items**

- Mailing list ([cordexfps-convection@hymex.org](mailto:cordexfps-convection@hymex.org))
- Website/wiki will be set-up by HyMex as well (Thanks Samuel!)
- Simulation, model-institute, RCM-GCM matrix spreadsheet (Stefan Sobolowski)
- Variable list (Stefan to circulate first draft)
- Date for next meeting t.b.d. (with Euro-CORDEX annual meeting, Jan. 2018? Other options?)
- Common topography, land-sea mask (Uni Research (Stefan))