Project: **1071**

Project title: **CCLM CORDEX-CORE Central Asia**

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Report period: **2018-01-01 to 2018-12-31**

Text: maximum of two pages incuding figures.

The project aims at producing the CCLM5 simulations for the central Asia domain of the CORDEX-CORE initiative.

At the start of the project no reference for the investigated domain was available. No real reference was available for any RCM for the region. Indeed, lot of efforts needed to be made for the configuration of the model for the considered regions.

These consisted in a set of simulations with a length going from 1 year to 30 years, for investigating model physical parameters and other aspects, as the use of the multi layer snow model of the TERRA-ML SVAT of CCLM.

The overall working plan of the project might be divided in three parts.

The first one included a set of simulations for testing the single and combined use of several parameterization. Part of these simulations were conducted within the DKRZ project BB1031.

The second and third parts follow the method of Belprat et al. 2012. In a first place more than 90 1-year long simulations have been conducted and outputs analyzed in order to individuate those model tuning parameters most sensible to changes. The analysis of this part is on-going.

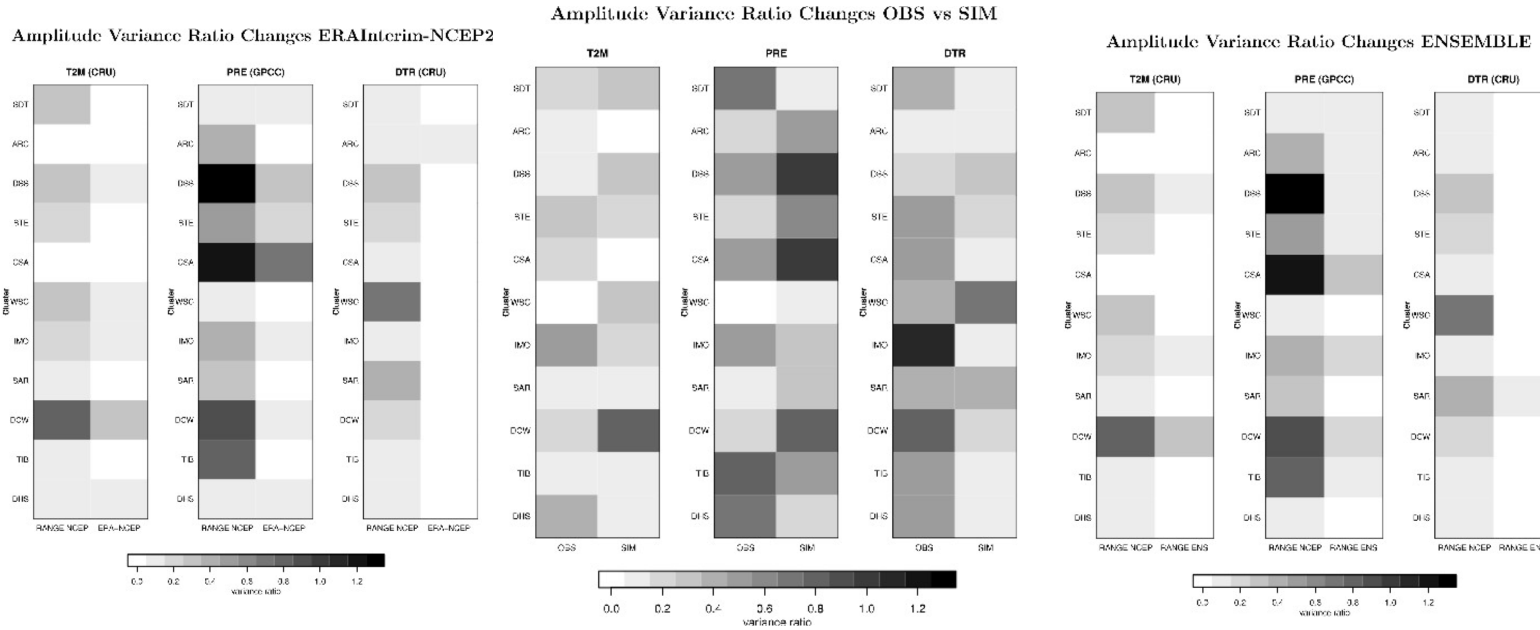
From these results, the third part of the project will follow. This consists in selecting five of the most sensitive parameters for the area and testing some of their values, singularly or combined with another parameter. At the end, a „perfect“ configuration will be found through a quadratic fit.

These experiments will be finished by the end of the year 2018. Then the real cordex simulations will be run. This part should be accomplished quickly once the model configuration has been settled.

Importantly, for the investigation of the CORDEX Central Asia domain, additional simulations to the mentioned ones have been performed. These are required in order to properly consider different sources of uncertainties for the evaluation. Among these, a set of four 15-year long simulations have been run in order to investigate the model internal variability. Results show that, concerning simulated to observed variability, the uncertainty coming from different observation is the largest one for the region, followed by the one deriving from the use of different boundaries and ending with the model internal variability.

One of the most significant deficiencies of the model over the region is a particularly pronounced warm climatological bias over Siberia in winter, probably related to a bad reproduction of snow cover. Indeed, we also conducted some tests increasing the number of model soil layers and using the CCLM snow snow model. Two important 25-year long additional tests have been conducted changing the number of soil vertical layer and using the multilayer snow model of TERRA-ML. Surprisingly, over the considered period, results showed no real improvement for winter mean temperatures over the Siberian region.

For the rest of the year 2018, after finalizing the analysis of the set of short simulations, we will focus on the finalization of the TUNING simulations and analyses and then perform the CORDEX run by the end of the year 2019.



Figures showing the range of changes in the simulated variance ratio of simulated to observed variance when changing driving dataset (left), observations (center) and changing simulation initial date (right)

Experiments Central Asia: 1-year long tests tuning parameters

1: tkhmin minimal diffusion coefficients for heat (0,**0.4**,1,2)
2:tkmmin, minimal diffusion coefficients for momentum (0,**0.4**,1,2)
3:tur_len maximal turbulent length scale (100,**500**,1000)
4:d_heat, factor for turbulent heat dissipation (12,**10.1**,15)
5:d_mom factor for turbulent momentum dissipation (12,15,**16.6**)
6:c_diff factor for turbulent diffusion of TKE (0.01,**0.2**,10)
7:rlam_heat scaling factor of the laminar boudary layer for heat (0.1,**1**,3,5,10)
8:rat_sea ratio of laminar scaling factors for heat over sea and land (1,10,**20**,50,100)
9:rat_can ratio of canopy height over z0m (0,**1**,10)
10:rat_lam ratio of laminar scaling factors for vapour and heat (0.1,**1**,10)
11:c_sea surface area density of the waves over sea [1/m] (1,**1.5**,5,10)
13:c_lnd, surface area density of the roughness elements over land (1,**2**,10)
14:z0m_dia roughness length of a typical synoptic station (0.001,**0.2**,10)
15:pat_len length scale of subscale surface patterns over land (10,100,**500**,1000)
16:e_surf, exponent to get the effective surface area (0.1,**1**,10)
17:entr_sc mean entrainment rate for shallow convection (5e-5, 1e-4, **3e-4**, 1e-3, 2e-3)
18:cloud_num cloud droplet number concentration (5e+7,**5e+8,**1e+9)
19:qi0 cloud ice threshold for autoconversion (**0**,0.00001,0.0001, 0.001,0.01)
20: v0snow factor for fall velocity of snow (10,15,**25**)
21:uc1 parameter for computing amount of cloud cover in saturated conditions (0.2,0.5,0.625,**0.8**)
22:q_crit, critical value for normalized over-saturation (1,**4**,7,10)
23:clc_diag cloud cover at saturation in statistical cloud diagnostic (0.2,**0.5**,0.8)
24:hincrad increment for running the radiation in hours (0.5,0.75,**1**)
25:radfac fraction of cloud water/ice used in radiation scheme (0.3,**0.5**,0.9)
26:soilhyd multipl. factor for hydraulic conductivity and diffusivity (**1**,1.62,6)
27: fac_rootdp2 Uniform factor for the root depth field (0.5,**1**,1.5)