Climate Limited-area Modelling Community

February 2019

Newsletter

No. 12

Content

See YOU at the ICCARUS 2019

18-22 March 2019
Offenbach, Germany

Invited speakers:

Gianpaolo Balsamo (ECMWF)

Heini Wernli (ETH)

Announcement:

CLM-Community Assembly 2019

17-20 September 2019

Paestum, Italy

Welcome to the 12th newsletter of the CLM-Community!

The major scientific goals and the main lines of development of the CLM-Community are defined in the CLM-Community Science Plan. The current science plan expired end of 2018 and thus it is necessary to develop a new plan for the period 2019 – 2025. The preparation of the new science plan will be one of the major tasks of the CLM-Community in 2019. More information about the new science plan can be found in this issue of the CLM-Community Newsletter.

Furthermore, the 12th issue contains an interview with Merja Tölle form the University of Gießen and research notes by Bo Huang et al. on „A colder and drier Europe in a future without trees“ and by Edoardo Bucchignani et al. on „Climate change projections for the Middle East-North Africa domain with COSMO-CLM at different spatial resolutions”. There is an article on the IPCC Special Report on Global Warming of 1.5°C and news from COP24 in Katowice by Andrew Ferrone, a review of the CLM-Community Assembly 2018 in Karlsruhe and an outlook to the upcoming ICCARUS and Numerical Model Training Course in March and April, respectively.

The editorial team is looking forward to meet all of you at ICCARUS 2019. Enjoy reading.

Yours sincerely,
Barbara Früh,
Susanne Brienen and
Christian Steger

ICCARUS LOGO, drawn by Nora Leps (University Frankfurt)

Five questions to … Merja Tölle

Universität Gießen

Photo by M. Tölle

Merja Tölle has a degree in Meteorology with interdisciplinary research topics relevant to climate modelling and land-atmosphere interactions. She is developing scientific topics with applying innovative methods dealing with statistical and numerical modeling. She brings with her long-standing experience as a lecturer for both undergraduate and graduate-level classes and above. She also supervises PhD students.

1. *Merja, you work in the institute for Geography at the Justus-Liebig University in Giessen. Can you please tell us something about the institute and your tasks there?*

The Department of Geography at the Justus-Liebig-University of Giessen is one of the oldest geographical institutes in Germany, in which lectures started in 1791. The department is divided into six parts with six professors for human, regional, economic, physical, climate, and didactical geography. Geoinformatics and remote sensing accomplish the curriculum.

I am a research scientist and lecturer in Jürg Luterbacher's group of Climatology, Climate Dynamics and Climate Change. International people from all over the world form his group, for which common research interests and experiences converge. We are involved in various national and international projects to work on past and future climate variability and extremes. Especially adaptation measures to climate change and reductions of greenhouse gases until 2050 is a focus of the LOEWE program FACE2FACE. We are also involved in both CORDEX Flagship Pilot Studies of Convective Phenomena and Land Use Change Across Scales.

I am leading the section of regional climate modelling in the group, where we are concerned with scale dependent climate change and with all aspects of the flora of the land surface, which affects the local and regional climate.

Furthermore, I am teaching courses at the bachelor and master level, which are devoted to statistical analysis, the climate system and modelling.

Finally yet importantly, the assistance of students and tutors, the fulfillment of examinations as well as involvements of university's self-organization are essential parts of my work.

2. *What is your main research focus when using COSMO-CLM?*

Ever since I started to work with the regional climate model COSMO-CLM my main research focus was on climate simulations on very high horizontal resolution (~1km) and land use change associated with the direct and indirect effects on the Earth's energy balance.

First, I was concerned with how the effect of bioenergy vegetation on climate can be implemented into the model and what are the processes of increasing bioenergy crops on a regional and local scale. I was the first in performing long-term convection-permitting simulations over almost the whole of Germany back in 2011.

Another important issue is how land use change affects climate variability like ENSO and how major shifts in land cover can be tracked in the time-series. I found that a deforestation scenario over entire South-East Asia can be as strong as reversing the sign of temperature of La Nina events. In another study, I was concerned with how different albedo parameterizations effect the radiative forcing and thus changes near-surface temperature. Major biophysical uncertainties due to land use change exist for mid-latitudes in summer showing different signs in temperature (either a cooling or warming) among diverse regional climate models. Especially in southern and mid Europe, where the forest fraction is small, the uncertainty is high. Here, I investigated and presented the dependency of the albedo parameterization in the model on the temperature signal.

As time moves on working with COSMO-CLM, I found the need to advance the regional climate model to be able to continue to answer further questions regarding boundary-layer processes and interactions between the land surface and atmosphere. Therefore, in a recently funded DFG-project I employ two PhD students to develop the regional climate model further with respect to a more heterogeneous land cover, including important vegetation types, and account for dynamic vegetation phenology.

3. ***You are a member of the CLM-Community for quite a long time now. What are, in your opinion the strength and the weaknesses of the CLM-Community?***

I am very happy to be in such a great community since it offers the opportunity to bundle the strengths of the community members to handle diverse tasks and problems together for science. I benefit a lot from this community since I have never worked in a regional climate modelling institute and therefore the community is of great importance to me. Seminars, assemblies, training courses, wiki pages, and the community homepage accomplish the support of the community members. I cannot report of any weaknesses.

4. ***You are the coordinator of the working group SOILVEG. Can you give us some insights in the current activities of the working group and your job as the coordinator?***

A major part as coordinator of the working group SOILVEG is to realize the science plan, which concerns the soil and vegetation in the regional climate model COSMO-CLM. Frequent meetings during the year serve to convene and get the latest update about the developments in the community. Specific research topics are combined with international projects like CORDEX FPS LUCAS. The working group also serves as platform for exchange, for support, and for new community members to get involved in the diverse projects.

5. ***What are your personal goals with respect to your scientific career?***

Overall, my personal goal is to improve my research by advancing knowledge of our scientific understanding of the Earth as a system, my teaching curriculum by developing the scientific knowledge and skills of the students, and myself, where reflection and adaption is a major part of the process. Currently I am starting my DFG project, supervise my PhD students to build up their scientific careers, and accomplish my proposed research questions. If I could make with my efforts a small contribution to serve society that would be great.

Thank you very much for the interview!

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IPCC activities

Special Report on Global Warming of 1.5°C

by Andrew Ferrone , Ministry of Agriculture, Viticulture and rural Development
Administration of agricultural technical services
Meteorological service
Luxembourg

The Intergovernmental Panel on Climate Change (IPCC) met from 1st to 5th October 2018 in Incheon, Republic of Korea. The main point on the agenda of this 48th Session was the adoption of the Special Report on Global Warming of 1.5°C and the approval, line by line, of it's Summary for Policymakers. The main messages of the report are as follows:

- It unequivocally confirms that negative impacts of climate change can be observed. Furthermore, it also clearly demonstrates the impacts, vulnerabilities and risks of further global warming to human societies and natural systems, including the attainment of sustainable development.
- Scientific evidence, underlying the report, indicates that risks at 1.5°C and 2.0°C are higher than previously thought and thresholds for tipping points might be reached between 1.5°C and 2.0°C. The risk for temperature overshoot scenarios returning to 1.5°C are higher than in scenarios without overshoot, including the potential of irreversible losses of ecosystems and ice sheets.
- It is still geophysically possible to limit warming to 1.5°C but this would imply immediate and scaled up actions across all sectors with green house gas emissions to be almost halved by 2030 compared to 2010 and CO_2 emissions to reach net zero globally around mid-century.
- This would imply an unprecedented transformation of the energy, transport, buildings, urban, land and industrial systems and urgent, deep emission reductions in all sectors as well as changes in human behavior.
- Implementing the current pledges that Parties made under the Paris Agreement for reducing their green house gas emissions by 2025 would lead to emissions twice as much as those in line with 1.5°C and would lead to a warming of about 3.0°C by 2100.

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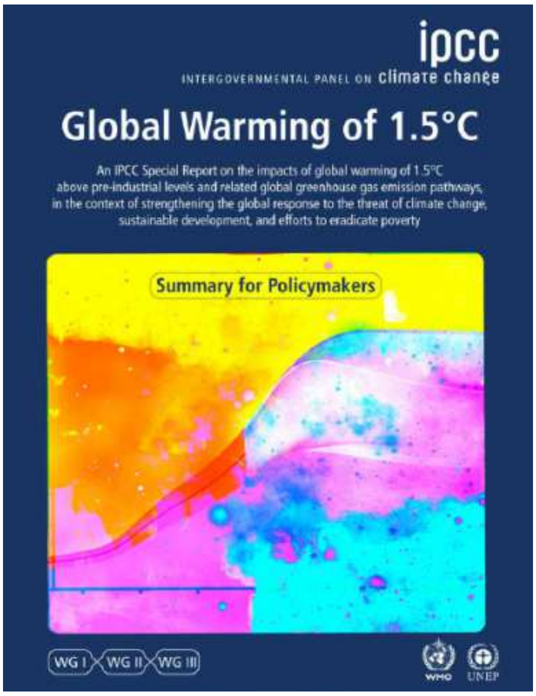
- All emissions pathways consistent with 1.5°C assume negative emissions removing CO2 from the atmosphere. This assumption implies technologies (including afforestation and bioenergy coupled with carbon capture and storage) whose feasibility, scaling-up and side effects raise concerns, in particular when deployed at large scale. Any further delay in near term action will lead to larger reliance on such technologies in the future.



The full report as well as its summary for policy makers is available under: https://www.ipcc.ch/sr15/

Upcoming sessions:

- Methodology Report: 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (49th session, 8-12 May, Kyoto, Japan)
- Special Report on Climate Change and Land (50th session, 13-17 August (TBC), location TBD)
- Special Report on The Ocean and Cryosphere in a Changing Climate (51st session, 20-23 September, Principality of Monaco, Monaco)

COP24: A robust rulebook for the Paris Agreement

by Andrew Ferrone , Ministry of Agriculture, Viticulture and rural Development
Administration of agricultural technical services
Meteorological service
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The 24th climate change conference (COP24) was held from 2nd to 14th December in Katowice, Poland. The Parties considered the IPCC Special Report on Global Warming of 1.5°C and expressed the appreciation and gratitude to the IPCC for delivering the report in time for COP24. The COP invited Parties to use the information of the report in their further deliberation and mandated the Subsidiary Body for Scientific and Technological Advice to consider the Special Report at its fiftieth session (June 2019).

The main focus of COP24 were however the decisions made on the rulebook to the Paris Agreement, needed to fully operationalize the Agreement.

The so-called 'Katowice Climate Package' includes decisions in five areas. The key parts of the rulebook are the decisions related to transparency and the global stocktake. As the Paris Agreement is based on a bottom up approach, it is important to evaluate the progress made over time (transparency) and take stock and increase ambition every 5 years from 2023 onwards (global stocktake):

- **Transparency**: This section of the rulebook describes, how often and with which details Parties should report on their climate efforts. The final text applies a single set of rules to all Parties from 2024 onwards, but giving developing Parties the possibility to apply flexibility, whenever they can provide a justification. Emissions must be reported no more than two years in the past (e.g. reporting in 2024 would cover years up to 2022) and Parties need to use common reporting tables which will be developed in the coming years.
- **Global Stocktake**: A key part of the Paris Agreement is its five-yearly pledge-and-review cycle. The idea is that every five years, Parties come together and take stock of progress towards the long-term Paris goals of avoiding dangerous global warming. Then, with this global stocktake in hand, Parties go home and return with enhanced climate pledges to fill gaps in ambition.

The rules decided on in Katowice set up the structure for the stocktake process, which is to be divided into three stages and spans over a period of one year: Information collection, technical assessment and consideration of outputs. The Paris Agreement set up the global stocktake in a way, that it would evaluate progress to the three long-term goals of the Agreement: cutting emissions, adapting to climate change and provide finance for climate change related activities (climate finance). A main area of discussions in Katowice was the extension of the discussion to other matters, such as the "loss and damage" caused by unavoidable climate impacts. The final decision includes that this matter should be considered but not on the same level as the three long-term goals of the Paris Agreement.

Further decisions of the 'Katowice Climate Package' include the following areas:

- **Climate pledge guidance**: These rules specify how Parties should report their pledges as mandated by the Paris Agreement. The final decision says that the latest accounting guidance from the IPCC must be used as well as the Global Warming Potential of the IPCC's 5th Assessment Report. There was also agreement that pledges should be recorded in a common registry and that they should cover a common timeframe from 2031 onwards, the length (5 or 10 years) being decided later.
- **Market mechanisms**: This was the most technical part of the rulebook and should allow Parties to participate in voluntary markets, where Parties can trade e.g. their overachieved pledges. Although progress in this area could be made in Katowice, a final agreement was not possible and the decision was postponed to COP25.
- **Climate finance reporting**: The rules agreed cover both projected availability of climate finance in the future and reporting on money that has already changed hands. Developed Parties are required to report on any climate finance they provide, whereas for developing Parties this is not mandatory. Developed Parties are also required to report on projected future finance initiatives from 2020 onwards. This information will be compiled to inform the global stocktake.

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CLM-Community issues

Review - CLM Assembly 2018

The 13th CLM-Community Assembly took place at the Karlsruhe Institute of Technology (KIT) in Karlsruhe, Germany from 18th to 21st of September 2018. 56 participants discussed scientific topics related to COSMO-CLM. Twenty-three talks were given in the five oral sessions from Tuesday to Thursday. The oral session were supplemented by a poster sessions with 22 poster on Wednesday afternoon.
A highlight of last years Assembly was the invited talk by Thomas Stocker (University of Bern), which could be organized in cooperation with the KIT-Climate lecture. In his talk, Thomas Stocker discussed the question "What if Paris fails?" and gave some very interesting insights to the creation process of an IPCC report.

Photo by N. Laube (KIT)

In addition to the scientific presentations, the meetings of the working groups and the CLM-Community meeting form the second important part of the Assembly. Here, some important steps towards further model development have been made, for example, with respect to convection-resolving simulations or the usability of ICON-CLM for regional climate model simulations. In the Community meeting, the members discussed and voted on many changes in the CLM-Community documents, the documents which set the frame for our cooperation in the CLM-Community.
We thank the KIT and Prof. Christoph Kottmeier for hosting the assembly and the local organization team, Gerd Schädler, Hans Schipper and Hendrik Feldmann, for the perfect organization. Thank you very much.

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Outlook - ICCARUS 2019

The next ICCARUS (ICON-COSMO-CLM-ART User Seminar) will take place from 18 to 20 March 2019 in Offenbach, Germany. As usual, oral and poster sessions are scheduled for the first three days, whereas the 4th and 5th day are designated for working group meetings. Please, make use of both opportunities to exchange and discuss results and ideas for further developments of our model systems!

ICCARUS organisation team (left to right): Bernd Kress, Daniel Rieger, Christian Steger, Heidelore Turau, Daniel Egerer, Anja Thomas. Photo by Michael Kügler

We look forward to 42 oral and even more poster presentations. In addition, Gianpaolo Balsamo from the ECMWF and Heini Wernli from ETH Zürich will talk as invited speakers.
More information can be found on the web page: www.dwd.de/iccarus and https://www.clm-community.eu/index.php?menuid=205&reporeid=318&getlang=en. A preliminary program is already online.

Outlook - Numerical Model Training Course 2019

For more than 10 years now, DWD offers an annual training course on the COSMO model system together with the CLM and ART communities. With the slow transition going on towards ICON as the new numerical model system for weather and climate applications, the contents of the course are also continuously adapted. This year, the NWP-targeted part of the course will be done completely with ICON-LAM, whereas for the climate community, presentations and exercises are still offered for COSMO-CLM. The course will take place from 8 to 12 April, 2019 in Langen, Germany. More information can be found on the web page: www.dwd.de/training

New science plan

The science plan of the CLM-Community sets the frame for the research and scientific activities within the Community. It “defines the goals of the community, identifies a strategy and outlines proposed actions to achieve these goals”. Furthermore, it discusses “the related research challenges and the ongoing scientific developments in the CLM-Community as well as the status and expertise of the CLM-Community”.
The current science plan covers the period from 2014 – 2018, so an update of the document is required. Therefore, the Scientific Advisory Board (SAB) suggested that the Coordinating Group (WG CO) should develop a new science plan for the period 2019 – 2025. A first draft should be available until May which will then be reviewed by members of the Community and the SAB. It is planned, that the Community can discuss and vote on the new science plan in the next CLM-Community meeting taking place during the next Assembly from 17 - 20 September 2019 in Paestum, Italy.
If you have suggestions for the new science plan or if you are interested in participating in the writing process please contact the coordinator of the working group which deals with your topic or write an e-mail to the coordination (clm.coordination[at]dwd.de).

Research notes

Climate change projections for the Middle East-North Africa domain with COSMO-CLM at different spatial resolutions

Edoardo BUCCHIGNANI[1]*, Paola MERCOGLIANO*[1]
Hans-Jürgen PANITZ[2]*, Myriam MONTESARCHIO*[1]
[1]*CMCC,* [2]*KIT*

More details and references can be found in:
Bucchignani, E., P. Mercogliano, H.-J. Panitz and M. Montesarchio (2018): Climate change projections for the Middle East-North Africa domain with COSMO-CLM at different spatial resolutions. Advances in Climate Change Research 9, 66-80, doi: https://doi.org/10.1016/j.accre.2018.01.004

The importance of assessing high-resolution climate projections over the 21st century is universally recognized. In particular, climate projections over the CORDEX–MENA domain are needed for the calculation of impacts on water resources in the region, and with regard to the development of adaptation strategies. As CORDEX-MENA is one of the last domains that have been defined in the frame of the CORDEX initiative, the number of literature works available is still limited. Currently, several modelling groups are performing regional simulations over CORDEX-MENA domain. In this study, projected changes in the future climate conditions for this domain over the 21st century have been investigated with COSMO-CLM. Two simulations have been performed respectively at 0.44° and 0.22° spatial resolution. The high-resolution simulation is nested in the lower resolution one.

Simulations at both resolutions were performed over the period 1979–2100. The historical period 1979–2005 has been simulated according to the IPCC 20C3M protocol, while the period 2006–2100 has been forced by the RCP4.5 scenario. Initial and boundary conditions are provided by the GCM CMCC-CM, which is a coupled atmosphere–ocean general circulation model. Analyses have been performed for average values of two-meter temperature (T2m) and total precipitation. Moreover, a subset of the standard ETCCDI indices (EWI) based on precipitation has been selected, in order to evaluate the skill of COSMO-CLM to simulate extreme events and to assess future changes.

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The capabilities of COSMO-CLM in reproducing the main climate features of the MENA domain have already been assessed in previous works, considering ERA-Interim driven simulations, compared with respect to a combination of available ground observations, satellite products and reanalysis. In the present work, the GCM driven simulations at both resolutions have been evaluated over the period 1980-2011, in terms of average properties, against CRU in order to have the same reference dataset as many studies found elsewhere. Moreover, precipitation EWIs were also compared with Tropical Rainfall Measuring Mission (TRMM) dataset. TRMM provides global daily precipitation estimates from a wide variety of meteorological satellites at 0.25° spatial resolution for the period 1998–2011. Both simulations (GCM and RCM) generally reproduce the main characteristics of T2m quite well. Even if it is difficult to draw a general conclusion, the comparison shows that, apart from a few exceptions, the RCM is able to reduce the model bias with respect to GCM. The resolution increase from 0.44° to 0.22° produces slight improvements in DJF and MAM, while no significant differences are recorded in JJA and SON. Concerning precipitation, it is evident that COSMO-CLM (at both resolutions) is able to reduce the bias of the driving GCM only in few cases. Otherwise, the resolution increase from 0.44° to 0.22° does not produce improvements the reason being that the mesoscale phenomena in this area are characterized by a higher resolution than those employed for the current simulations. Moreover, the high resolution is not exploited by the moist convection scheme used here, which probably works well with a cloud-resolving mode.

Climate projections have been analyzed considering the period 2071–2100 as representative of the end of the 21st century. Following the approach used in many literature works, the mean seasonal values of T2m and precipitation over the future period have been compared with the mean seasonal values over the reference one (1981–2010). Fig. 1 shows the seasonal T2m change projections for the period 2071-2100 with respect to 1981-2010, provided by CMCC-CM and COSMO-CLM at both resolutions. Both global and regional simulations suggest a general increase of temperature in the four seasons, but the finer resolution projects a slight lower warming.

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These differences can be related to local processes linked to land processes and parameterization, a better representation of topography and the location of land and sea at higher resolution. Temperature projections are statistically significant and generally highlight a strong warming, especially in summer, which could be associated with a thermal low.

Fig. 2 shows the seasonal precipitation climate projections for the period 2071-2100 with respect to 1981-2010 provided by CMCC-CM and COSMO-CLM at both resolutions. Both GCM and RCM suggest significant percentage decreases in DJF in the western part of domain. However, this area is characterized by very low precipitation values in the reference period, leading to high percentage variations even if absolute changes are small. A band of increase on the coast along the Gulf of Guinea is visible in CMCC-CM and not projected by COSMO-CLM. This structure could be related to a change in the West African Monsoon system, which is very difficult to be modeled. It has been shown that precipitation projections on this area, both in terms of average values and of extreme events indicators, largely depend on the horizontal resolution, suggesting the need for additional simulations at higher resolution.

A systematic and quantitative comparison with other projections was not possible, since regional climate simulations over CORDEX-MENA for the 21st century are not yet available in literature. Comparisons with global projections and with data extracted by other computational domains (e.g. CORDEX-Africa) revealed a good qualitative consistency for what concerns temperature, while projected precipitation changes are beset by larger uncertainties. Even if it is not possible to define an optimal resolution for every geographical domain, (depending on the climate variability of the area considered), it is evident that, at least in some areas, the high-resolution might provide good improvements.

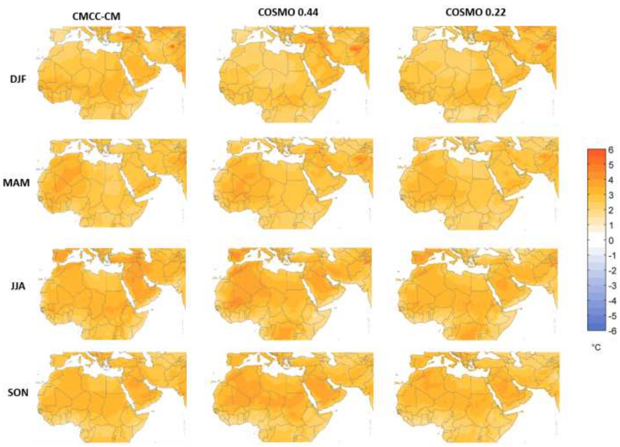

Fig. 1: T2m climate projections: seasonal differences (°C) between the average value over 2071-2100 and 1981-2010 for the four seasons, provided respectively by the Global Model and COSMO-CLM at both resolutions.

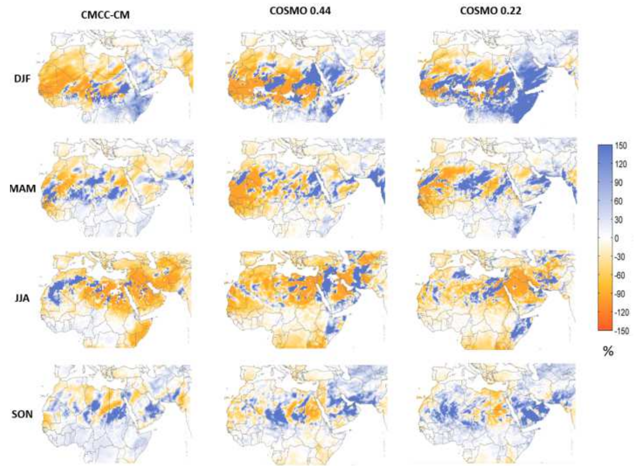

Fig. 2: Precipitation climate projections: seasonal differences (%) between the average value over 2071-2100 and 1981-2010 for the four seasons, provided respectively by the Global Model and COSMO-CLM at both resolutions.

A colder and drier Europe in a future without trees

Bo Huang [1], Francesco Cherubini [1], Xiangping Hu [1]

[1]*Norwegian University of Science and Technology (NTNU)*

More details and additional references can be found in:

Cherubini, F., B. Huang, X. P. Hu, M. H. Tolle, and A. H. Stromman, 2018: Quantifying the climate response to extreme land cover changes in Europe with a regional model. *Environ Res Lett*, **13,** 074002, doi: 10.1088/1748-9326/aac794

Introduction

Land use/cover change (LUCC) impacts the climate system from the local-to-regional scale. Previous studies do not have a similar conclusion of climate change caused by LUCC and even show some contrary results, especially in the mid-latitudes (Perugini et al. 2017). A larger difference of mean climate effects can be found in deforestation experiments using a regional climate model instead of a global climate model. The mean cooling effect in boreal zone is -2.18°C in regional climate model simulations and -0.49°C in global climate simulations (Perugini et al. 2017). The changes in climate model-based simulations are more significant than that in observations. For example, in the boreal zone, model simulations show regional cooling effects in deforestation experiments, ranging from -4°C to -0.82°C, while the effect is -0.95°C to 0.04°C in observations. These results cannot establish a full agreement of land use management. We want to quantify the climate response to extreme land cover changes with a regional model. The new findings can be used in assisting decision makers to design land management strategies in light of climate change mitigation and adaptation.

We used the regional climate model COSMO-CLM v.4.8 to quantify the regional climate response to extreme land use changes in Europe in terms of temperature, precipitation, and frequency of temperature extremes. The control simulation (CTRL) is based on present-day vegetation cover and soil from the global land cover database GLC2000 provided by the Joint Research Centre of the European Commission (Bartholome and Belward 2005). Then, we simulate two idealized land use transitions across the entire European domain involving abrupt conversion of today forestland to bare land (BL) and herbaceous vegetation (HV). All the simulations follow the EURO-CORDEX framework.

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The simulations use the initial and lateral boundary conditions from the European Centre for Medium-Range Weather Forecasts (ECMWF) Interim reanalysis (ERA-Interim; Dee et al. 2011). The ERA-Interim data are selected for a larger area in order to clear the noise in the lateral boundary conditions for the external part of the EURO-CORDEX domain. All simulations are performed using the EURO-CORDEX configuration and for the period 1980-2010 at a horizontal resolution of 0.44 degrees with 40 atmospheric levels. We use a time step of 300 seconds and the Tiedtke mass-flux convection scheme for physical parameterization (Tiedtke 1989).

Result

Figure 1 shows the spatial distribution of the mean temperature and precipitation response in Europe to the two extreme land cover changes. Deforestation experiments cause an average cooling in the northern and eastern part of the domain, and a slight warming effect in western and central Europe. The annual mean regional cooling is -0.06 ± 0.09 °C (mean ± one standard deviation) for FOR to BL and -0.13 ± 0.08 °C for FOR to HV. Impacts are stronger at a local scale on the grids affected by the land cover change, where they are on average of -0.20 ± 0.12 °C and -0.36 ± 0.11 °C, respectively. The replacement of forests with bare land or herbaceous vegetation increases surface albedo, especially during winter months due to the well-known snow effect (Anderson et al., 2010; Betts et al., 2007), which results in decreased absorption of solar radiation at the surface and annual mean cooling that exceeds 1 °C in some northern locations.

A clear latitudinal pattern emerges from the results. At increasing latitude, the average temperature response to deforestation declines and turns to negative (i.e., cooling) from about 45° N. The net impact of changes in biophysical factors on climate strongly depends on local climate and vegetation type, especially at mid-latitude areas where the opposing albedo and evapotranspiration effects are of comparable size but different sign. The net effect is thus small and rather uncertain. Depending on the location, the dominant effect can be an average annual warming or cooling, as shown by the heterogeneities of the responses in Figure 1.

The precipitation response to the simulated extreme land cover changes has large spatial variability (Figure 1c and d). In the deforestation experiments, a significant dryer climate is found over the EURO-CORDEX domain, especially over the affected grids.

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The annual mean difference across the entire domain is -0.05 ± 0.02 mm day^{-1} for FOR to BL, and -0.04 ± 0.02 mm day^{-1} for FOR to HV. Local responses can be up to -0.4 mm day^{-1}. Removal of trees causes a significant reduction in regional precipitation owing to reduced evapotranspiration, which is stronger in the transition to bare land than herbaceous vegetation.

The climate change signal for the different experiments over the entire domain and the grids affected by the change in land cover is summarized in Figure 2 as a probability function based on kernel density estimation. The distribution of the climate signal is more spread at a local scale (Figure 2b, d) than at a regional scale (Figure 2a, c). In the deforestation experiments, the probability distribution of local temperature changes peak at around -0.5 °C (up to more than 2% of total grids), with the FOR to HV case exhibiting a distribution (and average estimate) more translated towards higher temperature reductions (Figure 2b). Precipitation changes are rather similar and follow a bell-like shape curve around the mean estimate. Differences in the climate signal from the two afforestation experiments are relatively small, and the probability distributions follow a similar pattern for both temperature and precipitation changes.

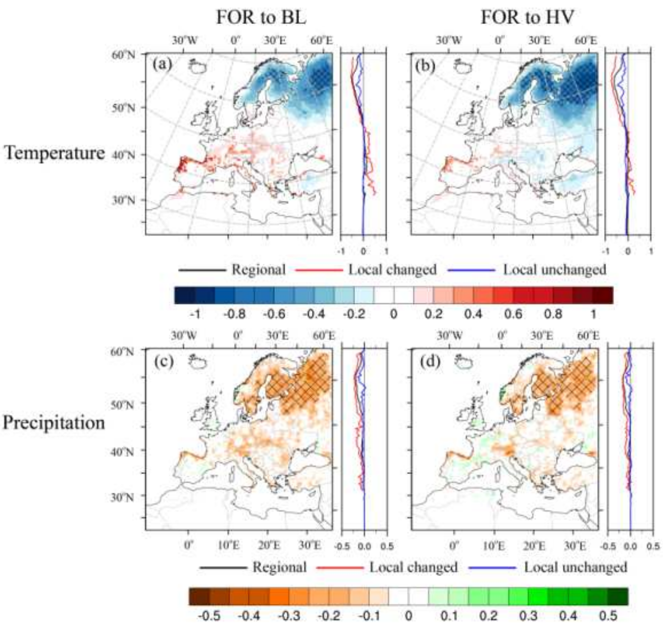

Fig 1: Annual daily mean temperature (“experiment minus control run”, unit: °C) and precipitation (“experiment minus control run”, unit: mm day^{-1}) response to land cover change in the deforestation (FOR to BL and FOR to HV) experiments. Panels on the right of each map show the land latitudinal average (normalized by the number of grids) of the average temperature change over all grids (black), only grids affected by land use change (red) and un-changed grids (blue). The black net in the maps illustrates the grids that passed the t-test at 0.05 level.

Conclusion

Two extreme land cover transition experiments have been compared with a control simulation in terms of temperature and precipitation changes in the EURO-CORDEX domain. An average cooling and dry effect can be found while the forest is replaced by BL and HV in Europe, especially in northern Europe. A slight warming effect occurs in western and central Europe from FOR to BL, and in western Europe from FOR to HV. However, the slight changes can not pass the significant test. In general, cut down all the trees will lead to a colder and drier Europe.

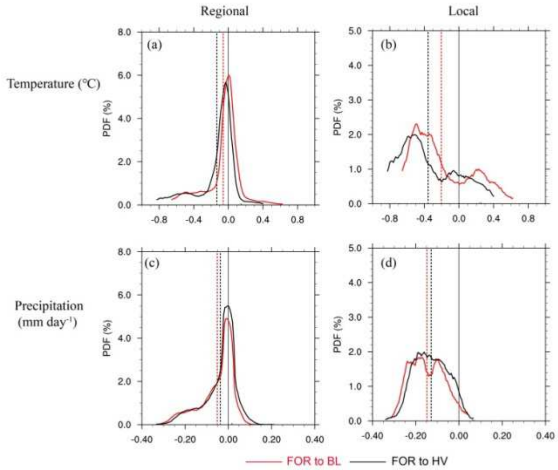

Fig 2: Probability density distribution of annual daily mean temperature (unit: °C) and precipitation (unit: mm day^{-1}) anomaly (experiment minus control run) over the land EURO-CORDEX domain (regional) and in land cover changed grids (local) in the deforestation (FOR to BL and FOR to HV) experiments. The differences refer to “experiment minus control run”. The solid line shows the distribution of the values and the dashed line indicates the mean value.

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Recent publications

Please send all information on new publications related to COSMO-CLM (peer-reviewed, reports, theses, etc.) with corresponding links to clm.coordination[at]dwd.de. Please do not forget to name the project in the topic browser to which it is related.

2019

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Remember!

… part of your scientific success relies on the work of those people providing the reference model setup, maintain the codes, etc. Therefore, it would be more than a sign of courtesy to offer them co-authorships once in a while.

Please, do not forget to state that you used the "COSMO model in Climate Mode (COSMO-CLM)" and, please, also include the statement "COSMO-CLM is the community model of the German regional climate research community jointly further developed by the CLM-Community" in each publication.

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Welcome to new Members

Stockholm University Sweden

(https://www.su.se/english/)

Topic: *Impact of climate change on weather forecast uncertainty*

Contact: *Sebastian Scher*

University of Bergen - Norway

(https://www.uib.no/en)

Topic: *Moisture transport analysis with COSMOtag and COSMOiso*

Contact: *Harald Sodemann*

Johannes Gutenberg University Mainz - Germany

(http://www.uni-mainz.de/eng/index.php)

Topic: *Meteorology-air chemistry interactions in urban regions*

Contact: *Joachim Fallmann*

Upcoming events 2019

Mar 18 – 22	ICCARUS, Offenbach, Germany
Mar 18 – 22	DACH 2019, Garmisch-Partenkirchen, Germany
Apr 02 – 05	EZMW, Workshop on Predictability,dynamics and applications research using the TIGGE and S2S ensembles, Reading, UK
Apr 07 – 12	European Geosciences Union General Assembly 2019, Vienna, Austria
Apr 08 – 12	Numerical Model Training Course, Langen, Germany
May 21 – 23	Klima-Nutzerworkshops - MIKLIP II, München, Germany
May 28 – 31	European Climate Change Adaptation conference (ECCA), Lisbon, Portugal
Jun 24 – 27	6th Inernational Conference Energy & Meteorology, Copenhagen, Denmark
Jun 24 – 28	14th International Meeting on Statistical Climatology (IMSC), Toulouse, France
Aug 21 – 23	Symposium "High-resolution climate modeling: Perspectives and challenges", Zürich, Switzerland
Sep 09 – 13	COSMO GM, Rome, Italy
Sep 09 – 13	EMS Annual Meeting, Lyngby, Denmark
Sep 16 – 20	OceanObs, Honolulu, Hawaii
Sep 17 – 20	CLM-Community Assembly, Paestum, Italy
Oct 14 – 18	International Conference on Regional Climate, ICRC-CORDEX, Beijing, China

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