

## Summary of the session “Climate Services in the frame of CORDEX”

Swantje Preuschmann, Daniela Jacob, Claas Teichmann, Juliane Petersen and the GERICS team

The session “Climate Services in the frame of CORDEX” took place on Thursday 19th of May from 2 to 5 pm at the ICRC-CORDEX 2016 conference. This session was hosted by Daniela Jacob, director of the Climate Service Center Germany (GERICS), Juliane Petersen and Claas Teichmann also working at GERICS. Further a team of six additional GERICS staff members supported this event.

The aim of this session was to receive an opinion from the CORDEX community about the usage of CORDEX data for climate services. In order to gain such an opinion and mirror it back to the community, this session was structured in four main parts: key-Note talks, workshop, presentation of case-studies and finally a synthesis of the workshop-phase with final plenum discussion.

The session was visited by more than 70 participants.

### Key-note talks

In the first part, an introduction to the session was presented by Daniela Jacob. It included the demonstration of existing climate service products, based on CORDEX data. Further, Claas Teichmann gave an overview of the activity of the „Vulnerability, Impacts, Adaptation, and Climate Services (VIACS) Advisory Board for CMIP6“. It was followed by a keynote talk presented by Geert Jan van Oldenburgh regarding the topic “From CORDEX data to climate service products”, summarizing experiences for making user-friendly products.

### The World-Café workshop

The second part was organized as workshop in the format of a so-called “World Café”: three moderated stations with pin-boards were established. The audience was divided into three major groups by attributing a colour, and additionally divided into mini-groups of three at the stations (see figure1). At each station the participants tried to answer two questions: the first question was a YES-NO question to receive a quick statistical overview while the second question was question open for discussion. Each sequence comprised 10 minutes of discussion within the mini-groups, whereby the answers were noted on cards and pinned at the board.

**The station attributed with the color blue focused on the usage of CORDEX data for climate service products, with following two questions:**

1. Have you already analyzed CORDEX data to provide information to end-users? (Yes/No?)
2. Do you think CORDEX data are appropriate for climate service products and what are the major challenges?

**The yellow-station regarded the quality and relevance of the standard CORDEX-output, by working on the questions:**

1. Does the standard CORDEX output (variables, temporal and spatial resolution) match the needs for climate service products? (Yes/No?)
2. What can be improved concerning the temporal and spatial resolution and/or the variables to fit the needs of the end-users?

**The aim of the orange-group was to reveal the needs for guideline and meta-information:**

1. Is there enough guidance (meta-data, contact points, guidelines, etc.?) concerning the use and usage of CORDEX data for the provision of Climate Services? (Yes/No?)
2. How can the usage of data be improved and is there a need for help or guidance concerning the data use?



Figure 1: World-Café discussion group: BLUE. Aula Magna, Stockholm University.

### Case study talks

The third part was reserved for four scientific presentations regarding climate service relevant case-studies:

- A climate services viewpoint on regional climate modeling's place in assessing future impacts of climate change by Travis Logan (OURANOS, Canada)
- From Climate Services to Climate Adaptation Decisions by Chantal Donnelly (SMHI, Sweden)
- Climate in Norway 2100 by Stephanie Mayer (UniResearch/Bjerkness Center, Norway)
- Development of a Regional Climate Projections Consortium and Data Facility in Asia and the Pacific by Jack Katzfey (CSIRO, Australia)

### Synthesis of results

Meanwhile, the results of the World Café were synthesized and presented directly in the session. In figure 2 the statistics for the yes/no questions are collected. Figure 3 shows original pin-boards of the three groups.

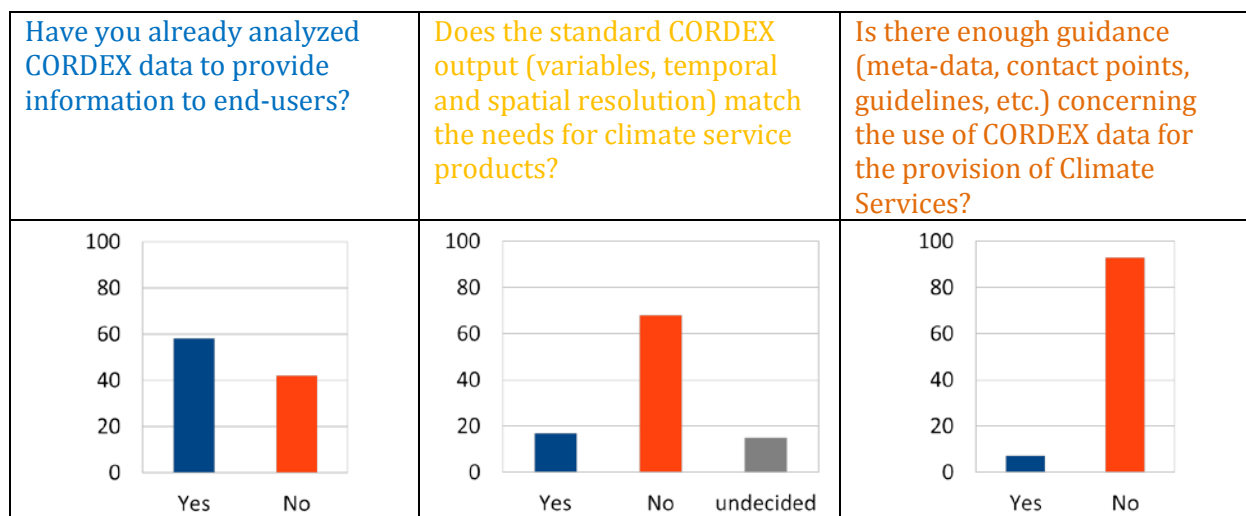


Figure 2: Results of the Yes/No-question of the World-Café. BLUE-Group (left), Yellow-Group (middle), Orange-Group (right).

## Usage of CORDEX data for climate service products

Within the blue-group on usage of CORDEX data for climate service products, the statistical mini-survey showed that more than 50% of the participants already analyzed CORDEX data to gain information for end users (figure 2, left).

While answering the question if the data is appropriate for climate service products, the common opinion was that it does not. A common request for more ensemble members and higher spatial and temporal resolution in data was obvious. Most of the participants pointed out that to fulfill their needs, further post-processing of the data is necessary. Especially, they feel a lack in guidance for a consistent post-processing (e.g. Bias Adjustment) and a lack of detailed meta-information (e.g. index methodological description) of the data. There is a request for support on how to judge about the data quality and usability. Even though, information on how to transfer the data into other formats, e.g. GIS compatible formats, is an issue to make CORDEX-data appropriate for climate service product. A major challenge seen within the data post-processing, is to find a common agreement in the methodologies and trans-regional validity.

More attention should be paid on understanding the physical processes in combination with the driving Global Climate models and additionally the inclusion of the human dimension. This also hints to a lack of information on how to handle the data for special cases. In particular, bias adjusted data seems to be in great demand. Also highly requested are transparent information and consistency of the bias adjustment methods as well as its usability. The communication of the limitations of the data to end-users is required.

In relation to the practicality of using CORDEX-data, the visibility of the CORDEX-output needs improvement. This includes a well working interface communicating the meta-information, limitations and detected mismatches.

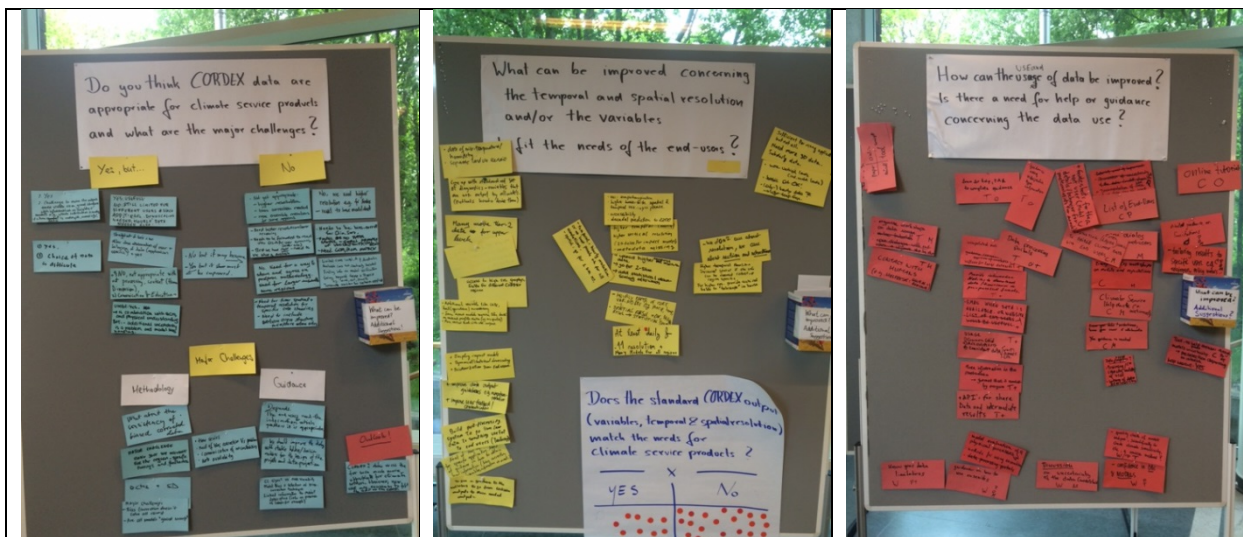


Figure 3: Pin boards of World-Café, BLUE-Group (left), Yellow-Group (middle), Orange-Group (right).

## Quality and relevance of the standard CORDEX-output

For the yellow-group on quality and relevance of the standard CORDEX-output, the question if the standard CORDEX output matches the need for climate service products was negated by 68% of the participants (figure 2, middle), 17% agreed, whereas 15% were undecided on that issue.

Concerning the improvement to fit the end-users needs, the question focused on the requested temporal and spatial resolution as well as requested variables. Variables recently missing for different impact studies are convective available potential energy (CAPE) and other parameters related to extreme weather events. For example information on hail events are necessary for agricultural impact assessments.

Many impact-models require 3D-fields and/or at least more vertical levels as driving data. A higher spatial resolution down to 2 km has been mentioned but no urgent need for higher

temporal resolution than already offered daily temporal resolution. However, realism and robustness of the data have higher priority.

### Needs for guideline and meta-information

As the orange-group on the needs for guideline and meta-information was asking, if enough guidance exists on the use of CORDEX data, the answer was a clear NO (figure 2, right).

Regarding the question on how the usage of data can be improved, and if there is a need for help or guidance concerning the data use, the results were diverse and envisaged concrete suggestions. Three major areas were determinable: Climate Service, Technical guidance on data, and Scientific Basis. At the same time, four different formats for guidance were suggested by the participants: Written documents, online information, human interaction and special tools. The results were brought into these categories and shown here in figure 4.

	Climate Service	Technical Guidance	Scientific Basis
written document	<ul style="list-style-type: none"> <li>documentation of model performance</li> <li>best practice examples</li> <li>guideline on limitations</li> <li>documentation of uncertainties</li> </ul>		<ul style="list-style-type: none"> <li>improved knowledge on data limitation</li> <li>improved model evaluation on physical processes</li> <li>documentation of uncertainties</li> </ul>
online information		<ul style="list-style-type: none"> <li>forum FAQ</li> <li>CORDEX-pedia</li> </ul>	
human interaction	<ul style="list-style-type: none"> <li>helpdesk/ national contact point</li> <li>Two-way training workshop</li> <li>co-design of user tailored products</li> </ul>	<ul style="list-style-type: none"> <li>helpdesk</li> <li>training workshop</li> </ul>	<ul style="list-style-type: none"> <li>discussions</li> </ul>
tool	<ul style="list-style-type: none"> <li>Explaining uncertainty</li> <li>documentation of uncertainties</li> </ul>	<ul style="list-style-type: none"> <li>processing portals</li> <li>interpolation on common grid</li> <li>conversion to user friendly formats</li> <li>data/intermediate results share point</li> </ul>	<ul style="list-style-type: none"> <li>methods to assess uncertainty</li> <li>methods for using ensembles</li> </ul>

Figure 4: Result-Matrix of "needs for guideline and meta-information".

In summary for the three groups, the results showed that CORDEX data are already used in practice in order to inform end-users. Although, it was felt that the standard output is not yet sufficiently adapted to the needs of end-users. Requested are guidelines and directives on data usage. The availability of high resolution data is rare, especially for some regions. This might hinder a sound statistical data analysis and restricts the calculation of special indices. The awareness on data limitation exists, even though generally more information and advice is requested.

### Discussion summary

The final ten-minutes of the "Climate-Service in the frame of CORDEX" session were reserved for a plenum discussion. It became clear that the demand for climate services increases. The number of users asking for help is rapidly growing and exceeds the capacity to help them. Therefore, it is necessary to focus on efficiency within the different climate service tools. Across the communities and regions many climate services exist. Consequently, a consistent usage in methods and data as well as communication techniques would be helpful. The visibility and accessibility of climate services needs to be enhanced and mechanisms to prevent contradictions in the statements need to be established. Further it is needed to incorporate expert knowledge into the provided information. This includes a detailed discussion between science and users on scientific feasibility and practical user expectations. Clear communication on the CORDEX-data quality leads to user confidence in the data. This includes progressive information on the data limitations and further evaluation also with respect to the CMIP6-GCM community. This activity could be embedded within the international network of the Climate-Service-Partnership, and deepened on the next CSP-ICCCS conference in Cape Town in 2017.