

C2SM-NEWSLETTER

Center for Climate Systems Modeling
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Climate Science: Basic or applied research or both?

Nicolas Gruber – C2SM co-chairman

Basic versus applied research - Where should C2SM position itself along this critical axis? As we are starting to plan for the next phase of C2SM, we need to provide an answer to this question. Should C2SM support primarily basic research or should it focus more on applied problems?

Here, basic research is meant to describe curiosity driven research, where the goal is to expand mankind's knowledge irrespective of whether this has a direct value to society. In contrast, applied research is meant to solve practical problems.

Discussions about the balance between basic and applied research have become more intense recently with an increasing demand for the scientific community to demonstrate the direct usefulness of its research to the public. This puts pressure on ETH and C2SM to become more applied, i.e. at least to demonstrate how we contribute to the society's welfare. It would not be a big surprise if this debate intensified further given the prospect of tightening public funding. This debate often touches also upon the issue of control, as there is a tendency for the sponsors of applied research to exert a much tighter influence not only about what is being researched, but also how this is undertaken. Hence, there is a natural tendency for researchers in the basic sciences to rank applied research lower as it is perceived to be connected with a loss of control. >> [page 2](#)

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We need to overcome this dichotomy between basic and applied sciences and to divorce this question from the one on control. C2SM clearly has to do both basic and applied research. It needs to continue supporting basic research and the necessary underlying infrastructure, as this is key to generate the deep insight and understanding needed to develop the next generation of models. But C2SM also should not shy away from addressing very applied problems of society. During the first phase, the balance arguably has been more on the basic side, so the addition of a more applied element is worth considering during the second phase.

There is no lack of very successful examples of people having moved back and forth between the two extremes, contributing to the advancement of science along the entire spectrum. Among them are some of the giants in our field, such as Jakob Bjerknes, Jules Charney, or Walter Munk. They all made seminal contributions to the basic understanding of the climate system, yet also solved very applied questions such as, in the case of Munk, forecasting the surf conditions for D-day during the 2nd world war. What was key for their success is that the decision how to move back and forth along this spectrum was theirs.

But what is then the right balance between basic and applied research? I don't think there is a right answer to this question. Ideally, there should be a constant exchange along this axis, with basic sciences nurturing new solutions on the applied side, and applied research inspiring new basic research. Even within one's research, one has to move back and forth. For example, in one of my group's projects addressing the problem of ocean acidification, we realized how important meso- and submesoscale processes are in shaping the environment that ultimately determines how ocean acidification impacts ocean ecosystems. The meso- and submesoscale variability is mostly driven by baroclinic instabilities and frontogenetic processes, requiring us to become engaged in very fundamental research on the nature of these processes and how they interact with marine biology. So an applied problem forced us to move deeply into very basic science.

A striking example of how basic science suddenly became very applied is when the LIDAR and balloon measurements of Prof. Thomas Peter and his group suddenly moved to the center of Europe's interest to decide whether or not to halt airline traffic in response to the ash cloud emanating from Eyjafjallajökull. These are examples of basic and applied research going hand in hand, as it should be.

» nicolas.gruber@env.ethz.ch

Regional climate modeling (RCM) activities at C2SM

The C2SM regional climate modeling activities are centered on the COSMO model, which will be prepared for the next generation of supercomputers in the High Performance and High Productivity Computing (HP2C) initiative.

The COSMO model is a limited-area atmospheric model developed by the Consortium for Small-Scale Modeling (COSMO), including MeteoSwiss and other European meteorological services. The model, which can be used in CLimate Mode (COSMO-CLM), is also further refined and applied in several groups at ETH, Empa and in the international model community. Over the years, the COSMO model has been coupled to different modules dedicated to tropospheric chemistry, aerosol, aerosol-cloud interactions and land-atmosphere interactions, allowing for the investigation of additional processes relevant for the climate system.

The work of Anne Roches, the scientific programmer in charge of the RCM activities, is geared towards refining the COSMO model, providing user support, and facilitating the joint use of codes. Over the last months, she has focused on setting up a code repository for COSMO at the Swiss National Supercomputing Centre (CSCS). The main goal is to facilitate the code maintenance by enhancing the traceability of the many versions used within the C2SM community. The repository will become available to all members in fall 2010. A training session will be held in October for all potential users.

Further development of the COSMO model will take place within the HP2C initiative. As computer architectures undergo significant changes, there is a need for substantial restructuring of existing codes. The HP2C COSMO-CCLM project started on 1 June 2010 will address this challenge through a collaboration between C2SM, ETH, MeteoSwiss, Empa, CSCS, and Deutscher Wetterdienst. In particular, the dynamical core of the model will be rewritten to optimize the use of the memory hierarchy and possibly heterogeneous processors. This restructuring of the code will enable to perform large ensembles of long-term climate simulations at high resolution. These simulations are of prime importance to predict the impacts of climate change at regional scale. (ib, ar)

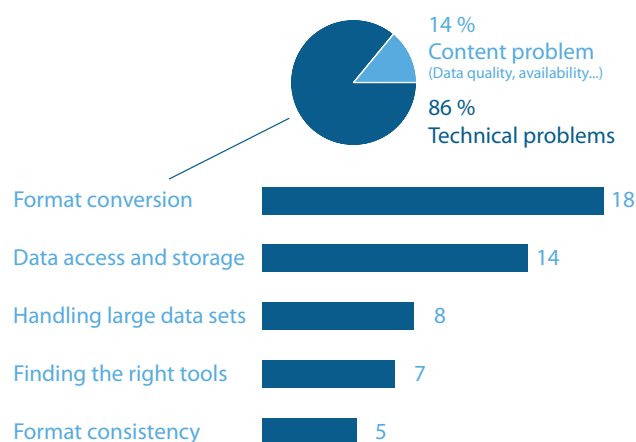
» www.c2sm.ethz.ch/research/HP2C-CCLM
» www.c2sm.ethz.ch/development/RCM

Data survey

Answers from the recent C2SM data survey will help developing the Center's data-related services.

With 75 participants, a substantial fraction of the community answered questions on the usage of climate data sets, persistent problems and possible future data services.

The results reveal a prevalent use of tools appropriate for analyzing large data sets. For instance, the Climate Data Operators (cdo) ranked among the most popular data processing tools and NetCDF was first among data formats. To find out how your favorite tool or format ranked in the survey, follow the link at the end of the article.



Most persistent data-related problems (at least 5 responses).

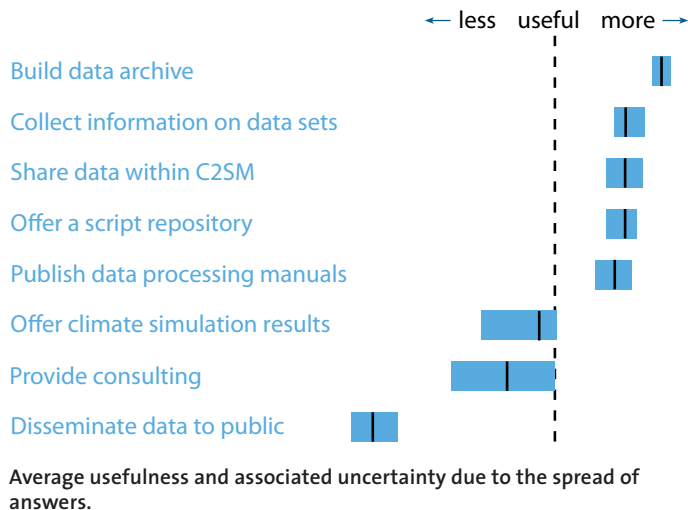
The answers on persistent data-related problems and the usefulness of potential future data services suggest three areas of action.

1. We will create a climate data directory and data dissemination facility, addressing the three ideas rated as most useful in the survey.
2. We plan a collaborative website assembling tools, manuals and scripts on data analysis and management, such as instructions on format conversion including sample scripts in often used programming languages.
3. In light of the various ideas and problems submitted by the community, we will always strive to support the community on an individual basis, be it through the Center's staff or its services.

Many individual comments by survey participants support these conclusions, as well as the discussion in the C2SM Working Group "Analysis of Climate Datasets".

Further results are available on our website. (tc)

» www.c2sm.ethz.ch/services/survey



Towards the second phase of C2SM.

The C2SM Steering Committee seeks for contributions to shape the scientific objectives of the second phase.

While C2SM has only been operational since early 2009, it is already time to plan ahead for the second phase. During the most recent C2SM plenary board meeting on 7 June, chairman Christoph Schär presented the status of the planning for the second phase. Discussions are already on-going with the ETH Schulleitung and our external partners including MeteoSwiss, Empa, and ART. In the meantime, there is a need to initiate the development of new research proposals as they provide a significant source of funding for both core and joint research activities.

The C2SM Steering Committee is therefore inviting the C2SM community to propose new ideas regarding the scientific questions to be tackled during the Center's second phase. Scientific proposals fulfilling the overall C2SM objectives, presenting an interdisciplinarity character and a coherent overarching theme with high visibility are particularly welcome.

Please put forward your ideas by sending a one-page proposal to Isabelle Bey before 23 July 2010. These ideas and questions will be used to develop large proposals for submission to the SNF Synergia and the ETH Collaborative, Highly Interdisciplinary Research Projects (CHIRP) initiatives in spring 2011.

For additional information, contact Isabelle Bey or any steering committee member. (ib, cs)

» isabelle.bey@env.ethz.ch

Agenda

Nationale Tagung Gebirgsforschung

Freitag, 25. Juni 2010
Hauptgebäude Universität, Bern

» tagung-benefits-berggebietsforschung.akademien-schweiz.ch/

10th EMS Annual Meeting & 8th European Conference on Applied Climatology (ECAC)

Monday - Friday, 13 - 17 September 2010
ETH Zentrum, Sälimstrasse 101, Zürich

» meetings.copernicus.org/ems2010

4. Nationales Klimaforum - „Create Impact“

Mittwoch, 20. Oktober 2010
Congress Hotel Seepark, Seestrasse 47, Thun

» www.climateforum.ch

8th Swiss Geoscience Meeting

Friday / Saturday, 19 / 20 November 2010
Pörolles 2, Fribourg

» www.geoscience-meeting.scnatweb.ch/sgm2010/

Updates & Further events

» www.c2sm.ethz.ch/news

Imprint

Center for Climate Systems Modeling (C2SM)
ETH Zurich
Universitätstrasse 16
8092 Zurich
www.c2sm.ethz.ch

Editor

Center for Climate Systems Modeling (C2SM)
Thierry Corti, ETH Zurich
Phone: +41 44 658 87 06
thierry.corti@env.ethz.ch

Authors

Anne Roches (ar)
Christoph Schär (cs)
Isabelle Bey (ib)
Thierry Corti (tc)

Credits

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Materials Science & Technology