C2SM Newsletter June 2017 Vol. 24

This Newsletter is also published at the C2SM Newsletter website.

Topics in this Newsletter

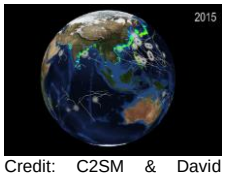
News from the Steering Committee

We regularly include information from the Steering Committee (SC) meetings and about the decisions that have been taken.

- C2SM’s scientific advisory board (SAB) plays a key role to advise and support our Center. Until very recently, it consisted of the following individuals: Bjorn Stevens (MPI-Met, Hamburg, Chair), David Bresch (SwissRe), Albert Klein Tank (KNMI), John Mitchell (UK MetOffice), and Christoph Ritz (ProClim). With Christoph Ritz's retirement and David Bresch having joined ETH's faculty, two members need to be replaced. ProClim’s new Executive Director, Karin Ammon,

has already agreed to be a candidate. The SC is currently searching for a second candidate - preferrably someone from the private sector. At the General Assembly in November, the admission of the two candidates to the SAB will be decided upon.

- The last SC Meeting took place on 23 June 2017 with a focus on the long-term strategic issues. Minutes will shortly be provided at the C2SM intranet.



Credit: C2SM & David Bresch. Background: Reto Stöckli, NASA

Update from the scientific visualization activities

In the recent months, we have received several interesting and challenging SciViz project proposals. These projects range from visualizations for atmospheric sciences to forest ecology.

We thank all our members for their support and interest in our services. Given the considerable number of SciViz proposals we are receiving, Tarun's schedule is basically full for 2017. Hence, currently we can only provide short-term support of less than two days. Longer-term projects can be conducted in 2018 again, and we are happy to receive proposals for the next year.

Lately we have focussed on visualizing data from the "Climada Impact Model" used and developed by Prof. David N. Bresch. These animations show historical tropical cyclones and time evolution of the cumulative damage caused by these events. One of these animations was presented and explained by David during his Werkstattgespräch.

Another interesting project we worked on was the 3D visualization of cloud and precipitation fields from a very high resolution simulation carried out by the crCLIM (Convection-resolving climate modeling on future supercomputing platforms) team. Given the massive data size, this visualization was processed and rendered in parallel using several nodes of the Piz Daint supercomputer at CSCS.

On the 16 and 17th of June, Tarun, Dr. Alex Upton (community project manager, SIS) and Dr. Thomas Wüst (group leader, Research Informatics, SIS) participated in InformatikTage 2017. They operated the booth representing the Scientific IT Services (SIS) of InformatikDienste. Our visualizations were the main attraction of the SIS booth. They were shown and explained to the many interested visitors from the general public.

As communicated previously, apart from working on longer directly paid projects we continue to provide free-of-charge short duration (up to 2 days) visualization support to individual researchers. Therefore, if you have any questions or require support, feel free to contact Tarun Chadha.

For more information on our activities and recent animations, please visit our scientific visualization page.

Update: Swiss Climate Change Scenarios 2018

The new "Swiss Climate Change Scenarios CH2018" will bring a number of advances to the users of climate data in science, government, and business. While our authors are busy writing up a Technical Report to describe the scenarios scientifically, it is a good time to highlight our advances in the interaction with the prospective CH2018 user community.

Early on in the project, a user poll showed that CH2018 must reach beyond the needs of research, and go the extra mile to provide relevant and accessible information to practitioners in adaptation to climate change. One way this goal is approached is through a Ph.D. project at the Institute for Environmental Decisions at ETH, which is currently in the process of setting up a stakeholder dialog with select partners from a list of around 300 firms, institutions, and government agencies.

Another way CH2018 is keeping in touch with users is its “sounding board”, an advisory group composed of research and government representatives, which met for the second time in April this year. While the wealth of new information in CH2018 was met with enthusiasm by the sounding board, it also pointed out that the complexity of the climate scenarios should be reduced to suit the users’ needs. This kind of feedback from the sounding board on communication and framing of climate information has been instrumental in the design of the planned CH2018 products.

In May, an exchange was held with Hydro-CH2018, a sister project of CH2018 under the umbrella of the National Center for Climate Services. CH2018 participated in the Hydro-CH2018 coordination workshop to make sure that the right data are provided for the hydrological research questions addressed in that project. This collaboration has already produced exciting first applications of preliminary CH2018 data illustrating the potential of the new climate scenarios in impact research.

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Eidgenössisches Departement des Innern EDI
Bundesamt für Meteorologie und Klimatologie MeteoSchweiz

News from MeteoSwiss

MeteoSchweiz

1. EUMETSAT Satellite Application Facility on Climate Monitoring (CM SAF): MeteoSwiss continues the development of satellite-based climate data

Within the next five years of the CM SAF Third Continuous Development and Operations Phase, MeteoSwiss will extend its existing competence on the ECV-by-ECV climatological retrieval of surface states and radiation fluxes from the Meteosat geostationary satellite sensors to a simultaneous retrieval of the full surface radiation balance. Existing MeteoSwiss Meteosat climate data records, such as the Cloud Fraction and Land Surface Temperature data, will be extended to 35+ years. MeteoSwiss leads the CM SAF work package on regional Land Fluxes. Satellite-based Land Flux climate data will consist of a multi-decadal hourly resolved set of land radiation, heat and water flux ECV’s which complement the CM SAF top of atmosphere radiation fluxes and will enable a land surface to atmosphere radiation and water balance analysis back to 1983.

For more information contact the CM SAF website or Anke Duguay-Tetzlaff at MeteoSwiss. MeteoSwiss also encourages highly motivated young scientists with a background in climatology or physics to apply to a related open Postdoc position at MeteoSwiss.

2. Werkstattgespräch: Der Brückenbauer. Prof. David N. Bresch talks about how his research can be applied to reduce society’s weather and climate risks. Watch the talk (in German) at Climate Science Visuals.

News from Empa

MEMO2, a new European Training Network to study European methane sources

Together with 9 academic and 13 non-academic partners, Empa will identify and evaluate European methane (CH_4) emissions and support mitigation measures. 13 PhD students across Europe, with 2 hosted at Empa, will collaborate in the next 4 years on measurements and modeling of atmospheric CH_4 and its isotopes using mobile platforms (cars, drones, aircraft) and applying atmospheric transport models including FLEXPART-COSMO. They will quantify the emissions of major CH_4 sources such farms, coal mines, landfills, etc. and will contribute to a better understanding of the European methane budget.
For further details refer to the MEMO2 project website.

Carbosense, a dense sensor network for quantifying CO_2 fluxes in Switzerland

The project Carbosense, which is a joint project of Empa (lead), Swisscom, Decentlab and the Swiss Data Science Center (SDSC), is currently establishing a uniquely dense network of approximately 300 CO_2 sensors distributed over Switzerland with a dense cluster over the city of Zurich. The project will complement the CO_2 measurements established in the SNF Sinergia project CarboCount CH and aims to provide near-real time information on man-made emissions and CO_2 uptake by the biosphere. The sensor nodes are equipped with low-cost, battery-powered sensors and use Swisscom's new Low Power Network (LPN) for data transmission. The sensors will be deployed at Swisscom communication towers, at meteorological measurement sites of MeteoSwiss, and at air pollution monitoring sites of NABEL, OSTLUFT and the city of Zurich. High-resolution atmospheric transport modeling is used to establish the link betweeen atmospheric concentrations and emissions.
For further information see Carbosense project website.

Update from SPARC, the international project on Stratosphere-troposphere Processes and their Role in Climate

SPARC just issued its Annual Report 2016, which offers a comprehensive insight into the status of current and emerging SPARC activities, contributions to WCRP Grand Challenges and SPARC's links to other projects and programmes. A major part of SPARC's activities in 2016 has been the implementation of the 'whole atmosphere' approach laid out in the 2015 SPARC strategy. See also the SPARC Annual Report.

SPARC recently published a new assessment report on trace gas and aerosol climatologies from satellite limb sounders (SPARC Report No. 8).

SPARC is organising its 6th General Assembly to be held in Kyoto, Japan, from 1-5 October 2018. General Assemblies are opportunities for SPARC to take stock of what has been achieved, where gaps in SPARC's research portfolio lie, and to define where SPARC needs to be moving to remain responsive to the needs of both its members and the users of SPARC research products. Information on the programme will soon be made available on the SPARC General Assembly 2018 website.

Join the SPARC community and subscribe to the SPARC eNews bulletin and the

SPARC newsletter or follow SPARC on Twitter or Facebook.

Newspaper articles

“Das wäre ein gefährliches Signal” A new study shows that the sun could radiate weaker in future than it does today. Is climate protection under these circumstances less urgent? No says Prof. Thomas Peter, atmospheric physicist and chemist at the Institute of Atmospheric and Climate Science (IAC) of ETH, in an interview with the newspaper Tagesanzeiger. Read the complete interview at Tagesanzeiger (in German).

New climate science webcasts

Oliver Stebler, part of Reto Knutti's Climate Physics Group at ETH, helps to communicate climate science in his science webcasts ("Werkstattgespräche"), where he interviews leading experts in climate research and climate related practice and industry. His most recent webcasts include:

- Der Brückenbauer. Climate change entails risks. Hence, well-advised is he or she who deals with those risks early. Watch the conversation between Prof. David N. Bresch and Oliver Stebler (in German) at Climate Science Visuals.

More climate science webcasts (in German) can be found on the Climate Physics Group's Werkstattgespräche page, or Oliver Stebler's page for climate science communication tools and multimedia productions.

PhD Defenses in the C2SM community

We congratulate our members for their successfully completed PhDs!

- Pavle Arsenovic, 17 May 2017: “The influence of spectral solar irradiance and energetic particle precipitation on climate”.

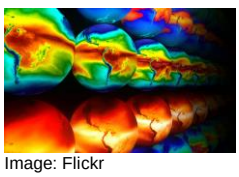


Image: Flickr

Events of interest

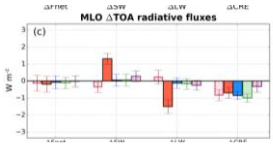
Workshops 2017:

- GCM User Workshop took place on 27 June 2017. This workshop is the global modelling equivalent to the COSMO User Workshop and is intended as a platform for meeting GCM users and developers of the C2SM community, to share experience and knowledge about global climate models, and to get an overview on ongoing projects of the different groups. The program is available online.

- SGM-C2SM Weather & Climate Communication Media Workshop: On 14 September 2017, The Swiss Society of Meteorology (Schweizerische Gesellschaft für Meteorologie, SGM) and C2SM will carry out a Weather and Climate Communication Media Workshop in collaboration with Beat Glogger, a microbioligst, freelance science journalist, and founder of the company Scitec Media. The workshop is open to everybody interested in science communication, but we specifically address young PhDs and post-doctoral scientists. More information on the workshop and the application details can be found at the C2SM webpage.

Klimarunde 2017

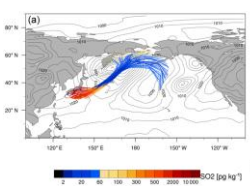
Klimarunde 2017 will take place at ETH main building on 8 November 2017. At their last meeting, the SC decided upon this year's topic for Klimarunde. It will cover the theme "The role of cities in climate change". As in previous years, Klimarunde will be prepared and conducted in collaboration with Energy Science Center (ESC). The Klimarunde web page is now available.



Paper: Is increasing ice crystal sedimentation velocity in geoengineering simulations a good proxy for cirrus cloud seeding?

The complex microphysical details of cirrus seeding with ice nucleating particles (INPs) in numerical simulations are often mimicked by increasing ice crystal sedimentation velocities. So far it has not been tested whether these results are comparable to geoengineering simulations in which cirrus clouds are seeded with INPs. We compare simulations where the ice crystal sedimentation velocity is increased at temperatures colder than −35°C with simulations of cirrus seeding with INPs using the ECHAM-HAM general circulation model. The radiative flux response of the two methods shows a similar behaviour in terms of annual and seasonal averages. Both methods decrease surface temperature but increase precipitation in response to a decreased atmospheric stability. Moreover, simulations of seeding with INPs lead to a decrease in liquid clouds, which counteracts part of the cooling due to changes in cirrus clouds. The liquid cloud response is largely avoided in a simulation where seeding occurs during night only. Simulations with increased ice crystal sedimentation velocity, however, lead to counteracting mixed-phase cloud responses. The increased sedimentation velocity simulations can counteract up to 60 % of the radiative effect of CO_2 doubling with a maximum net top-of-the-atmosphere forcing of −2.2 W m^{-2}. They induce a 30 % larger surface temperature response, due to their lower altitude of maximum diabatic forcing compared with simulations of seeding with INPs.

Gasparini, B., Münch, S., Poncet, L., Feldmann, M., and Lohmann, U., Is increasing ice crystal sedimentation velocity in geoengineering simulations a good proxy for cirrus cloud seeding?, Atmos. Chem. Phys., 17, 4871-4885, doi: 10.5194/acp-17-4871-2017, 2017.

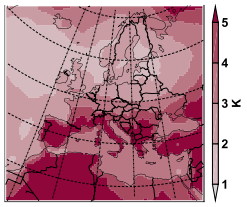


Paper: Effect of anthropogenic aerosol emissions on precipitation in warm conveyor belts in the western North Pacific in winter – a model study with ECHAM6-HAM

As a late output from the CHIRP2 project, Hanna Joos and colleagues published a

collaborative study of the atmospheric physics and dynamics groups on anthropogenic aerosol effects in North Pacific warm conveyor belts, based upon ECHAM6-HAM present-day and preindustrial climate simulations. The main result is that aerosol effects on precipitation are small in these intense, strongly dynamically forced precipitation systems.

Joos, H., E. Madonna, K. Witlox, S. Ferrachat, H. Wernli, and U. Lohmann, 2017. Effect of anthropogenic aerosol emissions on precipitation in warm conveyor belts in the western North Pacific in winter – a model study with ECHAM6-HAM. *Atmos. Chem. Phys.*, **17,** 6243–6255.



Paper: Separating climate change signals into thermodynamic, lapse-rate and circulation effects: theory and application to the European summer climate

Climate models robustly project a strong overall summer warming across Europe showing a characteristic north-south gradient with enhanced warming and drying in Southern Europe. This pattern is referred to as the Mediterranean Amplification, and the responsible processes are not fully understood. We here employ a sophisticated methodology using a set of regional climate model simulations to disentangle the contributions of different mechanisms. The methodology requires repeating the control simulation after adding seasonally varying vertical profiles representing the mean warming and moistening. In comparison to previous studies, our approach includes two important extensions: first, different vertical warming profiles are applied in order to separate the effects of a mean warming from lapse-rate changes. Second, a twin-design is used, in which the climate change signals are not only added to present-day conditions, but also subtracted from a scenario experiment. We demonstrate that these extensions provide an elegant way to separate the full climate change signal into different contributions. We find that the mean warming cannot explain the Mediterranean amplification, but the lapse-rate effect (i.e. the mean warming increases with height) is of key importance. This effect, which is quantified for the first time in our study, leads to a stronger warming and drying in southern Europe. It explains about 50% of the warming amplification over the Iberian Peninsula. In addition, changes in circulation and land-sea contrast also contribute.

Kröner, N., S. Kotlarski, E. Fischer, D. Lüthi, E. Zubler, and C. Schär, 2017: Separating climate change signals into thermodynamic, lapse-rate and circulation effects: theory and application to the European summer climate. Climate Dynamics, 48, 3425–3440, doi:10.1007/s00382-016-3276-3.

Credit: Curt Abderhalden

Paper: Evaluation of the Convection-Resolving Climate Modeling Approach on Continental Scales

Refining the grid spacing of climate models to the kilometer scale allows switching off the parameterization of deep convection (thunderstorms and rain showers). The approach allows formulating the model much closer to physical first principles, and thus reducing uncertainties associated with the parametrization of deep convection.

However, performing simulations at this resolution is computationally very costly. To address this issue, C2SM, MeteoSwiss and the IAC have established a version of the COSMO model, capable of exploiting GPU accelerators, and thus substantially reduce the computational cost in terms of required node hours and energy to solution (Fuhrer et al., 2014). Using the new version, Leutwyler et al. (2017) performed a 10-year-long climate simulation at 2.2 km resolution on a domain covering continental Europe (1536x1536x60 grid points). Results confirm substantial improvements found for the diurnal cycle of summer precipitation, but also show model deficiencies such as substantial performance difference between regions with and without strong orographic forcing. Furthermore they outline a novel approach on how to verify the annual cycle of deep convection over continental Europe.

The study was conducted within the framework of the SNF Sinergia project crCLIM, hosted by C2SM. The verification conducted in Leutwyler et al (2017) allows the project partners to establish high-resolution climatologies of surface frontal systems, extratropical cyclones or convective systems.

The paper has been selected as a publication highlight by AGU's Earth and Space Science News EOS.

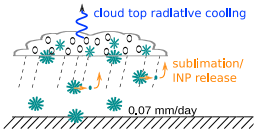
Leutwyler D., D. Lüthi, N. Ban, O. Fuhrer, and C. Schär (2017): Evaluation of the Convection-Resolving Climate Modeling Approach on Continental Scales, J.Geophys. Res. Atmos., 122, doi:10.1002/2016JD026013

Image: Flickr

Paper: Understanding the regional pattern of projected future changes in extreme precipitation

Heavy rainfall most likely will become more extreme in a warmer climate. However, the involved mechanisms are complex and the increase in extreme precipitation varies between different regions. Stephan Pfahl, together with Erich Fischer and Paul O'Gorman (MIT) decomposed existing climate projections of changes of extreme rainfall into contributions of increasing atmospheric moisture (thermodynamics) and of changing vertical wind velocities (dynamics). Their results show that the dynamic contribution modifies regional responses, amplifying increases, for instance, in the Asian monsoon region, and weakening them in the Mediterranean.

Pfahl, S., P. A. O'Gorman, and E. M. Fischer, 2017. Understanding the regional pattern of projected future changes in extreme precipitation. *Nat. Clim. Change,* doi: 10.1038/NCLIMATE3287



Paper: Cloud response and feedback processes in stratiform mixed-phase clouds perturbed by ship exhaust

Stratiform mixed-phase clouds (MPCs), which contain both supercooled liquid and ice, play a key role in the energy balance of the Arctic and are a major contributor to surface precipitation. As Arctic shipping is projected to increase with climate change, these clouds may frequently be exposed to local aerosol perturbations of up to 15,000 cm^{-3}. Yet little consensus exists within the community regarding the key feedback mechanisms induced in MPCs perturbed by ship exhaust, or aerosol in general. Here we show that many known processes identified in the warm-phase

stratocumulus regime can be extrapolated to the MPC regime. However, their effect may be compensated, or even undermined, by the following two most relevant processes unique to the MPC regime: (i) increased cloud glaciation via immersion freezing due to cloud condensation nuclei (CCN) induced cloud top radiative cooling and (ii) the continued cycling of ice nucleating particles (INPs) through the cloud and subcloud layer.

Possner, A., A. M. L. Ekman and U. Lohmann, Cloud response and feedback processes in stratiform mixed-phase clouds perturbed by ship exhaust, Geophys. Res. Lett., 1964–1972, doi: 10.1002/2016GL071358, 2017.

Paper: The social and scientific values that shape national climate scenarios: a comparison of the Netherlands, Switzerland and the UK

British, Swiss and Dutch climate scientists judge the usefulness of climate information for decision-making differently. For *innovators*, the newest climate science is seen as essential for decision-making (UK). *Consolidators*, on the other hand, believe that only tried-and-tested knowledge should be used to make decisions (Switzerland). And *collaborators* want to tailor their findings to their users' needs as much as possible (Netherlands). This diversity is surprising given there are so many similarities in the way the UK, Switzerland and the Netherlands model the climate. All these climate scientists work in esteemed climate science universities or met offices. And yet the climate scientists produced nationally distinct climate scenarios. Why? When the picture is enlarged to include as well the different politics and government styles in the three countries, it becomes clear why climate information is judged useful differently by *innovators*, *consolidators* and *collaborators*. Climate scientists in the UK have different roles in policy-making than their counterparts in the Netherlands or Switzerland. But is it really that surprising that Swiss climate scientists emphasise consensual knowledge? Or that the participatory style of Dutch politics expects that Dutch climate scientists need to have face-to-face interactions with users? We think not. But exactly because the climate scientists respond subconsciously to their national political culture, we should not simply cut-and-paste 'best' practices from one country to the next. The produced knowledge may remain unused by policy-makers and planners. And it can lead to frustrations for both scientists and users. To avoid this, scientists and users need to start reflecting on their scientific preferences. Our typology is a good starting point for scientists wanting to co-produce knowledge for decision-making. So ask yourself: Are you an *innovator*, *consolidator* or *collaborator*?

For a more comprehensive summary, visit this link.
Questions? Contact Maurice Skelton.

Skelton M, Porter JJ, Dessai S, Knutti R, Bresch DN (2017), The social and scientific values that shape national climate scenarios: a comparison of the Netherlands, Switzerland and the UK. Regional Environmental Change. doi: 10.1007/s10113-017-1155-z