



Welcome to another W2W newsletter!

One of the highlights of spring in W2W is getting together with all our friends and colleagues at the three Research Area Meetings. This year all the meetings have been held online, which has worked surprisingly well. The presentations by the early career scientists were excellent and triggered a lot of discussion. It was a real advantage to have the international members of the Scientific Advisory Board contributing virtually. Of course, we missed the personal contact, and we are hoping that the upcoming meetings in the fall can go ahead as planned. In the meantime, we have been busy with our research and have some new results that you might find interesting. Happy reading and stay healthy!

George Craig

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If you have any questions or comments about this newsletter or W2W in general, we would be happy to hear from you!

Upcoming events

- The **Kompaktseminar Numerik workshop** will be organized from 9 – 11th September 2020. More information will be available here: <https://www.wavestoweather.de/meetings/kompaktseminar2020>
- The **annual meeting of the W2W early career scientists** will take place from 28 – 30th September 2020. More information will be available here soon: <https://www.wavestoweather.de/meetings/ecs-annual-meeting-2020>
- A **machine learning workshop** will be organized by and for the W2W early career scientists from 12 – 14th October 2020 in Heidelberg. More information will be available here soon: <https://www.wavestoweather.de/meetings/ecs-ml-workshop2020>
- A **presentation skill workshop** will be organized by and for the W2W early career scientists from 28 – 30th October 2020 in Ulm. More information will be available here soon: <https://www.wavestoweather.de/meetings/ecs-presentation-workshop2020>
- The **6th W2W Annual Meeting** will take place from 16 – 18th November 2020 in Untermarchtal. The keynote speakers are Daniela Domeisen (ETH Zürich), Tim Hewson (ECMWF), Ron McTaggart-Cowan (Environment Canada) and Axel Seifert (DWD). Further international guests are: Michael Morgan (University of Wisconsin), Carolyn

Reynolds (NRL) and Susan van den Heever (Colorado State University). More information is available here:

https://www.wavestoweather.de/meetings/annual_meeting6

- The 7th **W2W Annual Meeting** will take place from 8 – 10th November 2021 in Eibelsstadt.

Additional information on upcoming events can be found here:

<http://www.wavestoweather.de/meetings>

News

PhD defenses



Marlene Baumgart (A1 project, Phase 1) defended her PhD on May 8th 2020.

Congratulations, Marlene, and all the best in your future career developments!



Philipp Zschenderlein (C4 project) defended his PhD on June 19th 2020.

Congratulations, Philipp! We wish you all the best for your future and we're looking forward to continuing collaborating with you.



Mirjam Hirt (A6 project during Phase 1, and A1 project during Phase 2) defended her PhD on June 24th 2020.

Congratulations, Mirjam! It's great to have you onboard for Phase 2!

Special collection W2W of the Quarterly Journal of the Royal Meteorological Society

Our special collection in QJ has been expanded to the rest of the Society journals.

More information about this collection is available here:

[https://rmets.onlinelibrary.wiley.com/doi/toc/10.1002/\(ISSN\)1477-870x.W2W](https://rmets.onlinelibrary.wiley.com/doi/toc/10.1002/(ISSN)1477-870x.W2W)

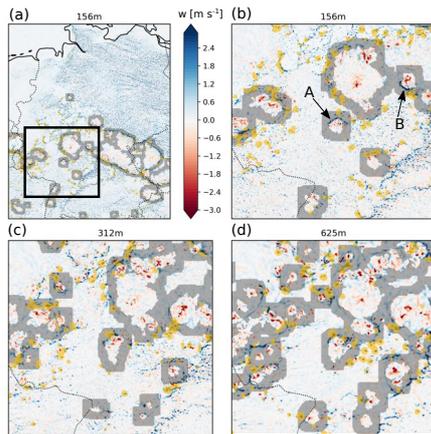
WWRP joint project

The World Weather Research Program of the WMO has formally recognized W2W as its first "Joint Project". Together with the WWRP Scientific Steering Committee the W2W community will develop international collaborations, give input to the global research strategy, and receive feedback on the quality and relevance of the research done in W2W. To read more, visit: <https://www.wavestoweather.de/news/wwrp-joint-project>

Research Highlights

Here are some examples of recently published research from W2W.

1. Cold pool driven convective initiation: using causal graph analysis to determine what convection permitting models are missing (M. Hirt, G. C. Craig, S.A.K. Schäfer, J. Savre and R. Heinze)

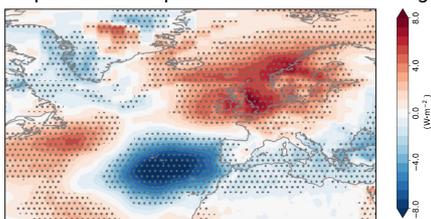


By identifying cold pools, cold pool boundaries (grey shading) and convective initiation (yellow shading) in different high-resolution model simulations, we find that cold pools are more frequent, smaller, less intense and trigger less new convection in lower resolution simulations. We further use a linear causal graph analysis to understand how model resolution influences triggering probability via several different processes. We find that reducing grid sizes directly reduces upward mass flux at the gust front, which causes weaker triggering probabilities.

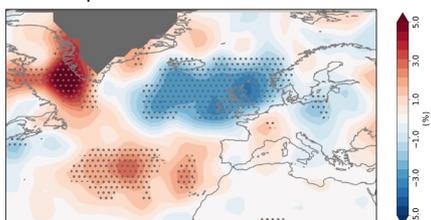
Read the full article: <https://doi.org/10.1002/qj.3788>

2. The role of observed cloud-radiative anomalies for the dynamics of the North Atlantic Oscillation on synoptic time-scales (G. Papavasileiou, A. Voigt and P. Knippertz)

NAO impact on atmospheric cloud-radiative heating



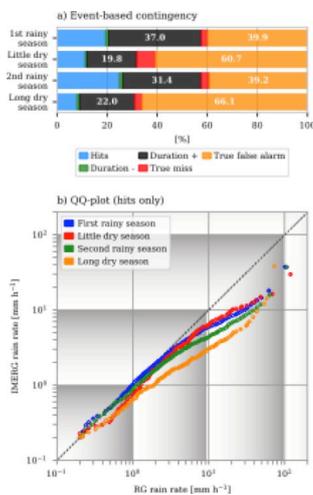
NAO impact on low-level cloud fraction



Clouds shape weather and climate by regulating the latent and radiative heating in the atmosphere. Here, we provide the first rigorous assessment of how clouds and the North Atlantic Oscillation (NAO) couple on synoptic 5-day-mean time-scales during Northern Hemisphere winter. To this end we combine satellite observations of clouds and radiative fluxes with an analysis of the surface pressure tendency equation based on ERA-Interim short-term forecasts. We reveal a robust dipole of changes in atmospheric cloud-radiative heating and cloud fraction during a positive NAO. We further show that the NAO-generated cloud-radiative heating anomalies are a small positive feedback on the Azores high, but also that the impact of radiation is much weaker than other diabatic processes, most notably latent heating.

Read the full article: <https://doi.org/10.1002/qj.3768>

3. A process-based validation of GPM IMERG and its sources using a mesoscale rain gauge network in the West African forest zone (M. Maranan, A. H. Fink, P. Knippertz, L. Amekudzi, W. Atiah and M. Stengel)

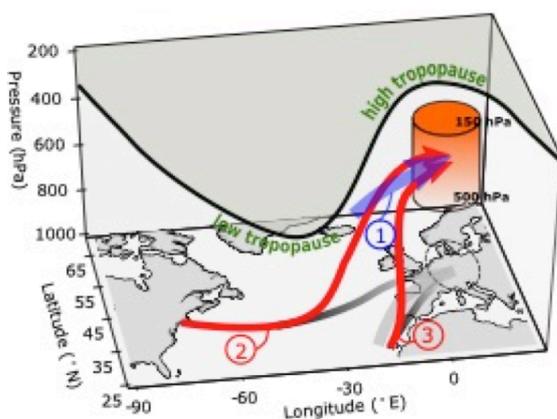


This study explores the performance of the new, gridded, satellite-based rainfall product IMERG (Integrated Multisatellite Retrievals for the Global Precipitation Measurement (GPM)) over the data-sparse West African forest zone on a half-hour timescale. Rainfall data from 17 high-resolution rain gauges over a two-year period (2016-17) as well as space-borne cloud-top information from the Cloud Property Dataset Using SEVIRI, edition 2 (CLAAS-2) are used to compile a multi-layered evaluation of IMERG - addressing, among other things, different rainfall types, seasons, and cloud characteristics.

Read the full article:

<https://journals.ametsoc.org/doi/10.1175/JHM-D-19-0257.1?mobileUi=0>

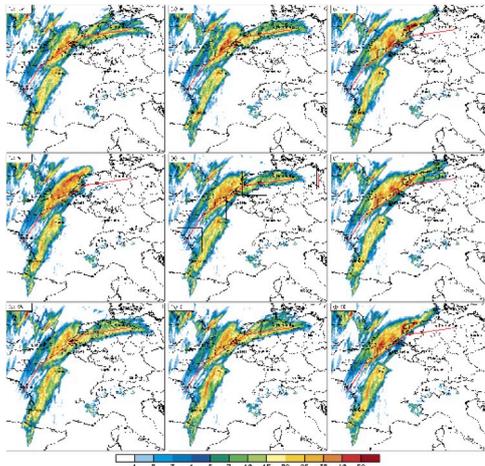
4. A Lagrangian analysis of upper-tropospheric anticyclones associated with heat waves in Europe (P. Zschenderlein, Pfahl, S., Wernli, H. and Fink, A. H.)



We analyze the formation and maintenance of upper-tropospheric anticyclones connected to European surface heat waves. Tracing air masses backwards from these upper-tropospheric anticyclones, we found that trajectories are diabatically heated in two branches, either by North Atlantic cyclones or by convection closer to the heat wave anticyclone. The first branch (remote branch) primarily affects the onset of the anticyclone, while the second branch (nearby branch) is more relevant for the maintenance. Our results suppose that heat wave predictions are sensitive to small-scale microphysical and convective processes.

Read the full article: <https://doi.org/10.5194/wcd-1-191-2020>

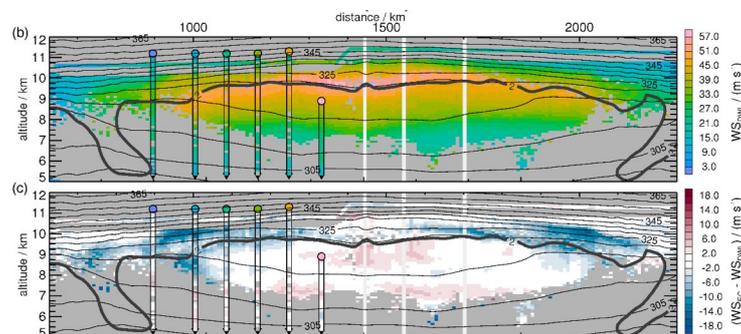
5. Large impact of tiny model domain shifts for the Pentecost 2014 mesoscale convective system over Germany (C. Barthlott and A. I. Barrett)



The mesoscale convective system (MCS) that affected Germany at Pentecost 2014 was one of the most severe for decades. However, the predictability of this system was very low. By moving the model domain by just one grid point changed whether the MCS was successfully simulated or not. The decisive factor seems to be small differences in the initial track of the convection: cooler air near the coast inhibited development there, but tracks slightly more inland found more favorable conditions.

Read the full article: <https://doi.org/10.5194/wcd-1-207-2020>

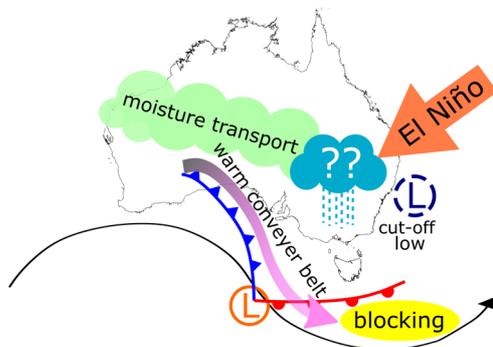
6. Observation of jet stream winds during NAWDEX and characterization of systematic meteorological analysis errors (A. Schäfler, B. Harvey, J. Methven, J.D. Doyle, S. Rahm, O. Reitebuch, F. Weiler and B. Witschas)



Observations across the North Atlantic jet stream are used to explore the structure of the jet stream, including the sharpness of vertical wind shear changes across the tropopause and the wind speed. Data by an airborne Doppler wind lidar, dropsondes and a ground-based Stratosphere-Troposphere radar reveal small overall wind speed biases throughout the troposphere and lower stratosphere. However, we find large and spatially coherent wind errors up to $\pm 10 \text{ m.s}^{-1}$ for individual cases, with the strongest errors occurring above the tropopause in upper-level ridges. The assimilation of operational observational data brings the analyses closer to the independent verifying observations but it cannot fully compensate the forecast error. Models tend to underestimate the peak jet stream wind, the vertical wind shear and the abruptness of the change in wind shear across the tropopause. The differences are large enough to influence forecasts of Rossby wave disturbances.

Read the full article: <https://doi.org/10.1175/MWR-D-19-0229.1>

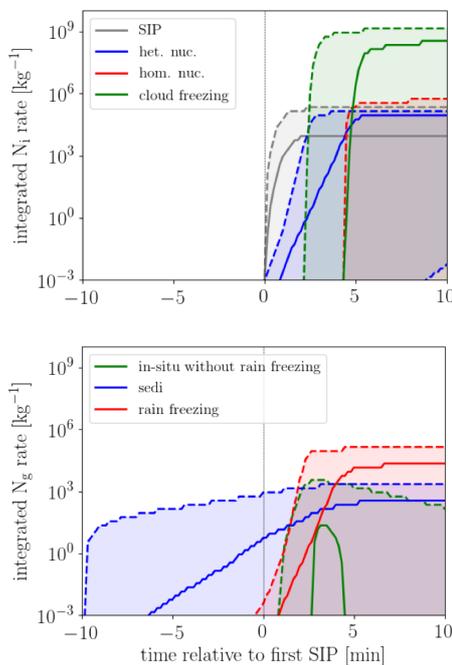
7. A weather system perspective on winter–spring rainfall variability in southeastern Australia during El Niño (S. Hauser, C. M. Grams, M. J. Reeder, S. McGregor, A. H. Fink and J. Quinting)



During El Niño, southeastern Australia typically experiences on average dry conditions. However, rainfall anomalies vary considerably from month to month. This study elucidates the contribution of synoptic-scale weather systems to this variability using a novel dataset of objectively identified weather systems. We find that a substantial fraction of the monthly rainfall variability during El Niño is related to frequency modulations of synoptic-scale weather systems, in particular of cut-off lows, warm conveyor belts, and blocking anticyclones.

Read the full article: <https://rmets.onlinelibrary.wiley.com/doi/epdf/10.1002/qj.3808>

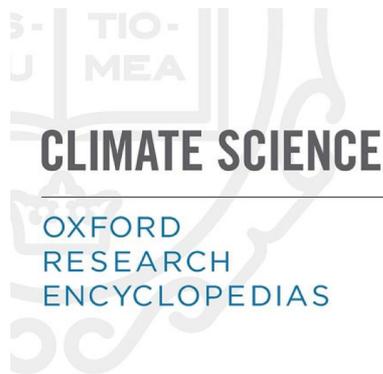
8. Secondary Ice Formation in Idealised Deep Convection—Source of Primary Ice and Impact on Glaciation (A.K. Miltenberger, T. Lüttmer, C. Siewert)



Secondary ice production (SIP) is an important process for the rapid glaciation and high ice crystal number concentrations in mixed-phase convective clouds. Initiation of SIP requires some frozen particles to be formed via heterogeneous or homogeneous freezing. We use online-trajectories in idealized ICON simulations of deep convection to characterize the thermodynamic and cloud microphysical history of air parcels around the initiation point. In the majority of parcels in-situ formation of frozen particles is not important, but graupel particles sedimenting from higher levels are key. The presence of warm-temperature INP has no discernible impact. The results highlight that for understanding cloud glaciation it is vital to consider the complex vertical coupling of cloud microphysical processes in convective clouds.

Read the full article: <https://doi.org/10.3390/atmos11050542>

9. Synoptic to intraseasonal variability of african rainfall (A. Schlüter)

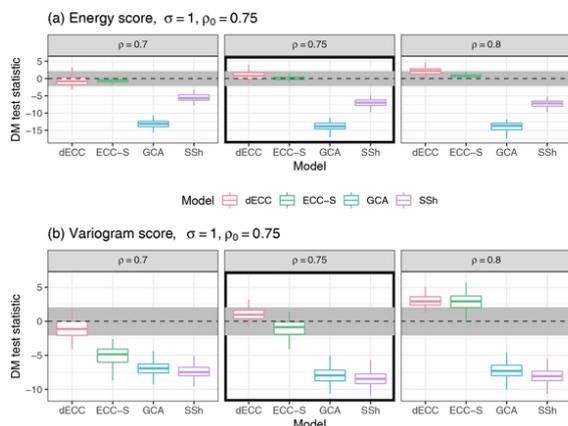


oxfordre.com/climatescience

Rainfall over Africa varies across timescales of a few days to several weeks due to several tropical and extratropical modes of variability. Excessive rains or prolonged drought regularly result in natural disasters and have thus a severe impact on the local economy, agriculture, spread of diseases, and entire ecosystems. This article reviews several synoptic to intraseasonal atmospheric wave modes, which govern rainfall variability over Africa.

Read the full chapter: <http://dx.doi.org/10.1093/acrefore/9780190228620.013.522>

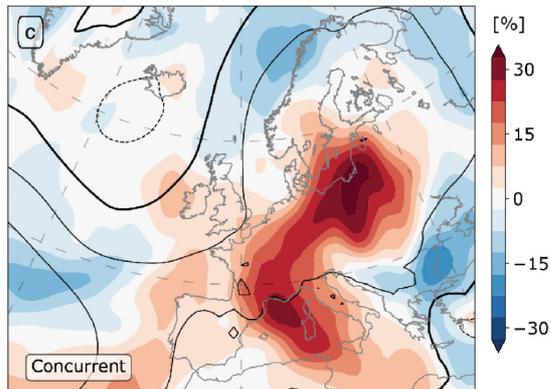
10. Simulation-based comparison of multivariate ensemble post-processing methods (S. Lerch, S. Baran, A. Möller, J. Groß, R. Schefzik, S. Hemri and M. Graeter)



Accurate models of spatial, temporal, and inter-variable dependencies are of crucial importance for many practical applications. We review and compare several methods for multivariate ensemble post-processing, where such dependencies are imposed via copula functions. Our investigations utilize simulation studies that mimic challenges occurring in practical applications and allow to readily interpret the effects of different misspecifications of the numerical weather prediction ensemble.

Read the full article: <https://doi.org/10.5194/npg-27-349-2020>

11. Dynamics of concurrent and sequential Central European and Scandinavian heatwaves (C. Spensberger, E. Madonna, M. Boettcher, C.M. Grams, L. Papritz, J.F. Quinting, M. Röthlisberger, M. Sprenger and P. Zschenderlein)



Motivated by the record-breaking heatwaves in 2003 and 2018, this study investigates the dynamics of concurrent and sequential Central European and Scandinavian heatwaves. Concurrent heatwaves in both regions are not necessarily associated with blocking anticyclones. Instead, synoptic situations with nearly vanishing synoptic-scale pressure gradients – so-called weak pressure gradient events – are prevalent over Central Europe during these events. Sequential heat waves do not result from the recycling of low-level heat. These events appear to be merely a random coincidence of a heat wave onset in one region and a decay in the other region.

Read the full article: <https://doi.org/10.1002/qj.3822>

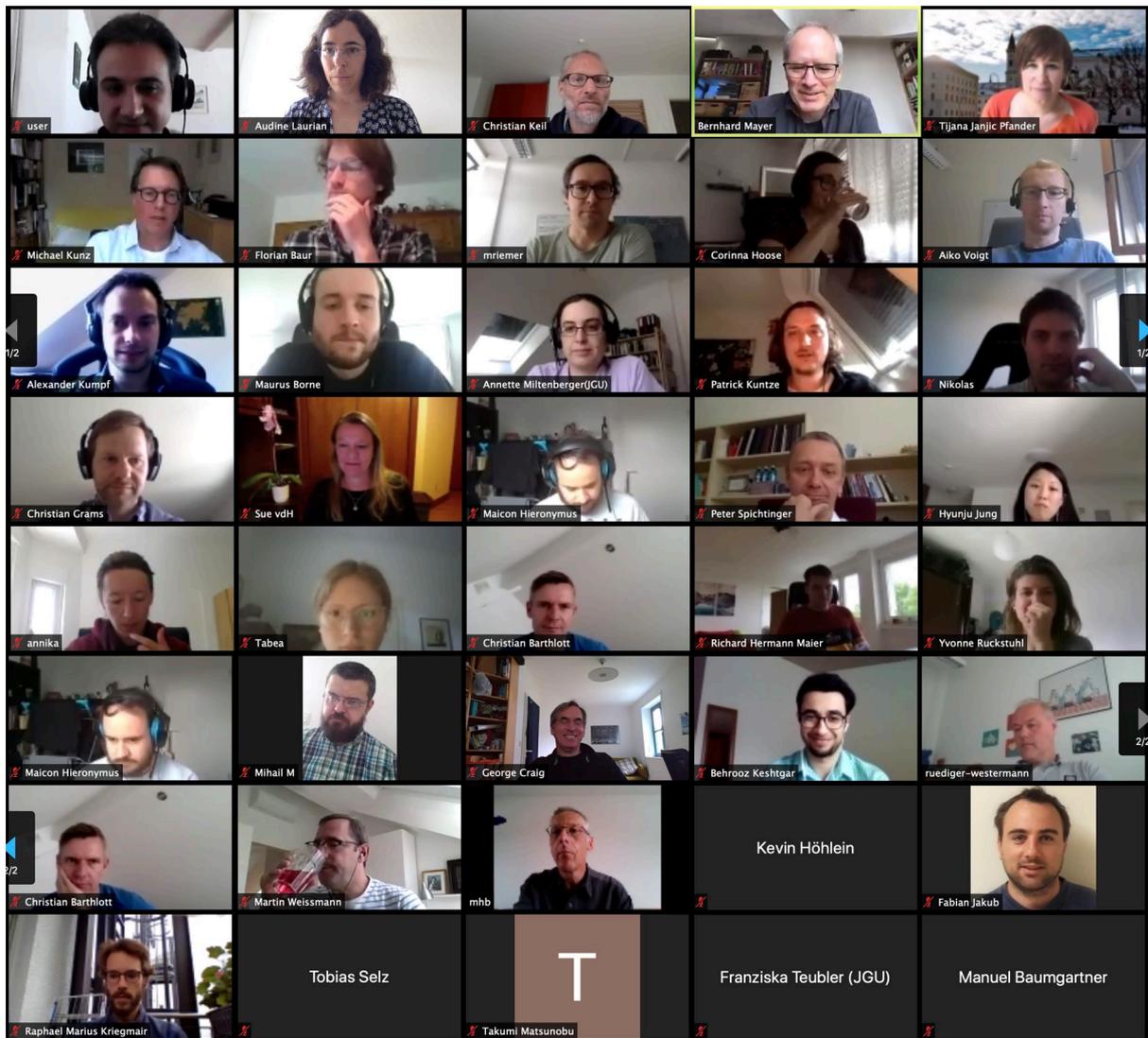
Additional publications relevant to W2W are listed here:
<http://www.wavestoweather.de/publications>

Past activities

Research Area B meeting

The first Research Area B meeting of Phase 2 took place online on May 20th 2020. About 40 scientists took part in this meeting. The scientists in RA-B presented their project and first results, and scientists from research areas A and C, as well as Sue van den Heever (member of the Scientific Advisory Board of W2W) took part in the zoom meeting.

The presentations were very good, in particular given that some ECS only started recently and given the COVID19 situation. On the other hand, the general discussion was short, and informal discussions were inhibited by the technical restrictions of the meeting.



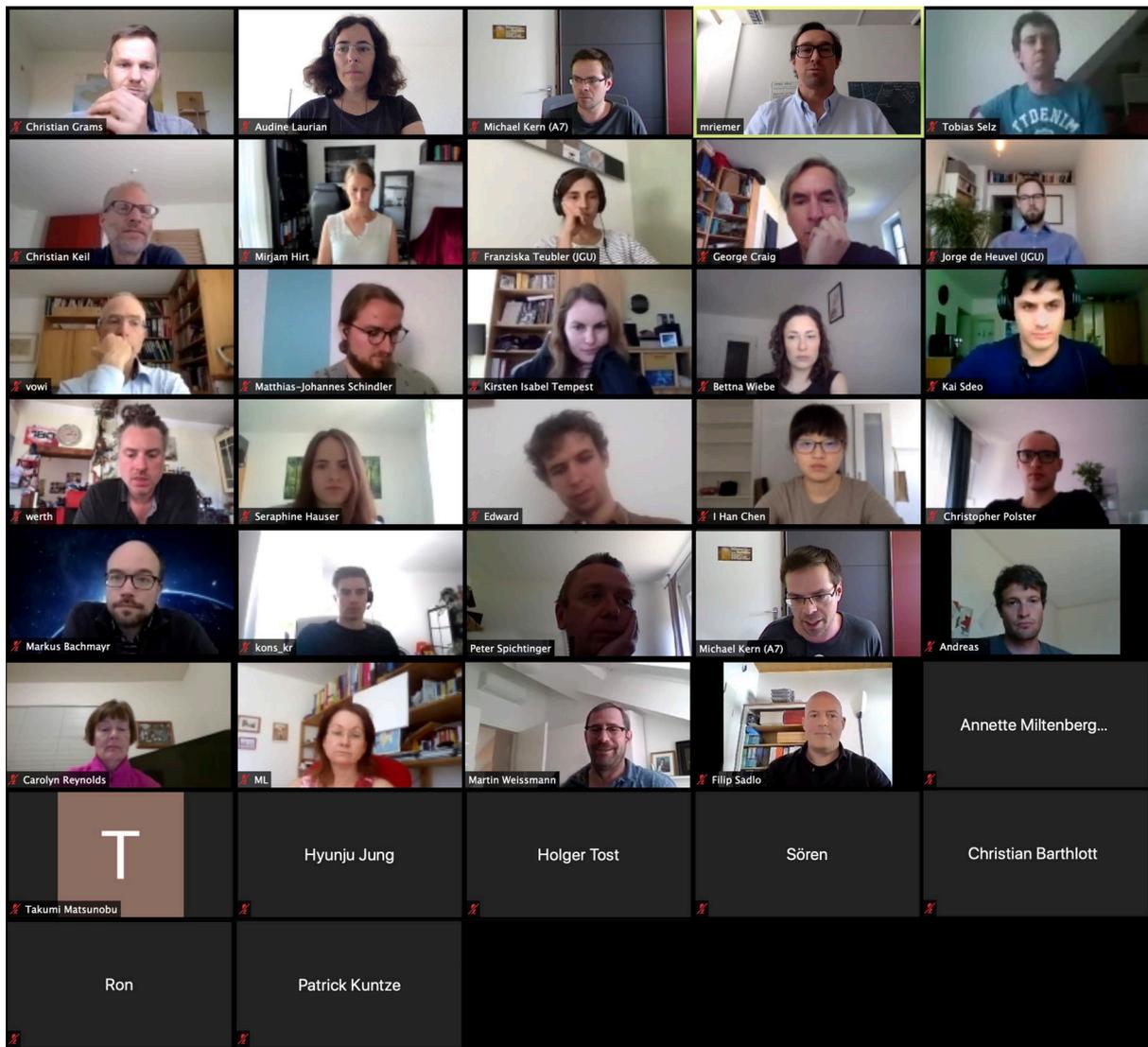
Participants of the RA-B meeting

More information is available here:

<https://www.wavestoweather.de/meetings/rabmeeting2020>

Research Area A meeting

The Research Area A (RA-A) meeting took place on May 27th – 28th 2020. About 36 scientists from RA-A, but also scientists from RA-B and RA-C, Carolyn Reynolds and Ron McTaggart-Cowan (scientific advisory board members) took part in this zoom meeting. The presentations were very good, clear and concise, highlighting the overall very good scientific progress and the excitement of the researchers. The discussions after each presentation, during virtual breakout sessions, and at the end of the meeting were very lively and fruitful. The feedback from Ron and Carolyn was highly appreciated.



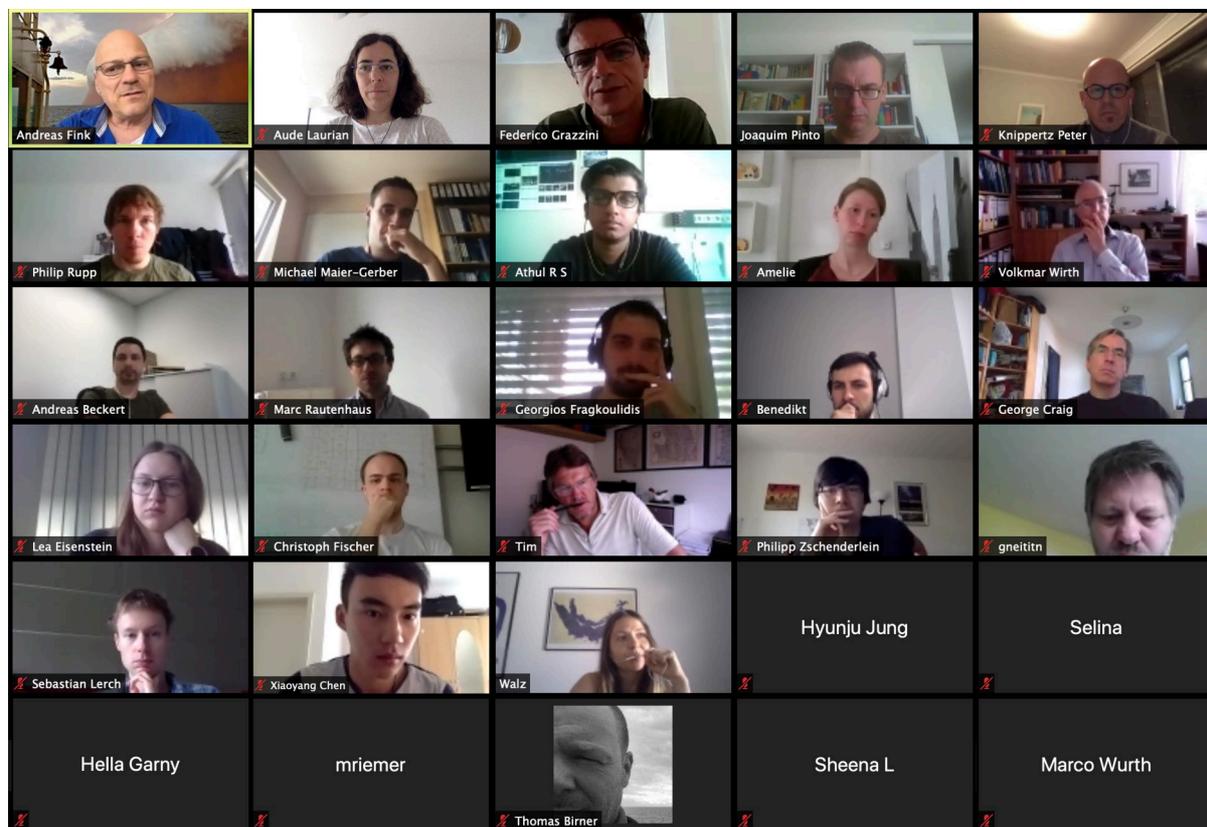
Participants of the RA-A meeting

More information is available here:

<https://www.wavestoweather.de/meetings/raameeting2020>

Research Area C meeting

The Research Area C (RA-C) meeting took place online on June 3rd 2020. About 35 scientists from RA-C, but also from RA-A and RA-B, as well as Tim Hewson (scientific advisory board member) took part in this zoom meeting. The presentations were exciting and concise, and the discussions after each presentation and at the end of the meeting were very lively.



Participants of the RA-C meeting

More information about this meeting is available here:

<https://www.wavestoweather.de/meetings/racmeeting2020>

Seminars and guest program

Information about previous guest scientists invited by W2W is posted here:

<http://www.wavestoweather.de/guest>

Past and upcoming W2W seminars are listed here:

<http://www.wavestoweather.de/seminars>

The seminars and colloquium are broadcasted live using **Adobe Connect**. If you would like to receive a link to listen to the presentation, please contact us.

Communication

Dissemination

Seminar at the Bureau of Meteorology

On 29 April 2020, Peter Knippertz gave a seminar at the Bureau of Meteorology in Melbourne, Australia, on "How to improve weather and climate predictions for the tropics?"

To read more about this event, visit:

<https://www.wavestoweather.de/communication/dissemination-activities/meetings/seminar-bom-2020>

Past issues of this newsletter

You will find the previous issues of this newsletter here:

https://www.wavestoweather.de/communication/dissemination-activities/publications/quarterly_newsletter

Outreach

“Spielstadt Mini-München”

Two workshops will be offered by W2W early career scientists (Sheena Löffel, Tabea Gleiter and Mirjam Hirt) at the “Mini-München” event. This event takes place over three weeks starting on 27 July and is for children and teenagers between 7 and 15 years. The first workshop will be focused on short and fun experiments to learn about pressure, temperature, clouds, thunder, etc. The second workshop will aim at introducing numerical weather forecast to the participants.

Read more about this event here:

<https://www.wavestoweather.de/news/mini-muenchen-2020>

Presentation at the Deutsches Museum in Munich

Thomas Birner has been invited to give a presentation within the seminar series "Wissenschaft für jedermann" at the Deutsches Museum in Munich on October 14th 2020. For more information, visit:

<https://www.wavestoweather.de/communication/outreach-activities/presentations-general-public/deutsches-museum-oct-2020>

Equal opportunity (EO) activities

Past teleconference of the EO committee (EOC)

On 7 April 2020, the EOC discussed ways to support the W2W community, and in particular parents of young children, during the COVID-19 crisis. Improving the working conditions at home for parents of young children is currently the main EO measure implemented in W2W.

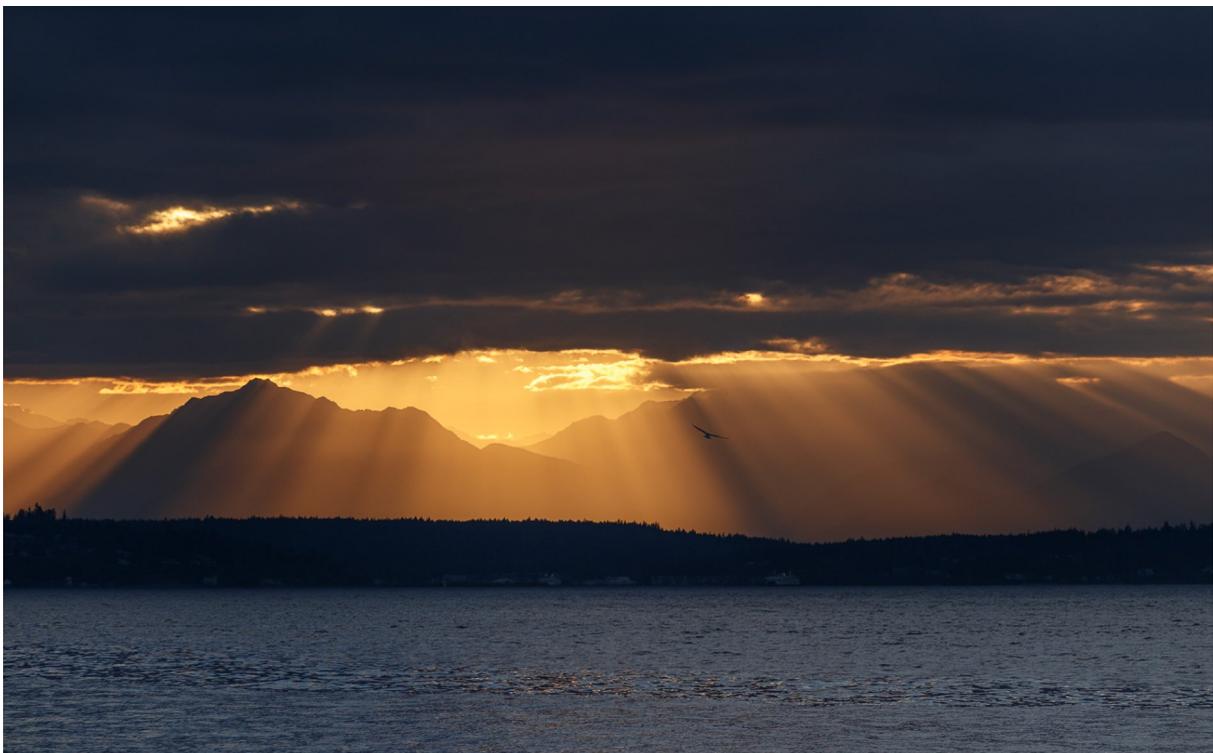
More information about measures implemented in W2W are listed here:

https://www.wavestoweather.de/equal_opportunity/eo_measures

EO measures in W2W

- Read about the EO committee:
http://www.wavestoweather.de/equal_opportunity/contact
- Read about the EO measures offered in W2W:
http://www.wavestoweather.de/equal_opportunity/eo_measures
- Read about the EO measures and activities already implemented:
http://www.wavestoweather.de/equal_opportunity/activities

Spring's highlight



Sunset at Puget Sound, Washington, USA. Photo: Volkmar Wirth

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