



In addition to new research highlights, this quarter's newsletter features some of the many online meetings and events that are keeping the W2W community together while we are all stuck in home office. One plus side of being online is that members of our Scientific Advisory Board have been actively participating in each of the Research Area Meetings. I would like to give a shout-out to the SAB members, Carolyn Reynolds, Michael Morgan, Tim Hewson, Sue van den Heever and Ron McTaggart-Cowan, who have contributed so much to our knowledge and to our motivation. I would also like to thank you for your interest in W2W and I hope you enjoy this issue.

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

- An **ICON developer meeting** for the W2W community will take place online on 6th July 2021.
- The **Kompaktseminar Numerik workshop** will take place in person in the Pfalzakademie Lambrecht, between Karlsruhe and Mainz from 8 – 10th September 2021. More information will be available here:
<https://www.wavestoweather.de/meetings/kompaktseminar2021>
- A virtual **workshop on the dynamics and process understanding of Atmospheric Blocking** will take place online from 27 – 29th September 2021. The focus of the workshop is process understanding and the dynamics of atmospheric blocking. More detailed information about the workshop as well as the Scientific Committee Members and the Keynote Speakers can be found on the workshop website:
<https://blocking-workshop-2021.wavestoweather.de>
- The **7th W2W Annual Meeting** will take place from 8 – 10th November 2021 in Eibelstadt, if possible. For more information, visit:
https://www.wavestoweather.de/meetings/annual_meeting2021
- A **W2W hands-on workshop** will take place on 4 September 2022, on the Sunday before the EMS Annual Meeting in Bonn, to showcase tools developed in W2W to the scientific and operational communities. Stay tuned!

Additional information on upcoming events can be found here:
<http://www.wavestoweather.de/meetings>

News



Federico Grazzini (T1 project, LMU) defended his PhD on 29 June 2021. Congratulations and good luck with your next career steps, Federico!



Tijana Janjic-Pfander has been awarded the **Quarterly Journal Editor's Award for 2020**. The Prize is awarded on the recommendation of the Journal Editors in recognition of a significant contribution to the journal or editorial process. Congratulations, Tijana!



The **COVID19** situation is a great challenge for everyone, for the W2W community, and in particular for the ECS at the start of their scientific career. To foster the **group dynamics in W2W** and at each institute, a number of activities have been organized. Read more here:

<https://www.wavestoweather.de/early-career/>

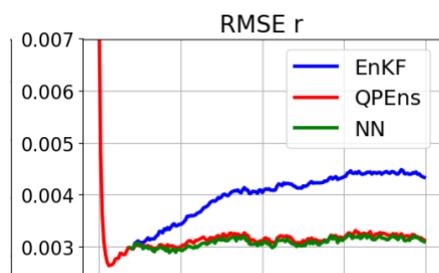


Maria Vela-Martin (Z1 project, LMU) has moved to a new permanent position outside of academia. On behalf of W2W, I would like to thank you, Maria, for your friendly and helpful support regarding our finances! We'll miss you and your positive attitude! Good luck with your next steps!

Research Highlights

Here are some examples of recently published research from W2W.

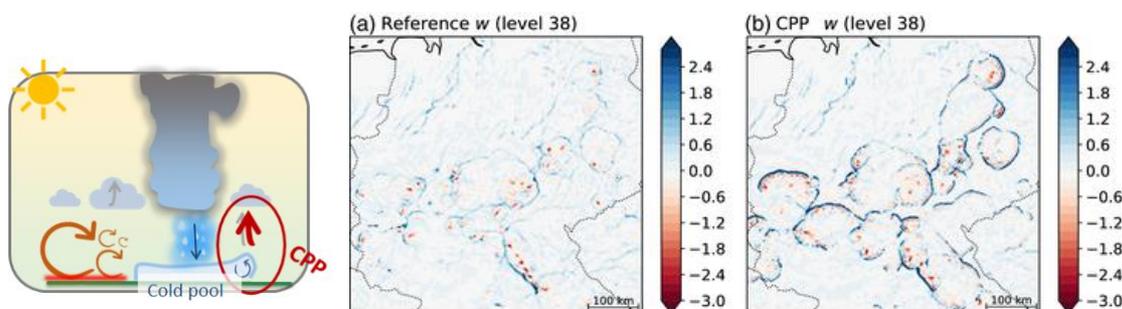
1. Training a convolutional neural network to conserve mass in data assimilation (Y. Ruckstuhl, T. Janjić and S. Rasp)



The assimilation of observations using standard algorithms can lead to a violation of physical laws (e.g. mass conservation), which is shown to have a detrimental impact on the system's forecast. We use a neural network (NN) to correct this mass violation, using training data generated from expensive algorithms that can constrain such physical properties. We found that, in an idealized set-up, the NN can match the performance of these expensive algorithms at negligible computational costs.

Read the full article: <https://doi.org/10.5194/npg-28-111-2021>

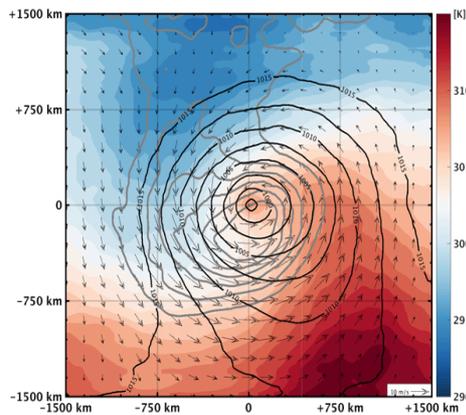
2. A cold pool perturbation scheme to improve convective initiation in convection-permitting models (M. Hirt and G.C. Craig)



Cold pool gust fronts, which are relevant for triggering new deep convection, are not well resolved in convection-permitting models, leading to precipitation deficits and a lack of convective organization. To address these deficits, we introduce a cold pool perturbation (CPP) scheme that strengthens vertical velocity at the simulated cold pool gust fronts. This is achieved by relaxing the vertical velocity in the gust front region towards a target value derived from similarity theory. We find increased precipitation amplitudes during the afternoon with CPP, evidence for improvements in the location of precipitation and for stronger organization of convection. The cold pools themselves become more frequent, larger and more intense.

Read the full article: <https://doi.org/10.1002/qj.4032>

3. A process-based anatomy of Mediterranean cyclones: from baroclinic lows to tropical-like systems (E. Flaounas, S.L. Gray and F. Teubler)



The atmospheric processes that turn Mediterranean cyclones into severe storms are addressed in this article. Online potential vorticity (PV) budget diagnostics and piecewise PV inversion are applied to WRF model simulations of the mature stage of 100 intense Mediterranean cyclones. The relative contributions of different processes to cyclone development are quantified and deliver, for the first time, a comprehensive insight into the variety of cyclonic systems that develop in the Mediterranean from the perspective of cyclone dynamics.

Read the full article: <https://doi.org/10.5194/wcd-2-255-2021>

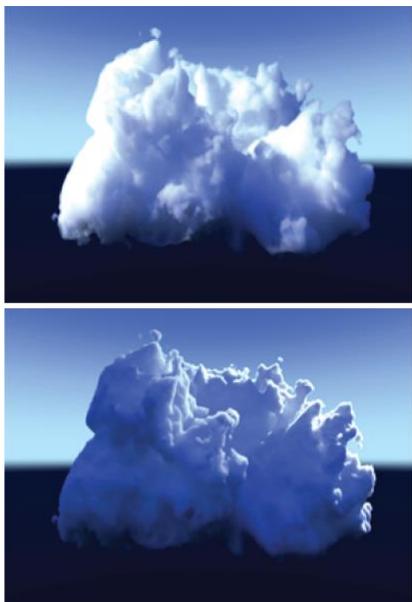
4. Post-processing numerical weather prediction ensembles for probabilistic solar irradiance forecasting (B. Schulz, M. El Ayari, S. Lerch and S. Baran)



We propose post-processing models for ensemble weather predictions of solar irradiance. In two case studies covering distinct numerical models, geographical regions, types of solar irradiances and temporal resolutions, we find that post-processing consistently and significantly improves the raw ensemble predictions for lead times up to at least two days.

Read the full article: <https://doi.org/10.1016/j.solener.2021.03.023>

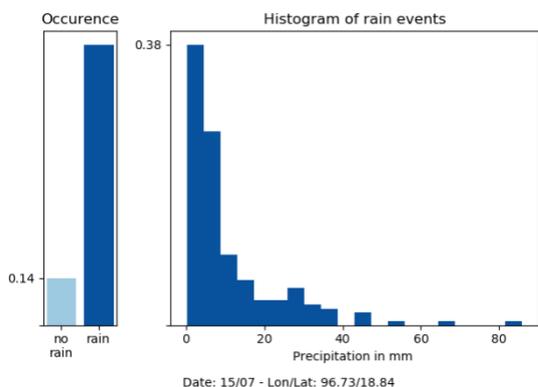
5. Learning Multiple-Scattering Solutions for Sphere-Tracing of Volumetric Subsurface Effects (L. Leonard, K. Höhle and R. Westermann)



Accurate simulation of light transport in participating media requires the integration of optical material properties along many complicated light paths. Standard simulation methods, such as Monte Carlo path tracing, rely on stochastic sampling strategies, which are computationally very costly. We present a method to speed up such simulations through data-driven learning of approximate transfer functions for random paths in sphere-shaped volumes of homogeneous, translucent material. We demonstrate efficient learning and inference using conditional variational auto-encoders constructed from neural networks with only three layers and no more than 16 nodes.

Read the full article: <https://doi.org/10.1111/cgf.142623>

6. An IMERG-Based Optimal Extended Probabilistic Climatology (EPC) as a Benchmark Ensemble Forecast for Precipitation in the Tropics and Subtropics (E.-M. Walz, M. Maranan, R. van der Linden, A. H. Fink and P. Knippertz)



Rainfall forecasts, even at leadtime of only a day, still constitute a large challenge for tropical and subtropical latitudes. Current NWP systems generally have low skill over these areas. To aid future improvements, be it with better dynamical or statistical models, we propose a well-defined benchmark forecast, namely the extended probabilistic climatology (EPC). EPC combines all past observations for a particular day of the year and all past observations in a +/- 15-day window around this day of the year.

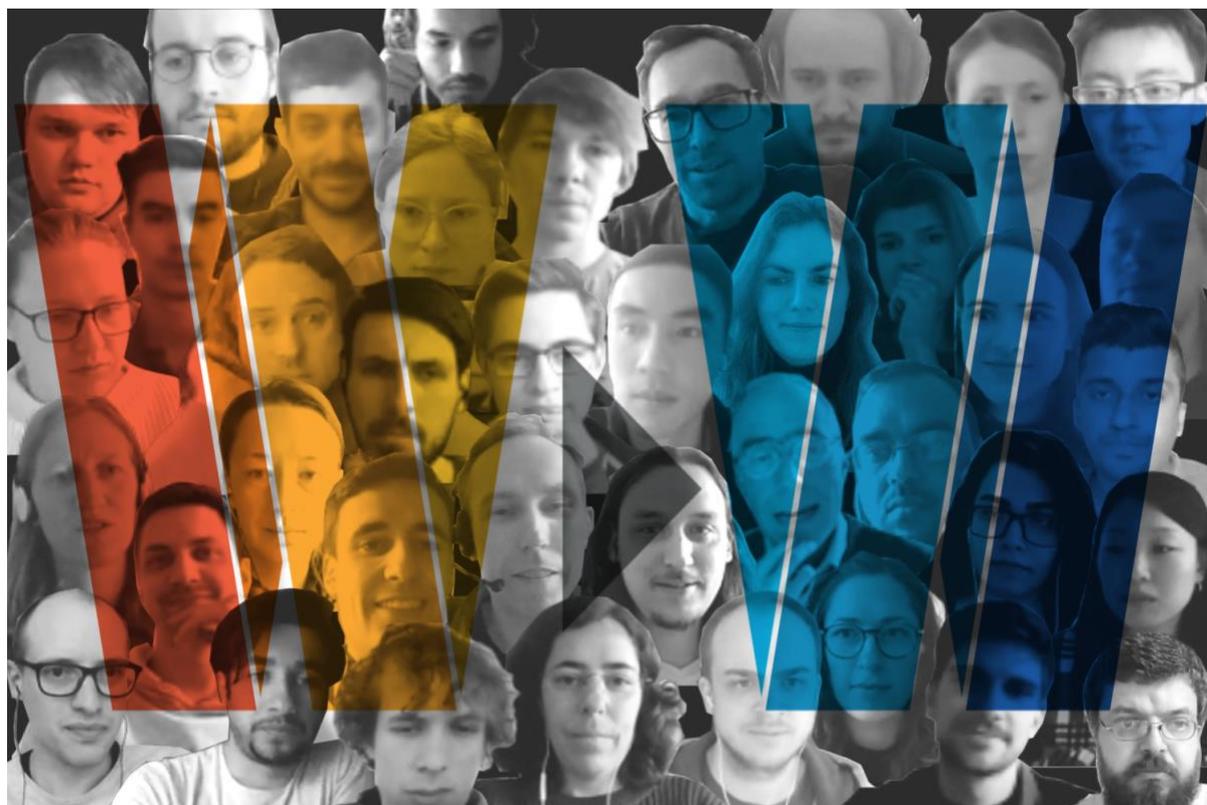
Read the full article: <https://doi.org/10.1175/WAF-D-20-0233.1>

Additional publications relevant to W2W are listed here:

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

Past activities

Report on the ECS annual meeting, by K. Tempest, S. Hauser and C. Polster



Some participants of the ECS meeting

From the 7th till 9th April the ECS gathered virtually to participate in their Annual Meeting. A warm-up session was opening each day and consisted in a combination of 5-minute “stupid” questions and longer “showcasing” sessions where papers and tools written and developed by the ECS were presented. On the first afternoon **Daniel Reinert (DWD)** gave a presentation about ICON. The ECS were then split into two groups: the beginners were led by **Oriol Prims** in a hands-on session and the others joined Daniel Reinert in a discussion session.

The second day featured both presentations and hands-on activities in smaller groups and was focused on preparing the ECS for the writing of papers and developing core scientific skills. The three sessions were about “how to read efficiently”, “how to write scientific papers” (with a focus on abstracts), and “the review process”. The involvement of PIs (**Hella Garny, Michael Riemer and Volkmar Wirth**) in leading these sessions gave valuable insight in how to master these steps including their personal tips and what challenges are to be expected, and how to address them.

On the third day a member of the YESS community (**Adnan Abid, ICTP**) was invited to the meeting to inform the participants about how W2W can collaborate with YESS. In addition,

he presented his research focused on predictability on a seasonal timescale. The ECS committee then gave an overview on the possibilities and activities within W2W. A long coffee break ended the meeting.

The annual meeting was about developing scientific skills and knowledge but it was also about building the W2W community. Icebreakers were organized at the end of each day and included online escape rooms and multiple small games where the participants joined in separate virtual rooms.

Through chairing a session, presenting, or organizing, this meeting relied, and was also improved by the involvement of most ECS. Therefore, we would like to say a huge thank you to everyone for making this meeting happen.

You can read more about this ECS meeting here:

<https://www.wavestoweather.de/meetings/ecs-annual-meeting-2021>

Research Area A meeting (18-19 May 2021)

The Research Area A meeting took place on 18-19 May 2021 online. Among the thirty-eight participants, the ECS presented their latest results in a very clear and concise way. The discussions after each presentation, but also on the relevance of the current research questions, the connections with the ICON community and the ongoing collaborations with other research areas were very lively and fruitful, not the least thanks to the active participation of three Scientific Advisory Board members (Carolyn Reynolds, Ron McTaggart-Cowan and Michael Morgan). Their contributions to the meeting were very valuable.

Thank you to all the participants for making this meeting so successful!

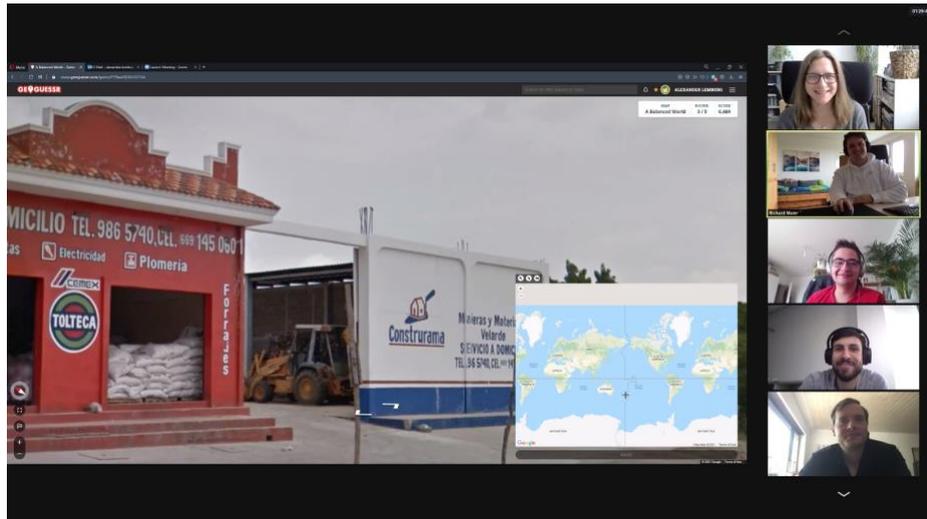
Here are parts of Carolyn's feedback: "Excellent science is being done despite the challenges of COVID. Well done!"

More information about the meeting is available here:

<https://www.wavestoweather.de/meetings/ra-a-meeting-2021>

Game event (21 May 2021)

A first online game event was organized by a few ECS on 21 May 2021. Five ECS from KIT, LMU and TUM took part in this Friday afternoon event. After briefly catching up with each other, the team chose to play "Geoguessr", a web-based game where players need to guess a world location based on a random Google Street View. The team played the game in four different modes and although the group was small, it was a lot of very fun! The whole W2W community (PIs included) is welcome to join the upcoming game events.



Snapshot from the “Geoguessr” game event on 21 May 2021

Research Area C meeting (9 Jun. 2021)

The Research Area C meeting took place on 9th June 2021 online. Up to 34 participants from RA-C, RA-A and the Z2 project attended the meeting. The presentations by ECS were excellent and highlighted the fact that communication and collaborations between projects and between disciplines (meteorology, mathematics, computer science) are ongoing and working well. Tim Hewson and Ron McTaggart-Cowan (Scientific Advisory Board members) contributed to the vivid discussions by providing very valuable inputs, making the meeting a success.

Some outputs of the final general discussion included discussing and rephrasing the current research questions, and possibly getting the RAs A and C closer together in Phase 3 of W2W. Thank you to all the speakers, to the ECS who chaired the sessions, to the organizers (Alexander and Andreas), and to Tim and Ron for their input!



Most participants of the RA-C meeting on 9 June

More information is available here:

<https://www.wavestoweather.de/meetings/racmeeting2021>

Research Area B meeting (16-17 Jun. 2021)

The Research Area B meeting took place on 16-17th June 2021 online. Up to 33 participants from RA-B, but also from RA-A, RA-C and the Z2 project attended the meeting. The excellent presentations by the ECS triggered many questions, lively discussions and new ideas. Sue van den Heever and Ron McTaggart-Cowan (Scientific Advisory Board members) made many relevant suggestions and comments and we thank both of them for their active and key participation to the meeting.

In the general discussion, the current research questions in RA-B were discussed and suggestions were made to rephrase them, and international experts were suggested as possible W2W Fellows. The SAB highlighted the excellent and significant progress made since the last Annual Meeting and the efforts made to collaborate despite COVID19.



Participants of the RA-B meeting on 16 June

More information is available here:

<https://www.wavestoweather.de/meetings/rabmeeting2021>

Seminars and guest program

Read about the **W2W Fellows program** here:

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

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

Studentische Meteorologie Tagung (StuMeTa)

On 13 May 2021, Volkmar Wirth was invited to talk about „Die Erforschung der Grenzen der Vorhersagbarkeit von Wetter“ at the virtual StuMeTa in Mainz.

Read more about this event here:

<https://www.wavestoweather.de/communication/dissemination-activities/meetings/stumeta-2021>

Past issues of this newsletter

Past issues of this newsletter are available here:

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

Outreach

Article in Die Zeit (6 May 2021)

Volkmar Wirth gave an interview to Anne Baum (freelance author for the newspaper “Die Zeit”) on „Ein Professor erklärt worum es in der Meteorologie geht“ (in English: „A professor explains what Meteorology is about“) for the section „Worum geht's“. The article appeared on 6 May 2021.

To read more about this article, visit:

<https://www.wavestoweather.de/communication/outreach-activities/press-releases/interview-die-zeit-mai2021>

Collaboration with the Deutsches Museum in Munich

1) Science Summer (20 Jun. 2021)

About twelve scientists from the meteorological institute in Munich (W2W and colleagues) prepared a number of activities for the “**Science Summer**” organized by the Deutsches

Museum in Munich, in the courtyard of the museum. The workshops included a Coriolis demonstration, a radiosonde launch, activities explaining the formation of clouds, a Monte Carlo game to illustrate radiative transfer, and a station to build a thermometer and an anemometer. Due to the current COVID19 situation, only presentations were allowed to take place and all hands-on activities were cancelled. **On 20th June 2021** Bernhard Mayer, Thomas Birner with Philip Rupp and Felix Jäger, and Markus Garhammer with the support of additional colleagues offered a reduced number of activities. Staff from the museum also took part in the event to train and possibly offer the workshops later, as a long-term activity offered by the museum. The weather was very nice and warm, which unfortunately attracted very few visitors. The disappointment associated with the reduced program and the few visitors was compensated by the nice atmosphere among the organizers (both from the LMU and the museum). This was a great opportunity to get to know each other and to start a long-lasting collaboration! To end the day on a friendly note, the participants went together to a Biergarten. If the situation allows for it, the full program of workshops will be offered again later this summer or next year.



Activities at the "Science Summer" on 20 June 2021. Top: Markus Garhammer launching a radiosonde. Middle left: Thomas Birner showing high- and low-pressure systems in a water tank. Middle right: Bernhard Mayer talking about clouds. Lower left: Philip Rupp and Felix Jäger illustrating chaos in the atmosphere and the difference between weather and climate using a double pendulum. Lower right: institute bus loaded with instruments to follow the radiosonde.

To read more about the current “Science Summer”, visit:

<https://www.wavestoweather.de/communication/outreach-activities/presentations-general-public/science-summer-2021>

2) Seminar series “Wissenschaft für jedermann”

Corinna Hoose (KIT) will give a presentation at the Deutsches Museum in Munich on 13 October 2021. This event is part of the seminar series “Wissenschaft für jedermann” addressed to the general public.

Equal opportunity (EO) activities

Response to the “Of course!” comic book

a) The project was featured on the blog of the AMS:

<https://blogs.egu.eu/divisions/as/2021/04/07/what-can-we-do-to-improve-gender-diversity-in-the-workplace>

b) On 16 April 2021, Audine Laurian was invited by the Nansen Legacy to give a talk at a webinar about gender imbalance in science to present the comic book, and EO measures and activities in W2W. About 13 participants discussed gender issues within the Nansen Legacy and shared their personal experience, e.g., on the importance of role models during the PhD thesis and the benefit of a mixed research group on the atmosphere at work. Reasons for the “leaky pipeline” were discussed and other diversity imbalances were also addressed. Read more about this event here:

<https://www.wavestoweather.de/communication/dissemination-activities/meetings/webinar-nansen-2021>



c) The comic book was distributed at the “Weather Day” offered at the Deutsches Museum by W2W scientists and colleagues on 20 June 2021 (see above), and at Girls’ Day to schoolgirls between 12-14 years old (see below).

d) On 14 June 2021, the women representative at the LMU in Munich organized a panel discussion on the documentary "Picture a Scientist". Thomas Birner and Audine Laurian were invited to join the panel to share their insights on gender imbalance and discrimination issues in the USA, and on personal stories featured in the comic book "Of course!". The panel consisted of seven scientists (4 women, 3 men) in Mathematics, Biology, Medicine, and Archaeology. About 50 participants took part in the lively, friendly and eye-opening discussion covering questions such as:

- Are the issues featured in the film a problem in Science, or do they also exist in other research areas?
- Are there any strategies to fight gender discrimination without being "the bad guy"?
- How relevant and useful are role models?
- Have gender imbalance and discrimination issues improved over time?
- What can we do to make the situation improve even faster?

Read more about this event here:

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

e) Since the comic book was printed, six role models (five women, 1 man) from W2W, but also from the ETH, the Norwegian Research Centre NORCE and Bjerknes Centre for Climate Research (Bergen), the University of Victoria (Canada), and the Colorado State University (USA) have been interviewed.

If you would like to suggest colleagues who might be interested in taking part in this project as a role models, please contact Audine Laurian.

Girls' Day (22 April 2021)

Girls' Day is a countrywide event to introduce schoolgirls to disciplines and careers in which women are usually underrepresented. Workshops (for the first time online) were offered by W2W scientists and their colleagues in Munich, in Mainz and in Karlsruhe on Thursday 22 April 2021.

In **Munich**, ten girls between 12 and 14 years old from Munich, Hamburg, Bremen, Hannover, Düsseldorf, etc. participated. Two special guests also joined the workshop to greet the participants: Bernhard Mayer and the Bavarian state minister for culture and education, Michael Piazzolo. After a round of introduction where the participants described the weather where they live and guessed the local temperature, Sheena Löffel, Theresa Diefenbach, Tabea Gleiter, Veronika Pörtge and Claudia Emde introduced themselves and their research interests. Claudia then offered a Monte Carlo game in which the participants roll a dice to identify the path of a photon through the atmosphere. A python script was written to simulate the game and Claudia ran it step by step to explain the basic notions of programming to the participants. The participants then made experiments to learn about pressure and wind with material that was sent to them beforehand. These experiments included the "kissing balloons" (<https://www.youtube.com/watch?v=3fWSTXDQ8eE>), the "ping-pong funnel" (<https://www.scienceworld.ca/resource/have-you-got-enough-puff/>) and constructing an anemometer. To close the workshop, Veronika offered a weather briefing for the weekend. Below are some impressions of the workshop.



Top left: Temperature map with location of the participants. Top right: anemometer. Bottom: Kissing balloons.

In **Mainz**, ten girls from Hannover, Hamburg, Munich and Mainz participated. After a short introduction round where everybody looked out of the window and described the weather situation at their place, Volkmar Wirth explained the fascination of atmospheric dynamics with visually stunning movies. Franziska Köllner (postdoc at JGU) described her experience during a flight campaign in Spitzbergen where she even saw a polar bear. Isabelle Prestel-Kupferer then offered a short weather briefing and explained the temperature, pressure and wind distribution and how the cold but sunny conditions observed during the introduction round can be explained. Material was sent to the participants a few days earlier to measure these variables. A windmill and a wind vane were created together. Below is an impression of the workshop.



Online workshop in Mainz

In **Karlsruhe**, Annika Oertel and other KIT colleagues gave a virtual overview on how diverse Meteorology can be to sixteen school girls. Within 90 minutes, the participants learned about how weather occurs and how climate change impacts extreme weather events. In a joint experiment, the school girls were able to trigger and observe convection. Examples of extreme weather events were finally discussed all together. This was an exciting experience, both for the school girls and for the KIT colleagues!



Impressions of the workshop at KIT

Thank you to all the volunteers who made these workshops so successful!

To read more, visit:

https://www.wavestoweather.de/equal_opportunity/activities/girlsday-2021

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



Karlsruhe, 27 March 2021. Photo: Behrooz Keshtgar

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