Waves to Weather

Newsletter Oct/Dec 2019

Welcome once again to the Waves to Weather Newsletter. Many of our early career scientists have finished their Phase 1 projects, so this edition is packed with research highlights. Meanwhile with the transition to Phase 2 we are being joined by many new colleagues. The Phase 2 Kickoff Meeting was held last month, and one highlight was the participation of the new Scientific Advisory Board, who will play an important role in keeping us on track over the next four years.
On behalf of the whole W2W community, I wish you a happy holiday season and all the best for the new year!

George Craig

Contents

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

Upcoming events

- A **retreat for the project leaders in W2W** will be organized from 10-11th February 2020 in Esslingen. More information will be available here shortly: https://www.wavestoweather.de/meetings/pi_retreat2020
- The **Kompaktseminar Numerik workshop** will be organized from 9-11th September 2020 in the Pfalzakademie Lambrecht. More information will be available here: https://www.wavestoweather.de/meetings/kompaktseminar2020
- The **6th W2W Annual Meeting** will take place from 16-18th November 2020 in Untermarchtal. More information will be available here: https://www.wavestoweather.de/meetings/annual_meeting6

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

Please contact us if you have any questions.

News

Open positions

Two positions are still open within the second funding phase of W2W. You can find more information here:
https://www.wavestoweather.de/positions
Please forward the information to whoever might be interested.

Steering Group

The Steering Group has been re-elected at the General Assembly on November 6th 2019.

Steering Group on November 5th 2019, Eibelstadt

More information about the Steering Group is available here:
https://www.wavestoweather.de/about_us/

New W2W members

The W2W members have unanimously elected

Lisa-Ann Kautz (KIT), and

Markus Bachmayr (JGU)

as new members of W2W during the General Assembly of W2W on November 6th 2019. More information about them can be found here:
https://www.wavestoweather.de/people/members

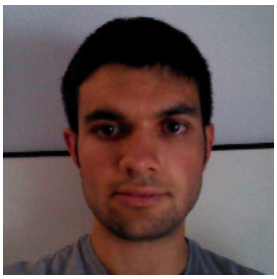
ECS committee

On November 6th 2019 at the kick-off meeting of W2W, the early career scientists (ECS) have elected a new ECS committee. It consists of **Jorge de Heuvel** (JGU), **Seraphine Hauser** (KIT) and **Kirsten Tempest** (LMU). To read more about ECS structure and activities, visit:
https://www.wavestoweather.de/early-career

PhD defenses

We would like to congratulate the W2W PhD students who defended their PhD recently and we wish them all the best for their future:

Georgios Fragkoulidis (project C4) defended his PhD on October 23rd 2019.



Paolo Ghinassi (project A1) defended his PhD on December 6th 2019.

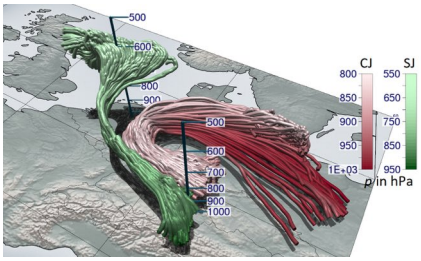
Data Management Plan for W2W

A data management plan has been set up for the second phase of W2W. All W2W participants must comply with it.

Research Highlights

Here are some examples of recently published research from W2W.

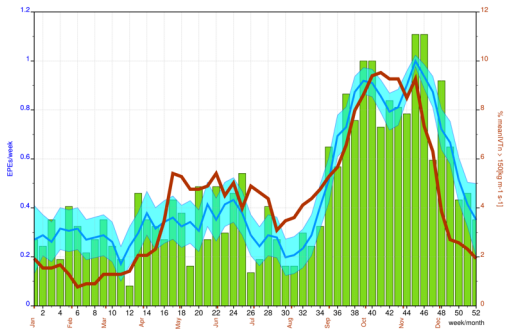
1. Dynamics of sting‐jet storm "Egon" over continental Europe: impact of surface properties and model resolution (L. Eisenstein, F. Pantillon and P. Knippertz)



Intense Shapiro-Keyser cyclones are often accompanied by a sting jet, a descending airstream that can cause extreme surface wind gusts. Here we present the first-ever detailed analysis of a sting jet over continental Europe and investigate the influence of topography on its dynamical evolution. Trajectories in sensitivity simulations and further simulations with changed topography all confirm the presence of a sting jet with consistent behavior and the contribution of conditional symmetric instability and evaporative cooling.

Read the full article: https://rmets.onlinelibrary.wiley.com/doi/abs/10.1002/qj.3666?af=R

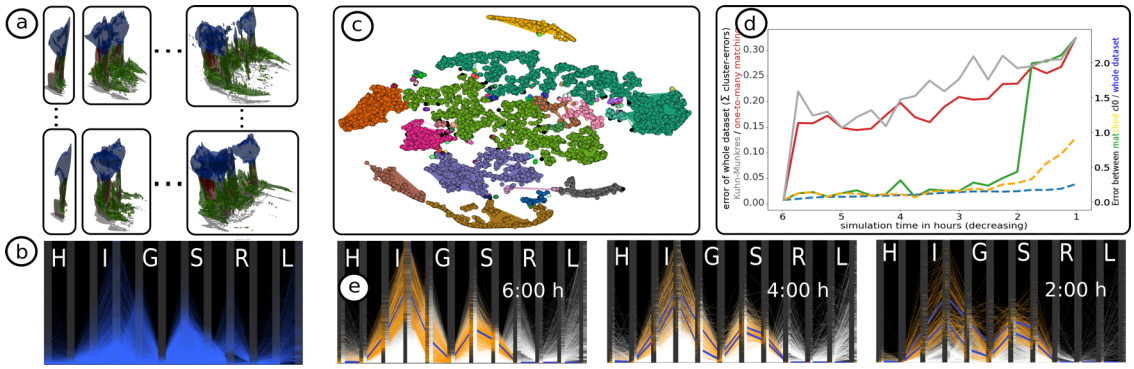
2. Extreme precipitation events over Northern Italy. Part (I): a systematic classification with machine learning techniques (F. Grazzini, G. Craig, C. Keil, G. Antolini and V. Pavan)



Extreme precipitation events (EPEs) are meteorological phenomena of major concern for society. This work provides a systematic classification of EPEs over northern–central Italy, one of the regions in Europe in which they occur with the highest frequency. A large list of events is compiled (887) and, with a combination of machine-learning algorithm, those are subdivided into three different dynamical classes: Cat1 events mainly attributable to frontal/orographic uplift, Cat2 events due to frontal uplift with (equilibrium) deep convection embedded, and Cat3 events mainly generated by non-equilibrium deep convection.

Read the full article: https://doi.org/10.1002/qj.3635

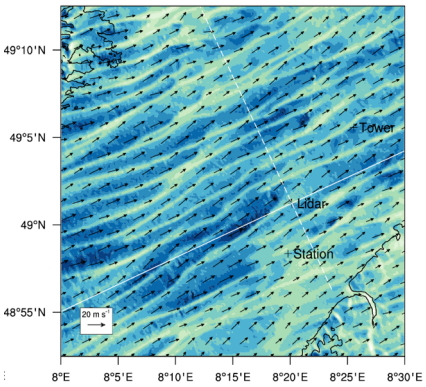
3. Cluster-based Analysis of Multi-Parameter Distributions in Cloud Simulation Ensembles (A. Kumpf, J. Stumpfegger and R. Westermann)



Similarities between different ensemble members and time-steps of a cloud dataset were investigated. Multiple k-Means clusterings on t-SNE projections were combined. Parameter value distributions were matched and compared over different time-steps and visualized using parallel coordinates.

Read the full article: https://doi.org/10.2312/vmv.20191321

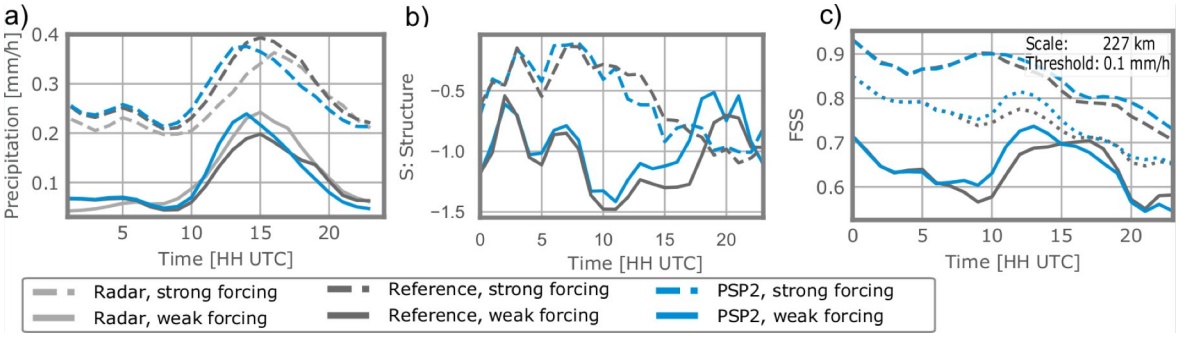
4. Formation of Wind Gusts in an Extratropical Cyclone in the Light of Doppler Lidar Observations and Large-Eddy Simulations (F. Pantillon, B. Adler, U. Corsmeier, P. Knippertz, A. Wieser and A. Hansen)



The passage of windstorm "Thomas" in the Upper Rhine Valley on 23 February 2017 was observed with a fast-scanning Doppler lidar during the Wind And STorms EXperiment (WASTEX) and modeled with ICON large-eddy simulations. The storm onset involved a sudden drop in dew point due to the downward mixing of a low-level jet and a dry layer, which was poorly predicted by operational convection-permitting forecasts overall. Lidar observations reveal the presence of long-lasting wind structures that result from a combination of convection- and shear-driven instability, whereas large-eddy simulations contain structures elongated in the wind direction that are qualitatively similar but too coarse compared to the observed ones.

Read the full article: https://doi.org/10.1175/MWR-D-19-0241.1

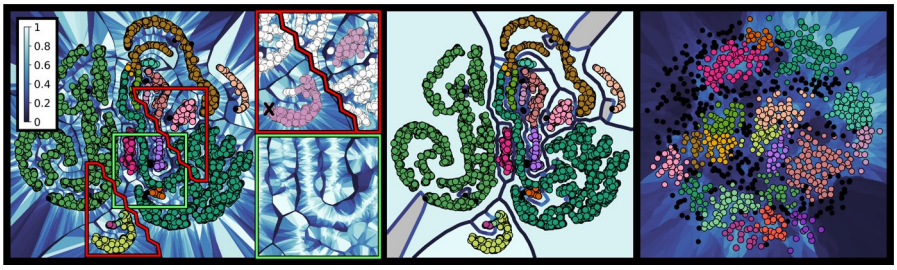
5. Stochastic Parameterization of Processes Leading to Convective Initiation in Kilometer-Scale Models (M. Hirt, S. Rasp, U. Blahak and G.C. Craig)



A physically-based stochastic perturbation scheme (PSP) for sub-grid processes has been proposed (Kober and Craig, 2016) that targets the coupling between subgrid turbulence and resolved convection. The first part of this study presents a revised version, PSP2, which retains the physically-based coupling to the boundary layer scheme of the original scheme while removing undesirable side-effects. The second part of the study focuses on perturbations to account for convection initiation by sub-grid orography. The resulting perturbations lead to enhanced convective initiation over mountainous terrain.

Read the full article: https://doi.org/10.1175/MWR-D-19-0060.1

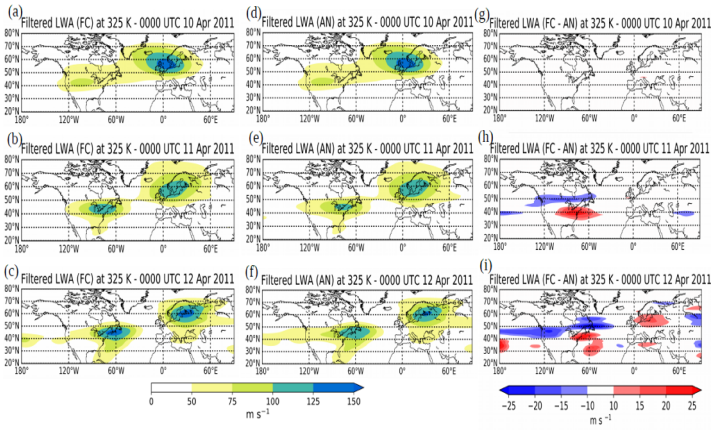
6. Visualizing the Stability of 2D Point Sets from Dimensionality Reduction Techniques (C. Reinbold, A. Kumpf and R. Westermann)



In this work, we use higher order Voronoi diagrams to assess the stability of neighborhoods in ensembles of 2D point sets, and apply it to analyze and visualize the robustness of a dimensionality reduction technique to variations in its input configurations. A pairwise similarity measure for point sets is introduced, which is used to select a subset of representative ensemble members. The proposed technique is utilized for visualizing the robustness of t-SNE applied to a 3D multi-parameter cloud simulation.

Read the full article: https://doi.org/10.1111/cgf.13806

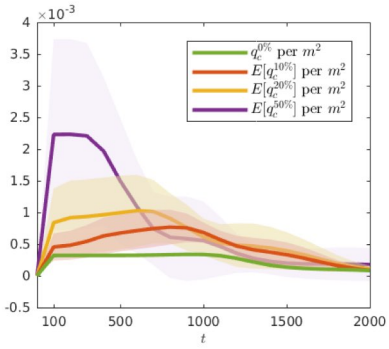
7. A budget equation for the amplitude of Rossby wave packets based on finite amplitude local wave activity (P. Ghinassi, M. Baumgart, F. Teubler, M. Riemer and V. Wirth)



We propose a budget equation for the amplitude of Rossby wave packets based on Local Finite Amplitude Wave Activity in isentropic coordinates. Our method allows one to distinguish between the conservative wave packet propagation and the influence that non-conservative processes may have on the wave packet amplitude evolution. We applied our diagnostic to an episode that occurred during April 2011 in which an upper tropospheric wave packet propagating from North America towards Europe was associated with below average forecast skills in all numerical weather prediction models. A comparison between the ECMWF forecast and the respective analysis attributed the creation of an amplitude error already after a short forecast lead time to the misrepresentation of non-conservative processes in the model. Such non-conservative processes included diabatic processes at the tropopause and the divergent outflow associated with latent heat release in the mid troposphere, which was found responsible to considerably alter the wave packet amplitude and structure.

Read the full article: https://doi.org/10.1175/JAS-D-19-0149.1

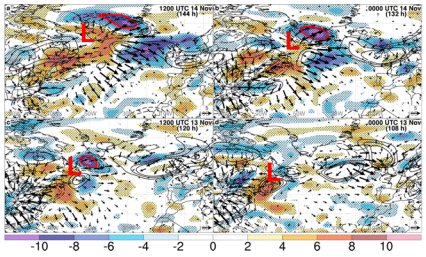
8. Stochastic Galerkin method for cloud simulation (A. Chertock, A. Kurganov, M. Lukáčová-Medvid'ová, P. Spichtinger and B. Wiebe)



We studied uncertainty propagation in an atmospheric model that combines the Navier-Stokes equations for weakly compressible fluids with evolution equations for the mass densities of water vapor, cloud drops and rain. Our numerical study clearly demonstrates applicability of the stochastic Galerkin method for the uncertainty quantification in complex atmospheric models. We have obtained interesting results illustrating the behavior of clouds in different perturbed scenarios and demonstrated that perturbations in the initial conditions can crucially change the time evolution of the moist Rayleigh-Bénard convection.

Read the full article: https://www.degruyter.com/view/j/mcwf.2019.5.issue-1/mcwf-2019-0005/mcwf-2019-0005.xml

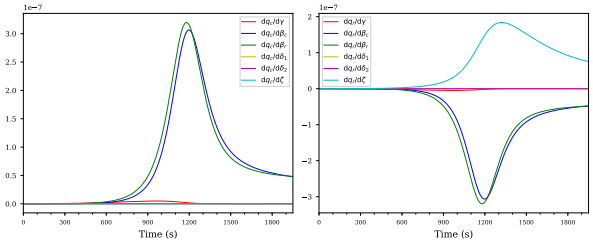
9. The Impact of Initial Condition and Warm Conveyor Belt Forecast Uncertainty on Variability in the Downstream Waveguide in an ECWMF Case Study (J. Berman and R. Torn)



This study evaluates the potential impact of latent heating variability in the WCB on subsequent downstream forecasts by applying the ensemble-based sensitivity method to ECMWF ensemble forecasts of a cyclogenesis event over the North Atlantic. For this case, ensemble members with a more amplified ridge are associated with greater negative PV advection by the irrotational wind, which is associated with stronger lower-tropospheric southerly moisture transport east of the upstream cyclone in the WCB. The results suggest that more accurate forecasts of upstream WCBs may greatly reduce forecast uncertainty in the downstream waveguide.

Read the full article: https://journals.ametsoc.org/doi/pdf/10.1175/MWR-D-18-0333.1

10. Algorithmic differentiation for cloud schemes (IFS Cy43r3) using CoDiPack (v1.8.1) (M. Baumgartner, M. Sagebaum, N.R. Gauger, P. Spichtinger, and A. Brinkmann)



We propose the use of algorithmic differentiation (AD) as a method to identify parameters within the cloud scheme, to which the output of the cloud scheme is most sensitive. We illustrate the methodology by analyzing a scheme for liquid clouds, incorporated into a parcel model framework. Since the occurrence of uncertain parameters is not limited to cloud schemes, the AD methodology may help to identify the most sensitive uncertain parameters in any subgrid scheme and therefore help limiting the application of uncertainty quantification to the most crucial parameters.

Read the full article: https://www.geosci-model-dev.net/12/5197/2019/gmd-12-5197-2019.html

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

Past activities

Kick-off meeting of W2W (4-6 Nov. 2019)

Participants of the Kick-off Meeting of W2W (Phase 2) in Eibelstadt, November 5th 2019

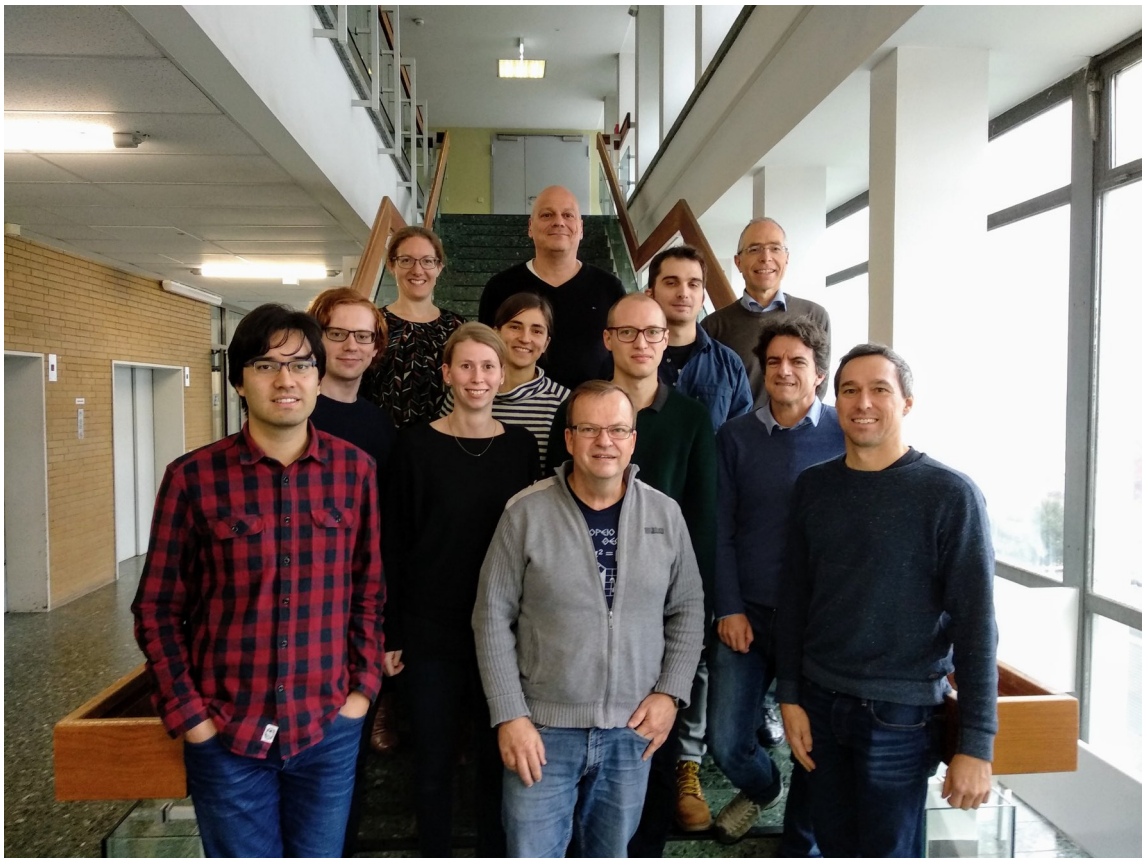
The **kick-off meeting of W2W for Phase 2** took place in Eibelstadt from November 4-6th 2019. About 80 participants got to know each other. The project leaders and early career scientists presented their projects and research plans for the coming years and started working together to address the scientific challenges of W2W. The international guests (keynote speakers and Scientific Advisory Board members) contributed to the many lively discussions and provided insightful feedback to the W2W community.
The international guests were **Andy Brown** (ECMWF), **Juliana Dias** (ESRL, NOAA, USA), **Rupert Klein** (Freie Universität Berlin), **Ron McTaggart-Cowan** (Environment Canada), **Michael Morgan** (University of Wisconsin), **Susan van den Heever** (Colorado State University), and **Nedjeljka Zagar** (Universität Hamburg).

Highlights of the meeting included a **discussion on understanding and simulating uncertainty** dedicated to mathematics led by Tijana Janjic-Pfander, and the presentation of the **data management plan** for W2W by Robert Redl. There were plenty of opportunities to discuss informally and to get to know each other, e.g., at the ice breaker on Monday, at breakfast and coffee break, and also during a **workshop on "unconscious biases"** organized on Wednesday (read more about this workshop in the section “Outreach and equal opportunity (EO) activities” below).

The program and additional information on the venue is available here:
http://www.wavestoweather.de/meetings/kick-off-meeting-nov2019

Workshop on Rossby waves (Dec. 2019)

A workshop on "Rossby waves and their implications for extreme weather and climate" was organized on 3 December 2019 at the Institute for Atmospheric Physics (Johannes Gutenberg-University, Mainz).
The workshop hosted 12 scientists: Rachel White (Barcelona Supercomputing Center), Federico Grazzini (LMU), Andreas Fink, Philipp Zschenderlein and Florian Becker (KIT), and a large portion of attendees from JGU Mainz: Volkmar Wirth, Michael Riemer, Joachim Eichhorn, Franziska Teubler, Georgios Fragkoulidis, Amelie Mayer, and Christopher Polster. Topics of discussion included the seasonal variability Rossby wave packet, disentangling the role of Rossby waves in shaping heat waves over Europe, the decadal variability of extreme precipitation over northern-central Italy, and the waveguidability of a midlatitude jet in a barotropic model framework.
Lively discussions accompanied the presentations throughout the workshop, and these continued even during the lunch break and at dinner following the official part of the workshop. The topic is considered as highly relevant and of current interest, and there will be a PICO session with a similar topic at the upcoming EGU General Assembly in Vienna in May 2020.
We are grateful to W2W for financial support for this exciting one-day event.



Participants of the Rossby Wave workshop in Mainz

More information can be found here:
https://www.wavestoweather.de/meetings/rossby-wave-workshop-2019

Early Career Scientists Meeting (Dec. 2019)

The first **ECS meeting** in Phase 2 took place from December 11th – 13th 2019 in Würzburg. Its focus was introducing the new generation of ECS to W2W and its unique infrastructure. Therefore, the meeting was a mixture of introductory presentations about, e.g., data management in W2W, hands-on sessions on data assimilation, unit tests, and Met.3D visualization. Furthermore, some ECS presented books and tools that could help new PhDs starting their journey.
Getting to know each other and forming a W2W ECS team was a major goal of this meeting. To achieve this, a scientific speed dating was organized in which random pairs of ECS introduced themselves and their project to each other in five minutes before new pairs were formed. Other measures to foster group identity included the visit of the castle ("Residenz") and of the Christmas market.

Participants of the ECS meeting in Würzburg

More information about this meeting can be found here:
https://www.wavestoweather.de/meetings/ecs-meeting-2019

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.

Outreach and equal opportunity (EO) activities

Presentation at the Deutsches Museum (October 16th 2019)

Bernhard Vogel (KIT) was invited by the Deutsches Museum in Munich to give a presentation within the series "Wissenschaft für jedermann" on October 16th 2019. He talked about "More than temperature and precipitation: the future of weather forecast" to a fully booked auditorium of approximately 230 people.

Bernhard Vogel in the Ehrensaal of the Deutsches Museum

To read more about this event, click here:
https://www.wavestoweather.de/outreach/deutsches-museum-oct-2019

Conversation with Christoph Pusch (World Bank)

On November 13th 2019 Volkmar Wirth has a conversation with Christoph Pusch who is the World Bank's Practice Manager for South Asia - Climate Change and Disaster Risk Management. They disscussed the issue of extreme weather events, how they might change in the coming decades, and the aims of W2W. More information can be found here:
https://www.wavestoweather.de/outreach/conversation-with-c-pusch-2019

Equal Opportunity committee

The W2W community has elected a new EO committee on November 6th 2019 at the Kick-off meeting of W2W. It consists of:

- **Corinna Hoose** and **Christian Barthlott** in Karlsruhe
- **Bettina Wiebe** and **Markus Bachmayr** in Mainz
- **Mirjam Hirt** and **Philip Rupp** in Munich

Corinna Hoose will draft the Terms of Reference for the EO committee to better define its role and duties.

Workshop on unconscious bias at the W2W kick-off meeting

A workshop on unconscious bias was organized at the Kick-off meeting of W2W on November 6th 2019. This workshop provided relevant research findings about the risks of biases in personnel selection or daily communication and offered a training in recognizing and dealing with such biases. The participants were split in small groups and addressed short challenges together, e.g., defining bias, spotting biases in videos simulating a hiring procedure at the university, defining measures to reduce unconscious bias at annual meetings, at group meetings, and during a recruiting phase. The discussions were very lively and continued during the coffee break. While some participants would have liked the workshop to be more relevant to the field of Meteorology, e.g. addressing biases due to cultural differences, most participants agreed that this workshop raised very important questions and issues. The workshop also allowed the participants to get to know each other from another perspective.

Girls' Day

Girls' Day will take place on March 26th 2020. Workshops will be offered to school girls by early career scientists in W2W and at the partner institutes.
For more information, visit:
https://www.wavestoweather.de/equal_opportunity/activities/girlsday-2020

- 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

Past issues of this newsletter are available here:
http://www.wavestoweather.de/outreach/quarterly_newsletter

Fall's highlight

Rainbow in Rotterdam. Photo: Edward Groot

Contact

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