Waves to Weather

Newsletter Oct/Dec 2018

November is time for the Waves to Weather annual meeting, this year was the last meeting of our first four-year phase.
Looking forward to Phase 2, we received six new members into the consortium, who are part of the proposal to be submitted at the start of the new year. But this was also a celebration of our achievements, since three of those new members are post-doctoral scientists in Phase 1 who have advanced in their careers and are now principal investigators in the next phase. From all of us in W2W, best wishes for a relaxing holiday and an exciting new year!

George Craig

Contents

Upcoming events

The **19th Cyclone Workshop** will be organized by W2W and will take place in Seeon (Bavaria, Germany) from September 29th – October 4th 2019. The abstract submission deadline is **April 15th 2019**. More information about the program, the venue, support to Early Career Scientists, etc. is available here:
http://www.wavestoweather.de/meetings/19th-cyclone-workshop

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

Please contact us if you have any questions.

News

Heisenberg Program
Congratulations to **Tijana Janjic-Pfander** who has been accepted to the Heisenberg Program of the DFG with a proposal entitled "Data assimilation on convective scale based on first physical principles"!
To find out more about this program, visit:
http://www.wavestoweather.de/news/heisenberg2018

New W2W members

André Brinkmann is a full professor at the computer science department of JGU in Mainz and head of the ZDV since 2011. His research interests focus on the application of algorithm engineering techniques in the area of data centre management, cloud computing, and storage systems. For more information, visit:
https://research.zdv.uni-mainz.de/people/andre-brinkmann/

Thomas Birner is a W2 Professor at the meteorological institute in Munich (LMU) since February 2018. More information about his research interests is available on his homepage:
https://www.meteo.physik.uni-muenchen.de/~Thomas.Birner

Sebastian Lerch has been contributing to W2W since 2016. He is currently a postdoctoral researcher in Project C7 “Statistical post-processing and stochastic physics for ensemble predictions”.
To read more about this project, visit:
http://www.wavestoweather.de/research_areas/c7

Joaquim Pinto is Professor of Meteorology at the Institute of Meteorology and Climate Research at KIT and holder of the AXA Research Fund Chair on "Regional Climate and Weather Hazards". His research interests include the investigation of the physical processes leading to the occurrence of mid-latitude extreme weather events and how their intensity and frequency may be affected by climate variability and change. To read more:
https://www.imk-tro.kit.edu/14_7131.php

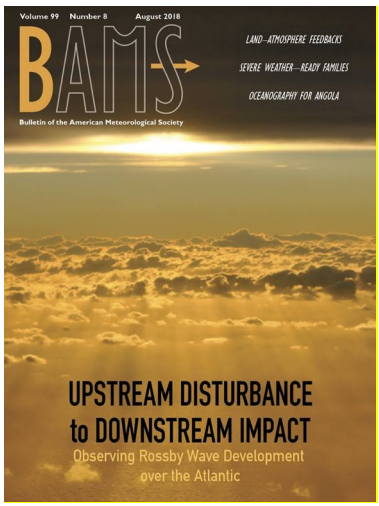
Marc Rautenhaus has been contributing to W2W since 2015. He is currently a research scientist at the Regionales Rechenzentrum at the University Hamburg. To read more about his research interests and achievements, visit:
https://www.rrz.uni-hamburg.de/ueber-uns/personen/3-mcc/rautenhaus.html

Andreas Schäfler has been contributing to W2W since 2015. He is currently a postdoctoral researcher in Project A3 “Model error and uncertainty for midlatitude cyclones analyzed using campaign data”.
To read more about this project, visit:
http://www.wavestoweather.de/research_areas/a3

Research Highlights

Here are some examples of recently published research from W2W.

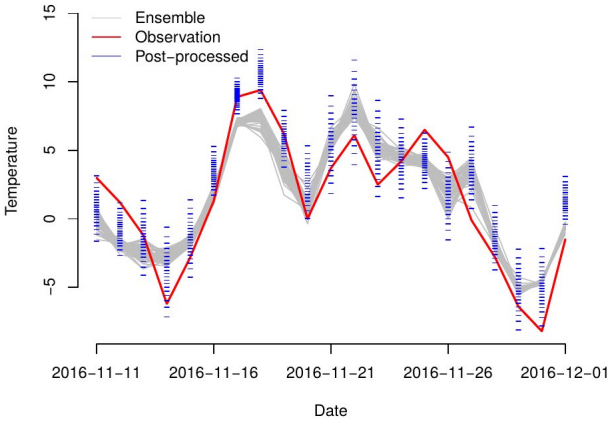
1. The North Atlantic Waveguide and Downstream Impact Experiment (A. Schäfler et al.)



The overview of the North Atlantic Waveguide and Downstream impact EXperiment (NAWDEX) has been published in the Bulletin of the American Meteorological Society. Multi-aircraft and ground-based observations were made over the North Atlantic, from the entrance region to the exit region of the climatological storm track, in the fall of 2016. The result is an unprecedented data set giving insight into the impacts of diabatic processes for midlatitude weather.

Read the full article: https://doi.org/10.1175/BAMS-D-17-0003.1

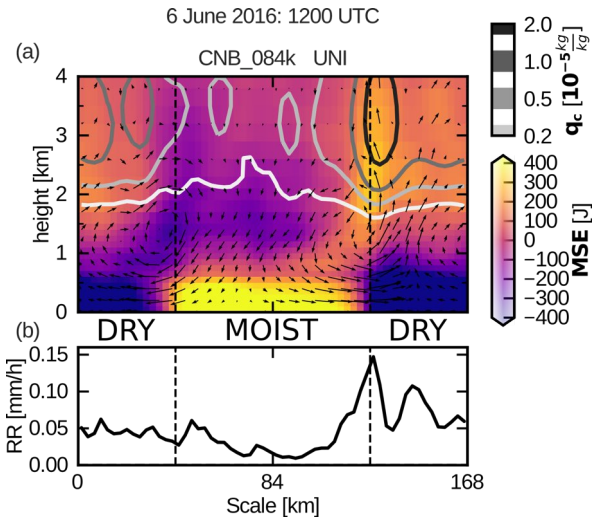
2. Neural networks for post-processing ensemble weather forecasts (S. Rasp and S. Lerch)



In this paper, the problem of calibrating ensemble weather forecasts is tackled with artificial neural networks. They provide a flexible way to model non-linear relations between different forecast variables and other properties specific to each weather station. The neural network approach outperforms all previous state-of-the-art approaches while being more computationally affordable. This study shows the potential of neural network for the field of postprocessing in general. The figure is one example that shows how our postprocessing increases the spread of the raw ensemble, which is severely underdispersive.

Read the full article: https://journals.ametsoc.org/doi/abs/10.1175/MWR-D-18-0187.1

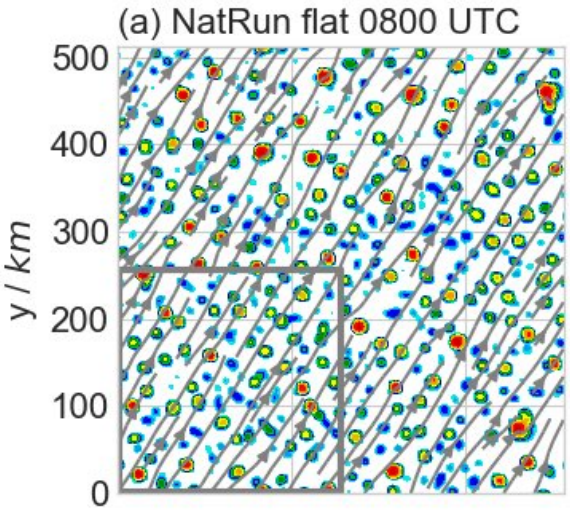
3. Soil Moisture - Precipitation Coupling over Central Europe: Interactions between surface anomalies at different scales and its dynamical implication (F. Baur, C. Keil and G. C. Craig)



The sign of soil moisture-precipitation coupling and its scale dependence are controversial issues. For synoptically weakly forced case studies over Central Europe, we found a local negative coupling. According to our experiments, preferred locations of convection triggering are defined by a superposition of the background wind and mesoscale circulations induced by soil moisture heterogeneity. This interaction causes a persistent updraft region at the downstream flank of the dry patch (right in panel a). This results in an export of Moist Static Energy (a) and increased precipitation (b).

Read the full article: https://rmets.onlinelibrary.wiley.com/doi/abs/10.1002/qj.3415?af=R

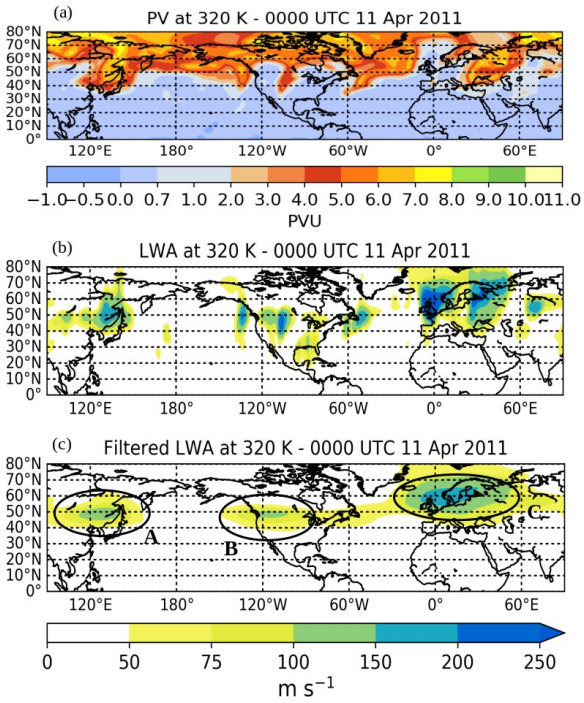
4. Impact of radar data assimilation and orography on predictability of deep convection (K. Bachmann, C. Keil and M. Weissmann)



Deep convection represents a classic example of limited predictability on the convective scale. We investigate the potential impact of assimilating radar reflectivity and velocity observations on the predictive skill of precipitation in short-term forecasts (up to 6h) using the operational COSMO-KENDA ensemble data assimilation and forecasting system in an idealized setup. Using a hierarchy of quality measures, we found a long-lasting beneficial impact of radar data assimilation throughout the entire forecast range of 6h. The presence of orography also increases the predictability of precipitation throughout the forecast range, particularly in its proximity and in case no radar data are assimilated.

Read the full article: https://doi.org/10.1002/qj.3412

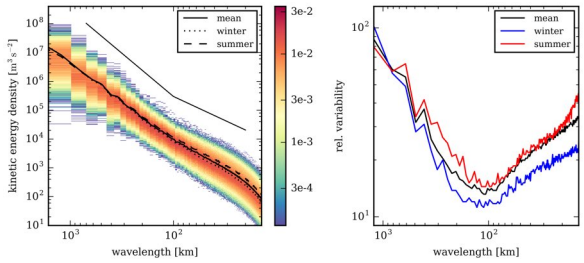
5. Local Finite Amplitude Wave Activity as a diagnostic for Rossby wave packets (P. Ghinassi, G. Fragkoulidis and V. Wirth)



We developed a novel diagnostic to identify upper-tropospheric Rossby wave packets (RWP) and to quantify their amplitude. Our method is based on the local finite amplitude wave activity (LWA) of Huang and Nakamura. LWA, at each longitude, is proportional to the meridional deviation of potential vorticity from a zonally symmetric reference state, therefore is suitable to identify regions of enhanced waviness of the atmospheric flow suggesting the presence of a RWP. LWA is then combined with a zonal filter based on wavelet analysis to remove its phase information and thus RWP are identified as a whole structure. The newly developed diagnostic is applied to a specific episode containing large amplitude RWP, and compared with a more traditional diagnostic based on the envelope of the meridional wind. At large amplitudes, LWA provides a more coherent picture of the RWP and their zonal propagation.

Read the full article: https://doi.org/10.1175/MWR-D-18-0068.1

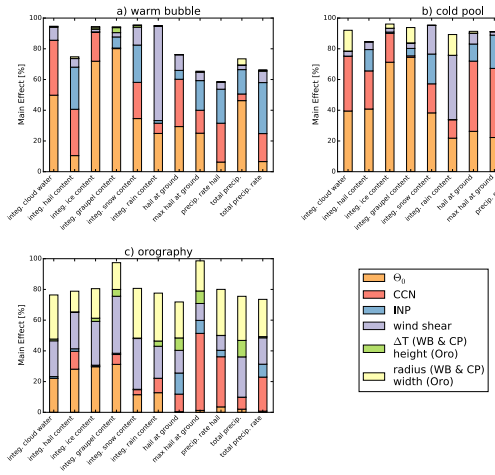
6. Estimation of the variability of mesoscale energy spectra with three years of COSMO-DE analyses (T. Selz, L. Bierdel and G. C. Craig)



We investigate the variability of the spectrum using three years of COSMO-DE kilometer-resolution analyses. It is shown that the mesoscale kinetic energy spectrum is highly variable in time, but a pronounced minimum in variability is found on scales around 100 km. Our findings suggest that the spectral slope and amplitude on the mesoscale range is governed by an ever-changing combination of the up- and downscale impacts from larger and smaller scales, rather than by a universal, intrinsically mesoscale dynamical mechanism.

Read the full article: https://journals.ametsoc.org/doi/abs/10.1175/JAS-D-18-0155.1

7. Using emulators to understand the sensitivity of deep convective clouds and hail to environmental conditions (C. Wellmann, A. Barrett, J. Johnson, M. Kunz, B. Vogel, K. Carslaw and C. Hoose)



This study aims to identify model parameters describing atmospheric conditions (e.g. wind shear and CCN concentration) which lead to large uncertainties in the prediction of deep convective clouds using the approach of statistical emulation. We find that the uncertainties of most cloud and precipitation outputs are dominated by the uncertainty in the temperature profile and the CCN concentration. The temperature profile is also an important factor in determining the size distribution of surface hail. Our results show that
depending on the choice of the trigger mechanism, the contribution of the input parameters to the uncertainty varies which means that studies with different trigger mechanisms might not be comparable.

Read the full article:
https://agupubs.onlinelibrary.wiley.com/doi/abs/10.1029/2018MS001465

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

Past activities

7th European Windstorm Workshop

Mid-latitude storms belong to the main natural hazards affecting Europe, and can have devastating socio-economic impacts. However, the processes involved in their intensification and generation of disastrous impacts such as widespread wind damage and flooding are not fully understood.
Initiated in 2011, the European storm workshops series (http://www.stormworkshops.org/) aims at bringing together dynamical meteorologists, climatologists, statisticians, stakeholders and risk model developers from insurance and engineering consultant companies. These interdisciplinary workshops try to bridge state-of-the-art breakthroughs in sciences to the practical implementation in risk modelling.
The 7th European Windstorm Workshop took place between October 10th – 12th 2018 at KIT (Campus South) in Karlsruhe. Over 60 international participants from 10 countries (mostly European but also including a few American colleagues) discussed the latest results and developments in windstorm research and applications. Among the participants, 26 non-

academics contributed to the workshop. The workshop included a total of 19 plenary talks and 11 posters split into 3 sessions, addressing academic and non-academic topics: (1) dynamics of European windstorms, (2) predictability and variability from weather to climate timescales and (3) windstorm risk and insurance collaborations. In addition to the oral and poster presentations, plenty of opportunities for exchange and discussions were provided during breakout groups, coffee and lunch breaks, and the conference dinner.

Highlights of the workshop included keynote lectures for each session. These were given by speakers from leading academic institutions and the insurance business. Helen Dacre (University of Reading) showed new results on how extreme precipitation accumulations associated with extratropical cyclones can lead to inland flooding. Particularly, she emphasized the role of interactions between atmospheric rivers and extra-tropical cyclone airflows for these extreme precipitation events. Aiko Voigt (KIT) illustrated the importance of cloud-radiative interactions on the mid-latitude atmospheric circulation. Understanding these interactions is crucial for an adequate assessment of climate change projections, where clouds are the largest source of uncertainty. Finally, Alan Whitelaw (CGI IT UK Limited) presented the operational windstorm service for the insurance sector provided by the Copernicus Climate Change Service. An extended database of windstorm tracks and high-resolution wind footprints is made available based on dynamical or statistical downscaling of atmospheric reanalysis products.

Finally, future directions and emerging topics were debated in three breakout groups dedicated to (1) the relative importance of the different air flows associated with windstorms for total property damage, (2) advances we can expect to make in the next 5–10 years in terms of understanding the impact of climate change on European windstorms, and (3) validation and calibration methods of extreme storms given the limited sample size of the historic record. The breakout discussions revealed that open questions were often shared between academia and the insurance business, thus highlighting the need for sustained collaborations. A consensus was clearly reached to keep organizing future workshops.

Group picture of the workshop participants

The organizing committee (Joaquim Pinto, Florian Pantillon, Patrick Ludwig) would like to take the opportunity to thank W2W for supporting the conference, it was very much appreciated!

The next European windstorm workshop series will take place in 2020. If you would like to be informed of the developments please register to the met-windstorm mailing list: https://www.lists.rdg.ac.uk/mailman/listinfo/met-windstorms
http://www.wavestoweather.de/meetings/windstorm-2018

4th Annual Meeting of W2W

The 4th Annual Meeting of W2W took place in Landau from November 12th – 14th 2018.
The format of the meeting featured overview presentations from the three Research Area (RA) coordinators, lightning talks by the Early Career Scientists (ECS) to introduce their poster, extended poster sessions, a few keynote presentations, and breakout group discussions focused on ongoing research in each the RA, lessons learned and added value of W2W during Phase 1, and suggestions for improvement for Phase 2. The participants had plenty of time to update each other on their ongoing research, for instance during the ice breaker and a guided tour of Landau.

Among the 78 participants, six invited speakers from five countries discussed with the ECS about their results and provided constructive feedback on W2W. The **invited speakers and guests** were:

- Judith Berner (NCAR, Boulder, U.S.A.)
- Ulrich Blahak (DWD, Germany)
- André Brinkmann (JGU, Germany)
- Hanna Joos (ETH, Zurich, Switzerland)
- Ron McTaggart-Cowan (Environment Canada)
- Mark Rodwell (ECMWF, UK)

At the 4th General Assembly of W2W on November 14th, the W2W members elected six **new members** (for more information, see the “News” section):

- Thomas Birner (LMU)
- André Brinkmann (JGU)
- Andreas Schäfler (DLR)
- Sebastian Lerch (KIT)
- Joaquim Pinto (KIT)
- Marc Rautenhaus (UHH)

The W2W members also elected Bernhard Mayer (LMU) as the **new coordinator of RA-B** "Cloud-scale Uncertainties".

The ECS elected a **new ECS committee** for one year, consisting of:

- Florian Baur (LMU), ECS representative
- Marlene Baumgart (JGU)
- Philipp Zschenderlein (KIT)

Group picture of the participants of the 4th Annual Meeting of W2W in Landau

Information about the program, keynote speakers, venue, and childcare organized during the meeting is available here:
http://www.wavestoweather.de/meetings/4th-annual-meeting-nov18

Seminars and guest program

Shira Raveh-Rubin (Weizmann Institute of Science, Israel) will be a W2W guest and visit the three partner institutes in Karlsruhe, in Mainz, and in Munich between May 13th - 20th 2019. She will give a talk at the IMK-Colloquium at KIT on May 14th.
To read more about her research: http://www.weizmann.ac.il/EPS/raveh-rubin/home

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 activities

Interviews

- George Craig was interviewed for the **podcast "Welt der Physik"** on how weather forecasts are made, what are the current theoretical open questions in this field, and if we can predict the weather at all. To listen to the podcast (in German): http://www.wavestoweather.de/outreach/interview_weltderphysik
- Andreas Fink and Michael Riemer have been interviewed in an article called "Die Kraft der Hurrikane kommt aus 100 Meter Tiefe" in **Die Welt Online** on October 22nd 2018. To read the article (in German) click here: http://www.wavestoweather.de/outreach/interview_welt_online_oct2018
- Andreas Fink gave an interview to the **"Neue Zürcher Zeitung"** on November 8th 2018. To read more about the recent severe weather in southern Europe, read the article (in German): http://www.wavestoweather.de/outreach/article-neue-zuercher-zeitung
- Volkmar Wirth gave an interview to the **"Neue Zürcher Zeitung"** on November 23rd 2018. To read more about the drought last summer and its predictability, read the article (in German): http://www.wavestoweather.de/outreach/article-in-nzz-23_11_2018

Presentation

On November 16-18th 2018, Rovereto (in the Trentino region, Italy) hosted the **"Festival della Meteorologia"**. This event brings together the diverse world of Italian meteorology, from researchers and forecasters to associations and students since 2015. The festival offers a concrete and multimedia opportunity to learn about meteorology, the fundamental science and technological aspects involved, and the economic, cultural and social implications. The program is rich and includes plenary conferences on selected topics, exhibitions, side events like evening scientific talks and concerts. Among others, Dr. Anna Ghelli (ECMWF) gave an overview talk on recent upgrades and products. **Federico Grazzini** was invited to give a plenary presentation about genesis, predictability, and effects of extreme precipitation. After a short introduction of W2W, he focused on extreme precipitation, including the new categorization proposed in the framework of the transfer project T1, complemented with an analysis of the recent extreme event that affected Northern Italy during 27-29th October. The festival was well attended with more than 2000 participants over the 3 days, with Italian newspaper articles and media interviews mentioning the themes presented at the festival.

Federico Grazzini at the "Festival della Meteorologia". Photo: Ludovica Galeazzi

For more information, e.g., about the program, visit:
http://www.wavestoweather.de/outreach/festival-meteorologia2018

Equal opportunity workshops

The country-wide outreach event for school girls **"Girls'Day"** will take place on March 28th 2019. Early Career Scientists in W2W and at the partner institutes will offer workshops on weather, weather forecasting, and climate.
For more information, visit:
http://www.wavestoweather.de/equal_opportunity/activities/girlsday-2019

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

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

Fall's highlight

Sandbridge Virginia USA, August 31st 2018 (photo: Tijana Janjic-Pfander)

Contact

Dr. Audine Laurian
Scientific Manager of Waves to Weather (SFB TRR 165; W2W)

Meteorological Institute
Ludwig-Maximilians University
Theresienstr. 37
80333 Munich
Germany

Tel: +49 (0) 89 2180-4513
Fax: +49 (0) 89 280-5508

Email: audine.laurian@lmu.de
Internet: http://www.wavestoweather.de