

Waves to Weather



Newsletter Jul/Sep 2017

Welcome to a new issue of the Waves to Weather newsletter!

As usual we highlight some of our scientific work - notable in this issue are some new developments coming from the collaboration between atmospheric and visualization scientists. We report on one of the most important events on our calendar this year: the Conference on Predictability and Multi-scale Prediction of High Impact Weather that we were privileged to co-organize with the HIWeather project of the WWRP. Finally, one of the great advantages of a long-term scientific program is that it gives us a chance to address structural issues that are crucial for the future of our field by engaging in educational and equal opportunity activities, some of which are described here.

Happy reading!
George Craig

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Upcoming events

The **3rd Annual Meeting of W2W** will take place from November 6th – 8th 2017 in Kempten. The early career scientists in W2W will present their latest results and keynote speakers from international research institutes and from weather services will take part in the discussions. For more information, visit:

<http://www.wavestoweather.de/meetings/3rd-annual-meeting2017>

The **6th International Symposium in Data Assimilation** will take place from March 5th – 9th 2018 at the LMU in Munich. Save the date!

For more information, visit

<http://www.wavestoweather.de/meetings/isda-2018>

Additional information on upcoming events can be found here:

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

Please contact us if you have any questions.

News

2017 IAMAS Early Career Scientist Medal Award

Congratulations to **Corinna Hoose** for receiving the 2017 IAMAS Early Career Scientist Medal Award!

This award is given to scientists in their early career phase who have obtained excellent research results in an area of atmospheric science and have shown the potential to make a significant international contribution. The medal was given to Corinna Hoose at the IAPSO-IAMAS-IAGA conference (<http://www.iapso-iamas-iaga2017.com>) in Cape Town, South Africa, by Prof. Joyce Penner, the vice president of IAMAS (International Association for Meteorology and Atmospheric Sciences) and chairman of the prize committee.

To read more about the awardee and the award, visit:

<http://www.wavestoweather.de/news/iamas-ecs-medal-award-2017>



Joyce Penner (IAMAS Vice President) and Corinna Hoose on Aug. 31st 2017 in Cape Town. Photo: H. Volkert.

Met.3D website

The Met.3D website provides documentation, downloads, a gallery of examples, publications and much more. It has been recently put online and is available here:

<https://met3d.wavestoweather.de/met-3d.html>

Past activities

Mini-Workshop on Multiscale Asymptotics

The members of the A1 project (http://www.wavestoweather.de/research_areas/a1) organized a workshop on Multiscale Asymptotics at the LMU in Munich on September 26th - 27th 2017. The purpose of the workshop was to initiate collaborations, as well as to discuss upcoming scientific projects with leading experts in this field.



Workshop participants: (from left to right) Ulrich Achatz (Goethe-Universität Frankfurt), George Craig, Lotte Bierdel, Tobias Selz and Rupert Klein (Freie Universität Berlin)

For more information about this workshop, visit:

<http://www.wavestoweather.de/meetings/workshop-multisc-asympt-2017>

ScienceFore Summer School: The Science of Forecasting

The ScienceFore Summer School organized by Tilmann Gneiting and other colleagues at HITS and KIT took place in Heidelberg from October 3rd – 6th 2017. About 40 participants, including W2W ECS from Munich and Karlsruhe, were introduced to the state-of-the-art in the interdisciplinary science of forecasting, with a focus on probabilistic and ensemble forecasts. They discussed topics such as forecast evaluation, forecasting across the disciplines and statistical post-processing with invited speakers from NOAA, the Norwegian Computer Center and the Pompeu Fabra University in Spain.



Participants of the summer school in Heidelberg

More information about this summer school is available here:

http://www.wavestoweather.de/meetings/forecasting_summer_school2017

Conference on Predictability and multi-scale Prediction of High Impact Weather

The international Conference on Predictability and multi-scale Prediction of High Impact Weather took place from October 9th – 12th 2017 in Landshut. It was organized by W2W and the HIWeather project of the WWRP. About 90 participants from six continents came together to present and discuss a broad spectrum of topics, from scale interactions and error growth to multi-scale prediction systems, probabilistic forecasting, extreme weather events and prediction of high impact weather in urban areas. The program featured high-quality presentations from scientists at international research institutes and weather services. Group discussions on e.g. fundamental challenges in the prediction of high impact weather and the reproducibility of scientific results were lively and fruitful. The conference has been a great occasion for networking, in particular for the early career scientists.



Some participants of the conference on predictability and multi-scale prediction of high impact weather

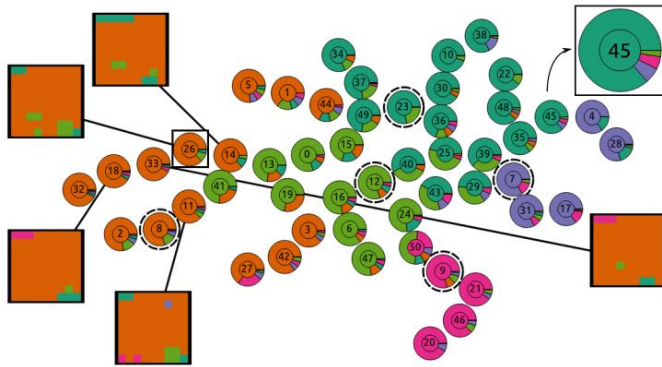
For more information about the conference, visit:
<https://hiw2017.wavestoweather.de>

For more information about past W2W meetings, visit:
<http://www.wavestoweather.de/meetings>

Research Highlights

Here are some examples of recently published research from W2W.

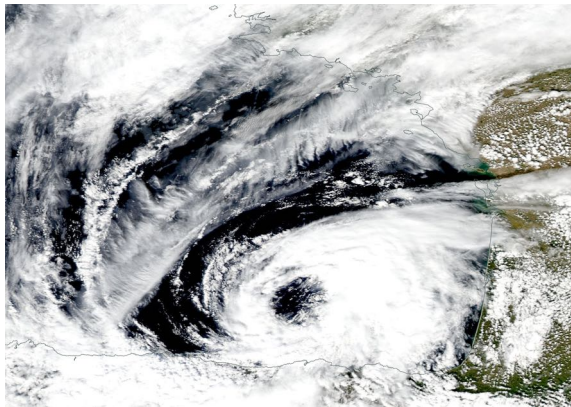
1. Visualizing Confidence in Cluster-based Ensemble Weather Forecast Analyses (A. Kumpf, B. Tost, M. Baumgart, M. Riemer, R. Westermann, and M. Rautenhaus)



Clustering ensembles is widely used in meteorology. However, the sensitivity of the clustering to perturbations to the input parameters such as the clustering region is often not discussed. Our visualizations and interactive workflow help to get a fast overview.

Read the full article: <http://ieeexplore.ieee.org/document/8019883/>

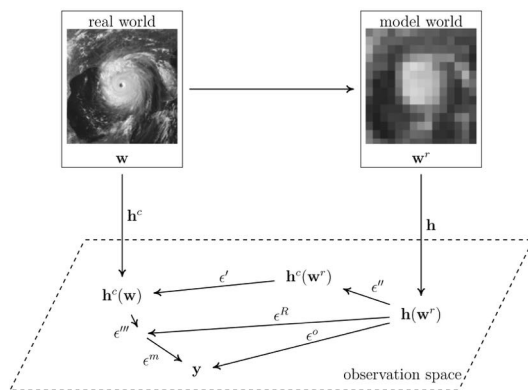
2. Birth of the Biscane (M. Maier-Gerber, F. Pantillon, E. di Muzio, M. Riemer, A. H. Fink, P. Knippertz)



This paper describes the unprecedented storm “Stephanie” that exhibited tropical characteristics over the Bay of Biscay on 15 September 2016. Remote and sensing observations reveal a cloud-free area surrounded by a circular precipitation pattern and an axisymmetric wind field, while buoy observations show an abrupt drop in wind speed during the passage of the storm center. Model analysis further corroborates an ongoing tropical transition from a frontal cold-core to a symmetric warm-core system. By analogy with “Medicanes” (Mediterranean hurricanes), we name this storm a “Biscane” (Biscay hurricane). Weather systems of this kind may become more frequent in a warmer climate.

Read the full article: <http://onlinelibrary.wiley.com/doi/10.1002/wea.2995/full>

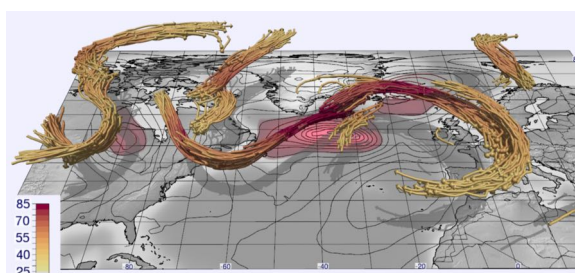
3. On the representation error in data assimilation (T. Janjić, N. Bormann, M. Bocquet, J.A. Carton, S.E. Cohn, S.L. Dance, S.N. Losa, N.K. Nichols, R. Potthast, J.A. Waller, and P. Weston)



Representation, representativity, representativeness error, forward interpolation error, forward model error, observation operator error, aggregation error and sampling error are all terms used to refer to components of observation error in the context of data assimilation. This paper is an attempt to consolidate the terminology that has been used in the earth sciences literature. We review the state-of-the-art, and through examples, motivate the terminology. In addition to a theoretical framework, examples from application areas of satellite data assimilation, ocean reanalysis and atmospheric chemistry data assimilation are provided. Diagnosing representation error statistics as well as their use in state-of-the-art data assimilation systems is discussed within a consistent framework.

Read the full article: <http://onlinelibrary.wiley.com/doi/10.1002/qj.3130/abstract>

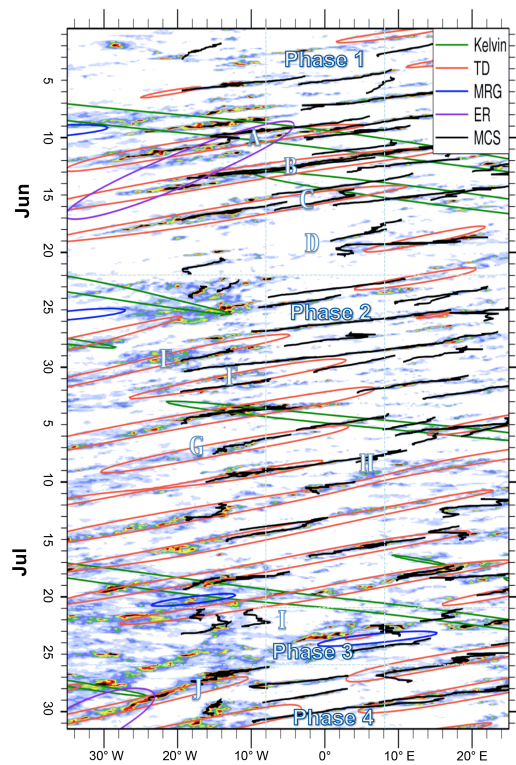
4. Robust detection and visualization of jet-stream core lines in atmospheric flow (M. Kern, T. Hewson, F. Sadlo, R. Westermann, and M. Rautenhaus)



In this work, we propose a method to automatically detect jet-stream core lines in a volumetric wind field. This method exploits directional information of the wind field to a robust 3D core line detection. We display the core lines as 3D tubes, color the tubes by (see example) wind speed and plot additional context, such as mean sea-level pressure. The figure represents a spaghetti plot of the detected core lines for 51 ensemble members. We also apply the extracted core lines to meteorological analysis, considering real-world case studies and demonstrate our method's benefit for weather forecasting and meteorological research.

Read the full article: <http://ieeexplore.ieee.org/document/8017585/>

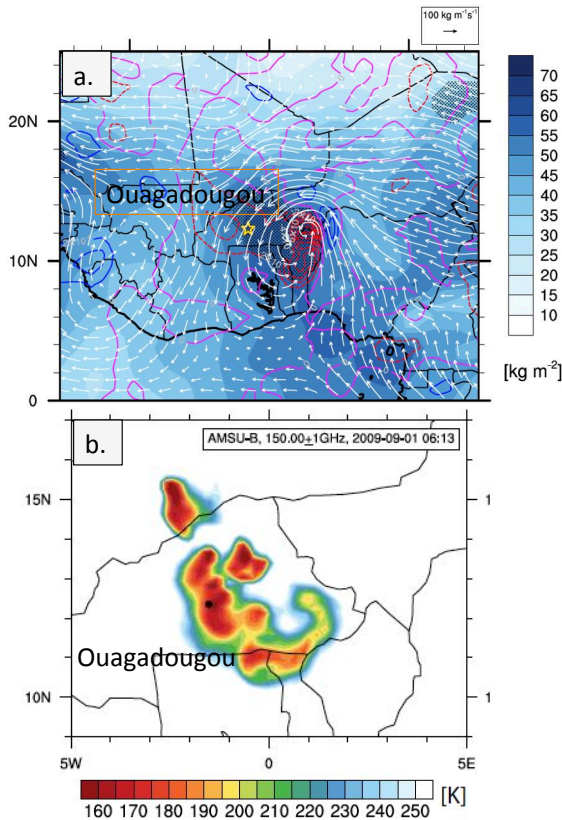
5. A meteorological and chemical overview of the DACCIWA field campaign in West Africa in June–July 2016 (P. Knippertz, A.H. Fink, A. Deroubaix, E. Morris, F. Tocquer, M.J. Evans, C. Flamant, M. Gaetani, C. Lavaysse, C. Mari, J.H. Marsham, R. Meynadier, A. Affo-Dogo, T. Bahaga, F. Brosse, K. Deetz, R. Guebsi, I. Latifou, M. Maranan, P.D. Rosenberg, and A. Schlüter)



In Jun.-Jul. 2016 the Dynamics-Aerosol-Chemistry-Cloud Interactions in West Africa (DACCIWA, see dacciwa.eu) project organized a major international field campaign in the Guinea coastal region with three research aircraft, ground super sites and radiosonde launches. In the aftermath of the campaign, W2W scientists contributed to a comprehensive and detailed analysis of the synoptic evolution of the campaign period, using – amongst other things – tools that were developed as part of W2W. One important aspect the paper discusses is tropical wave disturbances, as illustrated in the figure. These are objectively identified from filtered satellite-derived precipitation estimates (shading in figure). The analysis shows that during the DACCIWA campaign the study region was frequently affected by “tropical disturbances” (TD), while other wave types such as Kelvin waves were rather rare. The black lines in the figure are long-lived mesoscale convective systems (MCSs) objectively identified from infrared satellite data, demonstrating their close coupling with TD systems.

Read the full article: <https://www.atmos-chem-phys.net/17/10893/2017/acp-17-10893-2017.pdf>

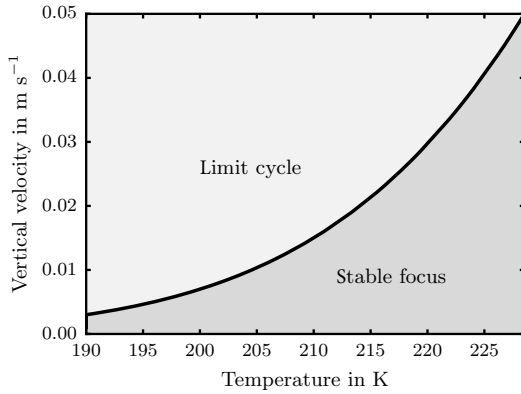
6. Extreme precipitation in the West African cities of Dakar and Ouagadougou – atmospheric dynamics and implications for flood risk assessments (T. Engel, A.H. Fink, P. Knipertz, G. Pante, and Jan Bliefernicht)



Two extreme, high-impact events of heavy rainfall and severe floods in West African urban areas (Ouagadougou on 01 Sep. 2009, Dakar on 26 Aug. 2012) are investigated with respect to their atmospheric causes and statistical return periods. In terms of the synoptic-convective dynamics, the Ouagadougou case is truly extraordinary. A succession of two slow-moving African Easterly Waves (AEWs) caused record-breaking values of tropospheric moisture (a). The second AEW (cf. a), one of the strongest in recent decades, provided the synoptic forcing for the nighttime genesis of Mesoscale Convective Systems (MCSs). Ouagadougou was hit by two MCSs within six hours, as the strong convergence and rotation in the AEW-related vortex allowed a swift moisture refueling (a). The impact of the AEW-related low-level rotation on convection can be seen in the curvature of the MCSs (b). The Ouagadougou event demonstrates that highly unusual dynamical developments can create extremes well outside of Return Value estimates from century-long rainfall observations. Future research shall investigate whether such developments may become more frequent in a warmer climate.

Read the full article: <http://journals.ametsoc.org/doi/abs/10.1175/JHM-D-16-0218.1>

7. Subvisible cirrus clouds - a dynamical system approach (E. J. Spreitzer, M. P. Marschalik, P. Spichtinger)



Time evolution of the potential temperature for warm bubble computed by an efficient and asymptotically stable implicit-explicit finite volume scheme. Only a half of the computational domain is shown in the x1-direction to visualize the interior temperature profiles. Colors correspond to the potential temperature θ' in the range 0 – 0.1K. The background color ($\theta' = 0$) has been removed. A large scale oscillation appears at the bottom of the air bubble interface, which is caused by the Kelvin–Helmholtz instability caused by the shear flow interactions along the interface between the rising bubble with the surrounding air at rest. These long wavelength oscillations of the interface lead to the turbulent structure at later times.

Read the full article: <http://www.nonlin-processes-geophys.net/24/307/2017>

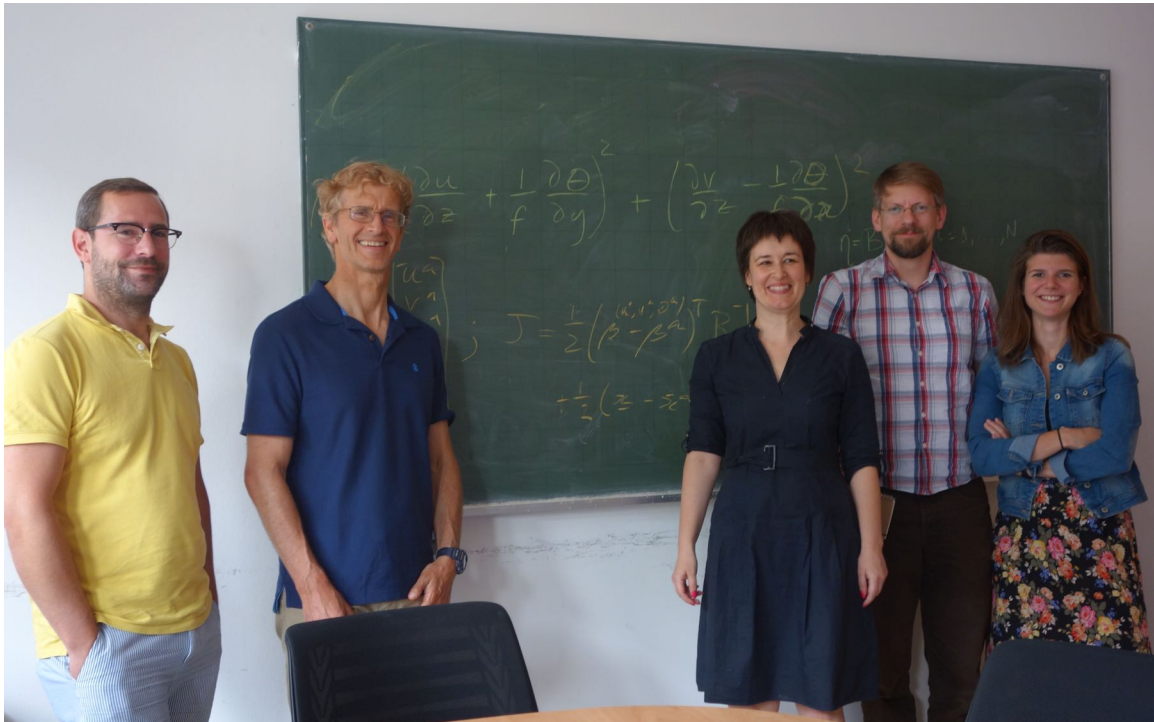
Additional publications relevant to W2W are listed here:

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

Seminars and guest program

Craig Bishop (U.S. Naval Research Laboratory) visited the meteorological institute in Munich from July 6th to July 13th 2017. He gave a presentation on "The GIGG-Delta filter: Data assimilation for episodic variables with skewed uncertainty distributions like cloud, precipitation, fire and ice" and a colloquium on "Gain form of the Ensemble Transform Kalman Filter and its relevance to satellite data assimilation with model space ensemble covariance localization". Craig provided insightful comments about a problem of preservation of positivity in data assimilation that affects assimilation of radar and cloud data. He also gave constructive feedback during the numerous informal discussions that took place throughout his visit.

Read more about his visit here: <http://www.wavestoweather.de/guest/craig-bishop>



From left to right: Martin Weissmann, Craig Bishop, Tijana Janjic-Pfander, Leonhard Scheck and Yvonne Ruckstuhl at the meteorological institute in Munich

Information about 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.

Selected past and upcoming outreach activities

A workshop was offered by a few ECS from the meteorological institute in Munich (including W2W researchers) for 15 high school students at the “**Tag der Physik @ LMU**” on July 22nd 2017. The students learned about atmospheric physics, numerical weather prediction and the propagation of model errors. They implemented the Lewis Fry Richardson’s forecast factory for real, producing their own simplified weather forecast and comparing their forecast with this of a numerical model. For more details on this workshop, please visit http://www.wavestoweather.de/outreach/tag-der-physik_lmu_22_07_2017

Equal Opportunity (EO)

On September 5th and 6th 2017, ten school girls between 12 and 14 years old took part in the summer program called “**Mädchen machen Technik**” offered by W2W at LMU. The participants made their own experiments to learn about temperature, pressure, convection, clouds, etc. They then took part in lab experiments to learn about the Coriolis force, the foehn winds and convection. They visited the roof instruments and the weather station of the institute. On the second day, they drew a weather chart and compared it to the current satellite images. They also produced a numerical weather forecast, which they compared to model outputs. The participants were very interested and motivated. They asked lots of questions and enjoyed the experimental activities as much as activities involving weather forecasting. They also enjoyed a lot talking to the volunteers about studying meteorology at the university.



Group picture on the roof of the meteorological institute in Munich with the participants and some volunteers

More information about this program can be found here:

http://www.wavestoweather.de/equal_opportunity/activities/maedchenmachentechnik2017

About EO measures within 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 already implemented:
http://www.wavestoweather.de/equal_opportunity/activities

Summer's highlight



Total solar eclipse on 21 August 2017 at 10:18 am in Rickreall, Oregon, USA (photo: Volkmar Wirth)

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