WAVES TO WEATHER

4th Annual Meeting of W2W

November 12th - 14th 2018

Jugendstil-Festhalle (meeting) and ParkHotel (accomodation)

(see map page 8)

Landau in der Pfalz, Germany

Program

(last update: Nov. 6th 2018)

Monday 12th November 2018

11:00-12:00 Registration, check-in *(Kleiner Saal)* and snack *(Room Ludovici)*

12:00-12:25 Introduction (Chair: A. Laurian)

12:00-12:05 Welcome and general overview (G. Craig)
12:05-12:15 Overview Cross-Cutting Activity (CCA) "Ensemble Tools" (R. Redl)
12:15-12:25 Overview CCA "Campaign Data" (A. Schäfler)

12:25-18:00 Research Area B "Cloud-scale Uncertainties" (Chair: M. Riemer)

12:25-12:55 Overview Research Area B (P. Spichtinger)
12:55-13:25 Poster presentation by the Early Career Scientists (ECS) in RA-B and guests (2' per presentation) (A. Barrett, M. Baumgartner, F. Baur, N. Crnivec, A. Kumpf, N. Porz, Y. Ruckstuhl, L. Schneider, C. Wellmann)
13:25-14:25 Algorithmic Differentiation and Cloud Physics (André Brinkmann, JGU)
14:25-16:35 Poster session RA-B – Coffee break *(Room Ludovici + glass corridor)*
16:35-17:35 Importance of Microphysics for extra-tropical dynamics (Hanna Joos, ETH)
17:35-19:00 Ice breaker *(Foyer in ParkHotel)*
19:00 Dinner at the hotel ParkHotel restaurant

Tuesday 13th November 2018

08:30-14:45 Research Area A "Upscale error growth" (Chair: A. Fink)

08:30-09:00 Overview Research Area A (M. Riemer)
09:00-09:45 Poster presentation by the ECS in RA-A and guests (2' per presentation) (M. Baumgart, D. Büeler, C. Euler, P. Ghinassi, C. Grams, K. Hanser, M. Hirt, M. Kern, T. Kremer, J. Quinting, S. Rasp, M. Rautenhaus, J. Rosemeier, S. Schäfer, A. Schäfler, M. Schindler, B. Wiebe)
09:45-10:30 Coffee break *(Room Ludovici)*
10:30-12:00 Guided tour *(meeting point: in front of the Festhalle; 2 groups in German, 1 group in English)*

12:00-13:45 Poster session RA-A – Lunch buffet *(Room Ludovici + glass corridor)*
13:45-14:45 Flow-dependent error growth at synoptic scales (Mark Rodwell, ECMWF)
14:45-15:00 Group picture

15:00-19:00 Research Area C "Predictability of local weather" (Chair: P. Spichtinger)

15:00-15:30 Overview Research Area C (A. Fink)
15:30-16:00 Poster presentation by the ECS in RA-C and guests (2' per presentation) (K. Bachmann, E. Di Muzio, G. Fragkoulidis, F. Grazzini, S. Lerch, M. Maier-Gerber, F. Pantillon, L.-A. Quandt, P. Rupp, A. Schlüter, F. Teubler, P. Vogel, P. Zschenderlein)
16:00-18:00 Poster session RA-C – Coffee break *(Room Ludovici + glass corridor)*
18:00-19:00 Development of a new storm-scale seamless integrated forecasting system (SINFONY) at DWD (Ulrich Blahak, DWD)
19:30 Dinner at the "Magazine" restaurant (see map page 9)

Wednesday 14th November 2018

09:00-10:00 On upscale error growth and the limitations on uncertainty schemes (Judith Berner, NCAR, USA)
10:00-10:30 Coffee break *(Room Ludovici)*
10:30-12:00 Breakout group discussion (1– RAs) (see page 3)
12:00-13:30 Lunch buffet *(ParkHotel restaurant)*
13:30-15:00 Breakout group discussion (2 – Added value of W2W) (see page 4)
15:00-16:30 General Assembly (see separate agenda) – **all PIs (Phase 1 and 2) and W2W members** (chair: G. Craig; minutes: A. Laurian) *(Kleiner Saal)*
15:00-16:30 Early Career Scientists meeting – **all ECS** *(Salon Levy, Goerke)*
16:30-17:30 Report on breakout group discussions and on ECS meeting *(Kleiner Saal)*
17:30-17:45 Feedback (R. McTaggart-Cowan)
17:45-18:00 Final discussion
18:00 End of the meeting – Packed snack to take away

Notes:
- The plenum room for overview and keynote presentations, general assembly and final discussions is the "kleiner Saal"
- Coffee breaks will take place in the room "Ludovici" next to the "kleiner Saal"
- Poster sessions will take place in the room "Ludovici" and in the glass corridor leading to the hotel
- Childcare will be organized during the meeting

Breakout group discussion (1)

Topic: Research Areas

(Wednesday 14th, 10:30-12:00)

Research Area A: **Upscale Error Growth** *chair: Michael Riemer*	**Research Area B:** **Cloud-scale Uncertainties** *chair: Bernhard Mayer*	**Research Area C:** **Predictability of local Weather** *chair: Andreas Fink*
Baumgart Marlene	Barrett Andrew	Bachmann Kevin
Büeler Dominik	Baumgartner Manuel	Birner Thomas (PI)
Craig George (PI)	Baur Florian	Corsmeier Ulrich (PI)
Euler Christian	Crnivec Nina	Di Muzio Enrico
Ghinassi Paolo	Grams Christian (PI)	Fragkoulidis Georgios
Hanser Karsten	Hanke-Bourgeois Martin (PI)	Garny Hella (PI)
Hirt Mirjam	Janjic-Pfander Tijana (PI)	Gneiting Tilmann (PI)
Kern Michael	Keil Christian (PI)	Grazzini Federico
Kremer Tobias	Kumpf Alexander	Knippertz Peter (PI)
Lukacova Maria (PI)	Kunz Michael (PI)	Lerch Sebastian
Quinting Julian	Mayer Bernhard (PI)	Maier-Gerber Michael
Rasp Stephan	Miltenberger Annette (PI)	Pantillon Florian
Rautenhaus Marc	Porz Nikolas	Quandt Lisa-Ann
Rosemeier Juliane	Ruckstuhl Yvonne	Rupp Philip
Sadlo Filip (PI)	Schneider Linda	Schlüter Andreas
Schäfer Sophia	Vogel Bernhard (PI)	Vogel Peter
Schäfler Andreas	Voigt Aiko (PI)	Wirth Volkmar (PI)
Schindler Matthias	Wellmann Constanze	Zschenderlein Philipp
Schömer Elmar (PI)		
Selz Tobias		
Tost Holger (PI)		
Voigt Aiko		
Weissmann Martin (PI)		
Westermann Rüdiger (PI)		
Wiebe Bettina		
→ Room: "Kleiner Saal"	**→ Room: "Goerke"**	**→ Room: "Salon Levy"**

If your name doesn't appear in the lists, please feel free to join the group of your choice.

Breakout group discussion (2)

Topic: Added value of W2W (why has W2W been worthwhile as a Collaborative Research Center? Collect highlights of collaboration between locations, projects, and disciplines and collect new research ideas that have arisen from these collaborations)

(Wednesday 14th, 13:30-15:00)

Group 1 *chair: George Craig*	**Group 2** *chair: Volkmar Wirth*	**Group 3** *chair: Peter Knippertz*
Andrew Barrett	Florian Baur	Kevin Bachmann
Nina Crnivec	Dominik Büeler	Marlene Baumgart
Christian Euler	Ulrich Corsmeier (PI)	Manuel Baumgartner
Andreas Fink (PI)	Karsten Hanser	Thomas Birner (PI)
Paolo Ghinassi	Tijana Janjic-Pfander (PI)	Enrico Di Muzio
Tilmann Gneiting (PI)	Christian Keil (PI)	Georgios Fragkoulidis
Christian Grams (PI)	Michael Kern	Hella Garny (PI)
Martin Hanke-Bourgeois (PI)	Tobias Kremer	Federico Grazzini
Maria Lukacova (PI)	Michael Kunz (PI)	Mirjam Hirt
Michael Maier-Gerber	Florian Pantillon	Alexander Kumpf
Annette Miltenberger (PI)	Nikolas Porz	Sebastian Lerch
Lisa-Ann Quandt	Julian Quinting	Bernhard Mayer (PI)
Marc Rautenhaus	Stephan Rasp	Filip Sadlo (PI)
Yvonne Ruckstuhl	Michael Riemer (PI)	Sophia Schäfer
Linda Schneider	Juliane Rosemeier	Andreas Schäfler
Elmar Schömer (PI)	Matthias Schindler	Andreas Schlüter
Tobias Selz	Peter Vogel	Peter Spichtinger (PI)
Holger Tost (PI)	Aiko Voigt	Martin Weissmann (PI)
Bernhard Vogel (PI)	Rüdiger Westermann (PI)	Constanze Wellmann
Philipp Zschenderlein		Bettina Wiebe
→ Room: "Kleiner Saal"	**→ Room: "Goerke"**	**→ Room: "Salon Levy"**

If your name doesn't appear in the lists, please feel free to join the group of your choice.

Keynote presentations

André Brinkmann (JGU, Mainz) *Monday 12th, 13:35-14:35*

Title: Algorithmic Differentiation and Cloud Physics

Abstract:
Computer simulations have become an indispensable tool to understand complex physical phenomena. Nevertheless, simulation programs (mostly) do not exactly calculate the underlying physical phenomena but can only approximate it. Reasons are that either exact calculations are too expensive or that the precise equations are even unknown. The calibration of a model by fitting its parameters is in this case a wide-spread approach to align simulation outputs with observations.
Unfortunately, physical models often include a huge number of variables and parameters and it is therefore important to understand their individual impacts on the model behavior before performing any model optimizations. Algorithmic differentiation (AD) helps to (semi-) automatically build the Jacobian of a set of independent variables. These derivates can then be calculated while running a computer simulation, giving precise information about how they impact the dynamics of the simulation output over time. This talk will give a (short) introduction into AD and then discuss, how it can be integrated into W2W to improve our ability to predict the weather.

Hanna Joos (ETH, Zurich) *Monday 12th, 16:35-17:35*

Title: Importance of Microphysics for extra-tropical dynamics
Co-authors: H. Wernli, M. Böttcher, B. Crezee, R. Attinger, E. Spreitzer

Abstract:
In this presentation we show in detail how the manifold microphysical processes acting during the formation of liquid, mixed phase and ice clouds in extra-tropical cyclones modify the potential vorticity and thus the atmospheric dynamics. The link between latent heat release occurring during cloud formation and the modification of the atmospheric flow can be described by the diabatic modification of potential vorticity (PV). The first order effect is that PV is produced below the maximum of diabatic heating and destroyed above.
In order to investigate this link in detail, simulations with the IFS (ECMWF global Model) are performed where all diabatic heating rates (DHR) occurring during cloud formation and radiation are output hourly. Based on the DHRs we can then investigate the impact of each microphysical process on the modification of PV, and thus the dynamics, separately. We use a Lagrangian technique where all DHR and associated diabatic PV rates (DPVR) are traced along trajectories. Based on case studies it will be shown that warm phase processes like condensation and ice phase processes like the depositional growth of ice/snow contribute strongly to the PV modification and have the potential to also influence the upper level flow. Furthermore, we show that below cloud processes like melting or sublimation of snow or evaporation of rain also strongly modify the PV and are of great importance for the formation of low-level PV anomalies along fronts and in the cyclone centre.

In a second part we will discuss the importance of cloud bands formed by the cyclones warm conveyor belts for the net cloud forcing in the extra-tropics.
The strong linkage of microphysical processes and the meso- and large-scale dynamics as well as the interaction of clouds formed in extra-tropical cyclones with radiation highlights the importance for a correct representation of clouds, their formation pathways and their impact on the dynamics in numerical models and motivates field campaigns in order to better constrain the parameterization of these processes.

Mark Rodwell (ECMWF, UK) *Tuesday 13th, 13:45-14:45*

Title: Flow-dependent error growth at synoptic scales

Abstract:
This presentation explores a practical approach for improving ensemble forecasts. It is based on the assessment of short-range flow-dependent reliability. This approach can provide useful information for modellers which should lead to reduced flow-dependent forecast bias and more accurate flow-dependent error growth rates. Moreover, I will try to demonstrate that the improvement of flow-dependent reliability is exactly what modellers want to do if they are to improve proper forecast scores.

Ulrich Blahak (DWD, Germany) *Tuesday 13th, 18:00-19:00*

Title: Development of a new storm-scale seamless integrated forecasting system (SINFONY) at DWD
Co-authors: Kathrin Wapler, Marcus Paulat, Roland Potthast, Axel Seifert, Liselotte Bach, Elisabeth Bauernschubert, Robert Feger, Kathrin Feige, Michael Hoff, Markus Junk, Alberto de Lozar, Lisa Neef, Rafael Posada, Martin Rempel, Markus Schultze, Christian Welzbacher, Sven Ulbrich, Manuel Werner

Abstract:
At Deutscher Wetterdienst (DWD), the pilot project SINFONY has been set up to develop a seamless ensemble prediction system for convective-scale forecasting with forecast ranges of 6 up to 12 hours, which integrates nowcasting techniques with numerical model prediction (NWP) in a more or less seamless way. The focus is on severe summertime convective events with associated hazards such as heavy precipitation, hail and wind gusts.
So far, the storm-scale forecasting for the first 2 hours and warning rely mostly on observation-based nowcasting products with frequent updates (typically with 5-min intervals) that are available within a few minutes. New NWP forecasts with the convection-allowing ensemble system COSMO-DE-EPS are started only every 3 h and can outperform the quality of nowcasting only at later forecast times. Moreover, nowcasting and ensemble NWP are treated as two separate and independent methods, and there are only few common products available for the forecasters.
The goal of SINFONY is to narrow down this gap provide and to provide new products for the forecasters from observation time up to +6 h / +12 h, combining nowcasting and NWP. Therefore, efforts are undertaken on the one hand by enhancements to both nowcasting

and NWP separately and on the other hand by mutual information exchange and combination between these two methods.
The nowcasting system, which is currently purely deterministic, shall be expanded to an ensemble approach and will consider life-cycle information compared to the classical pure advection approach. For the NWP system, a rapid update cycle (RUC) is under development, with hourly ensemble forecast on km-scale. Additional effort is done to further improve the model physics (e.g., 2-moment microphysics). Assimilation of further high-resolution observational data including 3D-radar-data, Meteosat SEVIRI satellite data and lightning densities in the LETKF based assimilation system is introduced, as well as the assimilation of nowcast objects. A thorough comparative verification of nowcasting ensemble and NWP ensemble is another prerequisite for the optimal combination of these systems.
The presentation will give an introduction to the specific forecasting problem, an overview of the goal and the concept of the SINFONY project and its current status.

Judith Berner (NCAR, USA) *Wednesday 14th,09:00-10:00*

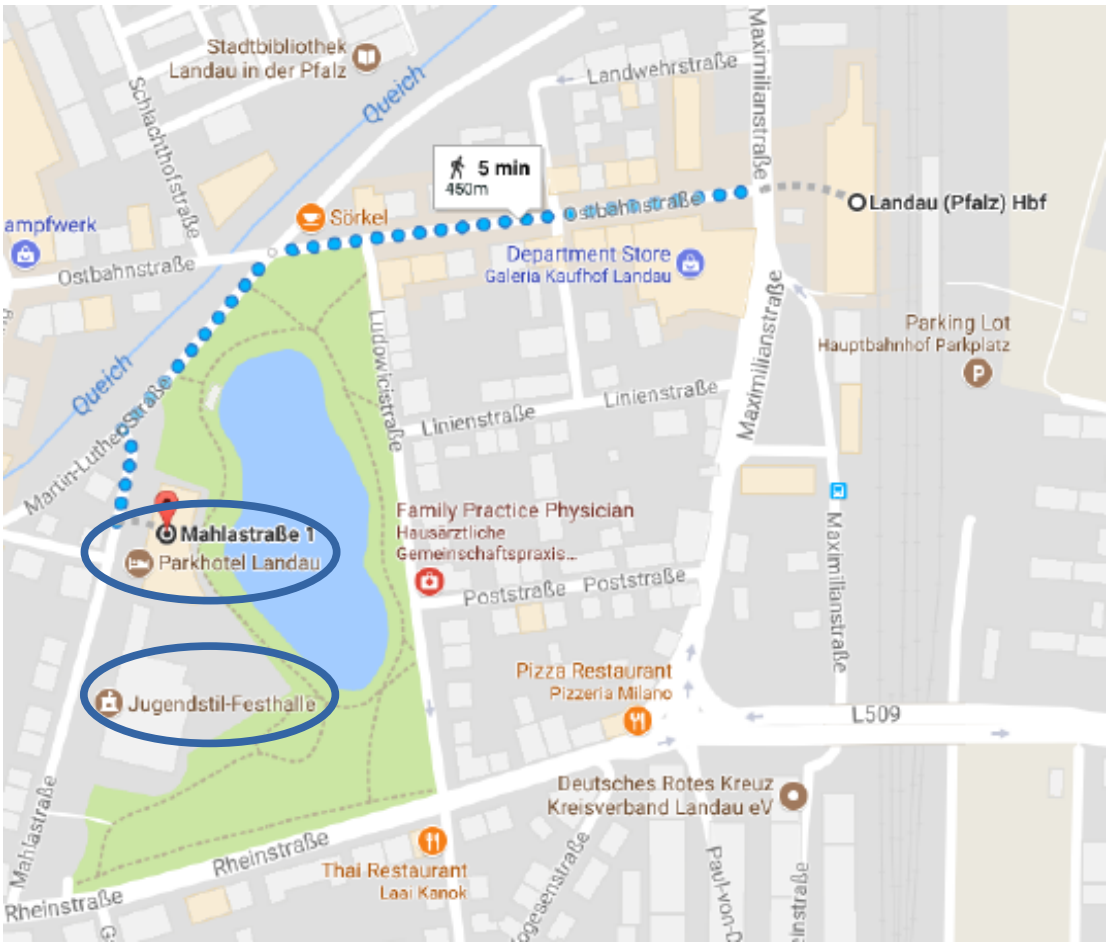
Title: On upscale error growth and the limitations on uncertainty schemes

Abstract:
With growing evidence that initial uncertainties are not sufficient to entirely explain forecast uncertainty, the role of model uncertainty is receiving increasing attention. Operational weather centers now routinely employ stochastic or other perturbation methods to increase the reliability of ensemble forecasts. While the benefits of stochastic parameterization scheme such as e.g., the stochastic kinetic-energy backscatter or the stochastically perturbed physical tendency scheme have been undisputed, they have been criticized in that they are added *a posteriori* to models that have been independently developed and tuned.
In contrast, schemes that aim at representing uncertainty at its source, for example the stochastically perturbed parameter approach, are by themselves not able to generate enough spread to produce reliable forecasts in many state-of-the art ensemble systems.
The argument will be laid out that many current weather models have insufficient upscale propagation of errors, so that the introduction of realistic uncertainties in the physical processes cannot produce reliable ensembles systems. For the development of next-generation numerical weather prediction systems, process-based understanding of upscale error propagation should be more closely linked to the statistical perspective of the spread-error relationship.

How to get there?

The 4th Annual Meeting of W2W will take place in the **Jugendstil-Festhalle** in the Mahlstraße 3, 600 m away from the Landau central train station called "Landau (Pfalz) Hbf". This meeting room is located next to the **ParkHotel Landau** (Mahlstraße 1, https://www.parkhotel-landau.de/en/) where rooms are reserved and paid centrally by W2W for all participants.

From the Landau central station, it is a 5-min walk (see the map below).



- If you come **by train**, the trip lasts about 30 minutes from Karlsruhe, 2h30 from Mainz, 1h30 from Heidelberg, and 4h from Munich.
- If you come **by plane**, the trip lasts about 2h from Frankfurt airport (FRA), 2h30 from Stuttgart airport (STR), and 5h from Munich airport (MUC).
- If you come **by car**, there is a customer parking lot.

Dinner on Tuesday 13th Nov. 2018

The dinner will take place in the restaurant “Magazine” located in the Ostbahnstrasse 12, about 300m away from the hotel (see the map below).