PhD student in Atmospheric Dynamics with focus on “Barriers to predictability of Tropical Cyclones (TCs) over the North Atlantic”

Primary supervisor: Andreas H. Fink (KIT, Karlsruhe, place of work)
Secondary supervisor: Michael Riemer (JGU, Mainz)

Understanding the predictability of TCs remains one of the great challenges of weather forecasting today. Research during Phase 1 of the “Waves to Weather” (https://www.wavestoweather.de) collaborative research project focused on the predictability of Mediterranean Hurricanes (Medicanes) and Tropical Transition (TT) in the North Atlantic Ocean, i.e. the transition from a cold-core extratropical storm to a warm-core tropical systems. In both cases, the ensemble prediction system of the European Centre for Medium-Range Weather Forecast (ECWMF) encountered “forecast jumps” with lead time, e.g. the number of members that predict the storm suddenly increased between consecutive forecasts. These jumps also occurred with respect to storm location, intensity, and warm core development. The figure below shows a schematic on the predictability regimes during the TT of Hurricane Chris (Maier-Gerber et al. 2019, DOI: 10.1175/MWR-D-18-0188.1).

One major goal of the Ph.D. research is on expanding the findings from this case study to a large TC sample that includes all types of tropical cyclogenesis in the North Atlantic. We aim at a better physical understanding of how “predictability barriers” govern sudden changes in ensemble statistics of up to 10 days of TC genesis and development in the North Atlantic. From computer science, low-dimensional descriptions of 2D and 3D waves (e.g. African Easterly Waves) and extratropical potential vorticity objects will be provided to check whether the quality of the forecast of these objects can be traced back to forecast jumps at characteristic lead times. As a preparatory step, such forecast jumps during the last 20 years need to be identified, largely using existing ensemble forecast analysis tools developed during Phase 1 and applied to ECMWF operational ensemble forecasts. The project will involve collaborations with colleagues in the US (e.g. Michael Janiga), as well as with operational weather services (e.g., ECMWF), which will allow the PhD student to spend some time abroad.
The Ph.D. position is within the Atmospheric Dynamics group at the Institute of Meteorology and Climate Research (IMK) at the Karlsruhe Institute of Technology (KIT, https://www.imk-tro.kit.edu/english/5874.php). The group is internationally renowned for its work on the physical mechanisms of weather systems and their implications for predictability, with a particular focus on tropical weather and African meteorology. KIT is a distinguished research university that combines three core tasks — research, education and innovation — into a single mission. With 9,400 employees and 25,000 students, it is one of the largest institutions of research and higher education in natural sciences and engineering in Europe.

The position is also within the Waves to Weather project C3 titled “Predictability of tropical and hybrid cyclones over the North Atlantic Ocean” (https://www.wavestoweather.de/research_areas/phase2/c3/index.html) that is a twin project between KIT and the JGU in Mainz. PD Dr. Michael Riemer from JGU, who is an internationally renowned expert on tropical cyclone dynamics, will act as a co-supervisor. It is also an interdisciplinary project between computer science and meteorology. Thus, the PhD student in meteorology will work closely with a fellow student from computer science, Ch. Fischer (supervised by Elmar Schömer, JGU, presently hosted at KIT).

Requirements
The ideal candidate holds an MSc in Meteorology, Physics, or a closely related discipline and has a strong background in atmospheric dynamics and an interest or first experiences in tropical meteorology. Experience with scientific programming (e.g. linux, python, MATLAB, ncl, cdo) is required.

Employment conditions
The position is offered for 3 years with flexible starting date in 2021. The position is remunerated according to TV-L 13 (Collective Agreement for the Public Service Sector of the Federal States). The group is based on KIT’s Campus South located in the city centre of Karlsruhe.

Applications and deadline
Please send applications to Prof Dr. Andreas Fink (andreas.fink@kit.edu), including a motivation letter, CV, copies of relevant certificates, preferred starting date, and the names of at minimum two references.

Review of all applications will start on 15th May 2021 and will continue until the position is filled.

W2W features an innovative program for the development of early career researchers based on self-government. In addition to self-organized activities such as workshops, trainings and a guest program, the successful candidate will have the opportunity, if desired, to pursue international research visits. The consortium conducts an ambitious program to gradually enhance gender equality on all career levels.

KIT actively supports equality, diversity and inclusion, and as an equal opportunity employer, KIT explicitly encourages applications from women as well as from all others who will bring additional diversity to the university’s research and teaching. Applicants with disabilities will be preferentially considered if suitably qualified.