

Preface to the special issue on the collaborative research centre SFB 512 ‘Cyclones and the North Atlantic climate system’

The present special issue of *Tellus A* presents actual research results elaborated within the Collaborative Research Centre (Sonderforschungsbereich) SFB 512 entitled ‘Cyclones and the North Atlantic climate system’. The SFB 512 has been established at the University of Hamburg and funded by the German Science Foundation (Deutsche Forschungsgemeinschaft DFG) since 1998 for twelve years. Within the SFB, scientists from the Meteorological Institute and Institute of Oceanography of the University of Hamburg, from the neighbouring Max-Planck-Institute for Meteorology in Hamburg, the GKSS Research Centre in Geesthacht, and the Alfred-Wegener-Institute for Polar and Marine Research (AWI) in Bremerhaven work together.

The main subject of research is the state and the variability of the North Atlantic climate system with its subcomponents atmosphere, ocean, cryosphere and land surfaces. Variability can arise from interactions between and/or within the individual subcomponents and occurs over a wide range of time scales. The SFB research focuses on the shorter time scales which range from synoptic (weather systems) to decadal variations and which are well covered by observations compared to the longer time scales. A special feature of the North Atlantic is its coupling with the Arctic Ocean and thus with the primary regions of northern hemisphere sea ice production and melt. These regional processes affect significantly the North Atlantic climate and have the potential to affect even the global climate via the thermohaline circulation.

The research within the SFB takes both aspects, large-scale and regional-scale processes, into account. The primary aims are:

- (1) A better understanding of the large-scale circulation patterns and their interannual variations (e.g. North Atlantic Oscillation) and the assessment of predictability.
- (2) A better understanding of local processes (e.g. dense water overflow) and short-term air–sea–ice interaction processes (e.g. in cyclones).

Within the SFB a hierarchy of models ranging from global to mesoscale models with different degrees of coupling between atmosphere, ocean and sea ice is used as well as operational model analyses, e.g. of the European Centre for Medium-Range Weather Forecast.

This is completed by field data in key regions of the North Atlantic (e.g. Fram Strait or Denmark Strait) for process analyses or model validation and initialisation. The data were sampled during special ship and aircraft expeditions to the Nordic Seas and the Arctic Ocean, or originate from autonomously measuring buoys and floats and from various satellite-based remote-sensing instruments.

The SFB includes eleven research projects which are organized in three research areas with the following topics: (i) large-scale processes in the North Atlantic climate system: internal dynamics and external forcing, (ii) air–sea interaction in the northern North Atlantic: water mass transformation and transports and (iii) air–sea interaction in the northern North Atlantic: synoptic variability. More information on the individual projects within the research areas can be obtained from the SFB homepage (see references).

The following 15 articles in this issue represent the latest research results of the SFB. The papers deal with an extreme value statistics of North Atlantic cyclones (Sienz et al.), the measurement and modelling of cyclones over sea ice in Fram Strait (Lammert et al.; Ries et al.), the estimate of precipitation over the Northeast Atlantic using satellite retrievals and model analyses (Romanova et al.; Andersson et al.), the remote sensing and ground truth of oceanic snow fall (Klepp et al.) and the air–sea interaction in a gale-force wind field (Brümmer et al.). Two papers study the heat and freshwater budgets and the mid-depth circulation in the Nordic Seas (Latarius et al.; Voet et al.) and three papers investigate the dense water overflow in the Denmark Strait and Faroe Bank Channels (Serra et al.; Köhl; Köller et al.). The final paper deals with the impact of North American aerosol on the North Atlantic climate system (Fischer-Bruns et al.). The geographical locations of the research focal points presented in the following fifteen papers are indicated in Fig. 1.

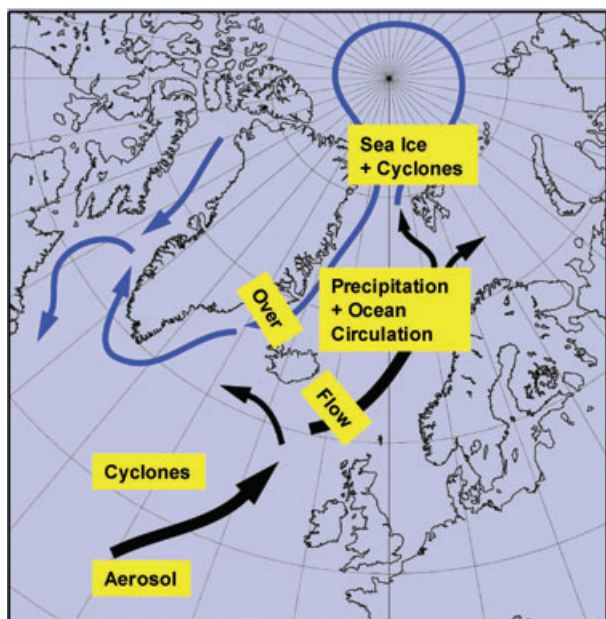


Fig. 1. Geographical focal points of the SFB research presented in the papers of this issue.

A first collection of SFB research papers was published in the journal *Meteorologische Zeitschrift* (2005). Additional publications of the SFB 'Cyclones and the North Atlantic climate system' are listed on the SFB homepage.

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References

- Meteorologische Zeitschrift*. 2005. Special issue on the SFB 512 "Cyclones and the North Atlantic climate system". *Met. Zeitschr.*, **14**(6), 691–822.
SFB homepage: <http://sfb512.zmaw.de>.