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Editorial

The German Priority Program SPP 1276 "Multiple Scales in Fluid Mechanics and Meteorology" (MetStröm)

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In June 2007, the German Research Foundation (DFG) founded the 6-year Priority Research Program 1276 on "Multiple Scales in Fluid Mechanics and Meteorology". Its short name "MetStröm" combines the German words "**Met**eorologie" and "**Strömu**ngsmechanik", i.e., meteorology and fluid mechanics. The program was initiated by Rupert Klein, Free University Berlin and Dieter Etling, Leibniz University Hannover.

Within **MetStröm**, researchers from Meteorology, (engineering) Fluid Dynamics and Applied Mathematics cooperated in multidisciplinary projects to lay the foundations for model- as well as grid-adaptive numerical simulation concepts. Specifically, the goal was to initiate the development of simulation models which would combine scale-dependent (mathematical) descriptions of key physical processes with adaptive flow discretization schemes.

Deterministic approaches based on continuum mechanics, discrete and/or stochastic closures for unresolved scales, and their respective interplay with numerical discretization schemes were investigated to contribute to an advanced methodology of multiscale meteorological/fluid mechanics modelling.

Over the total funding period of six years, 21 projects operated by 65 principal investigators were funded and grouped into three major research areas,

- Large Scale Dynamics and Models
- Turbulence/Large Eddy Simulations (LES)
- Multiphase Flows (clouds and convection)

While the majority of the projects addressed theoretical issues and numerical simulation techniques, three judiciously chosen laboratory experiments and one field observation campaign provided benchmark data for model validation purposes. These were rotating annulus experiments at the Brandenburg University of Technology at Cottbus, related to the research area "Large Scale Dynamics", boundary layer wind tunnel experiments at Hamburg University and turbulence field measurements over a forest canopy by Technical University of Dresden, both related to "Turbulence/LES", and droplet interaction wind tunnel experiments at the University of Magdeburg, related to "Multiphase Flows".

The MetStröm program was funded by the DFG for 6 years in total and ended formally in June 2013. MetStröm-related Publications are listed on http://metstroem.mi.fu-berlin.de.

In this context, see also the MetStröm Special issue in the Journal of Theoretical and Computational Fluid Dynamics, Vol. 27, Issue 3–4, June 2013.

At the end of the program it was decided to propose two dedicated volumes of *Meteorologische Zeitschrift* that would summarize advanced results achieved within the program. The proposal met with very positive response and the present one is the first of these two dedicated issues. These issues cover 19 contributions, specifically including results from several co-operations between the individual projects, as reflected by the respective lists of authors.

The present issue, Part I, focuses on multiphase flows, encompassing the papers by Braack et al.: Error estimation and adaptive chemical transport modeling, Hoffmann et al.: Entrainment and mixing at the interface of shallow cumulus clouds. Results from a combination of observations and simulations, Jasor et al.: Modelling artefacts in the simulation of sedimentation with a quadrature method of moments, Schmeyer et al.: Numerical simulations of measurements of a droplet size distribution in a turbulent vortex, Siewert et al.: Influence of turbulence on the drop growth in warm clouds. Part I: Comparison of numerically determined collision kernels and Ziemer et al.: Quantitative comparison of presumed-number-density and quadrature moment methods for drop sedimentation.

The article by Liersch et al.: Recent progress in designing moving meshes for complex flows can be related to the sub topic Turbulence/LES. The papers by Grewe et al.: On the theory of mass conserving transformations for Lagrangian methods in 3D atmosphere-chemistry models and by Schuster et al.: On discontinuous Galerkin

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approach for atmospheric flow in the mesoscale with and without moisture fall into the category Large Scale Dynamics and Models.

Part II will constitute the next issue of *Meteorologische Zeitschrift*, and it will cover benchmark tests related to the rotating annulus experiment, and further articles on the sub topics mentioned above.

We hope that the reader will get an impression of and benefit from the multidisciplinary research performed within the priority program MetStröm through the two dedicated issues of *Meteorologische Zeitschrift*.

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