Preface

This special issue brings a collection of papers that were presented at the conference "Advances in Weather and Circulation Type Classifications & Applications," which took place in Krakow, Poland, October 22–25, 2008. It was organized by the Jagellonian University in Krakow and the regional branch of the Institute of Meteorology and Water Management. Great thanks go to the main local organizers, Zbigniew Ustrnul and Agnieszka Wypych, whose efforts and friendliness contributed considerably to the success of the conference.

The event was organized as a mid-term conference of the COST733 Action "Harmonisation and Applications of Weather Type Classifications for European Regions". This COST Action is a five year activity, running in 2005–2010, which has involved more than 60 scientists from 23 countries participating in the Action. Classifications of circulation patterns are in the centre of its attention. The main objective of the Action is to achieve a general numerical method for assessing, comparing and classifying typical synoptic situations in the European regions. In order to achieve this rather ambitious goal, the action will also enhance the knowledge on linkages between the atmospheric circulation, weather, climate, and environmental variables by identifying suitable criteria/indicators to weather types, analysing the strengths and weaknesses of individual classification methods for different applications, and providing tools for comparison and evaluation of different circulation classifications.

Thirty-six oral presentations, of which three were keynote introductory talks and eight were solicited, and 43 posters were presented at the conference. They covered a truly wide range of studies in (not only) atmospheric sciences where classifications play an important role. The topics ranged from the theory, methodology, and development of classifications through their evaluation to applications in climatology, meteorology, air pollution and human health, hydrology, and even more specific and 'exotic' areas. Although the main emphasis was put on classifications of circulation patterns, classifications of other kinds found their place in the scientific programme as well.

Fifty papers based on the presentations at the conference were submitted, of which 29 have finally been published in this issue. Given that several other conference contributions have been published elsewhere in the meantime, one can see that a large portion of conference presentations found their way to scientific journals.

In this editorial, we do not present a review of the field of classifications and their applications in the atmospheric sciences because this subject has been reviewed in sufficient detail recently (Huth et al., 2008). Instead, we provide a brief introduction into the content of the issue.

The special issue opens by the keynote paper by *Jolliffe and Philipp* (*2010*), presenting several ideas in cluster analysis, which recently emerged in statistical literature, that have potential for being applied in the atmospheric sciences. Several theoretical and methodological papers follow: *Richman and Adrianto* (*2010*) present the kernel principal component analysis to the climatological and meteorological community and apply it to classification and regionalization of sea level pressure. *Reusch* (*2010*) presents several examples to illustrate the potential of self organizing maps (SOMs), while *Guentchev and Winkler* (*2010*) introduce the concept of a two-tier classification. *Spekat et al.* (*2010*) develop a classification that build the circulation types on their impacts on climatic variables.

The following five papers are devoted to the database of classifications of circulation patterns that has been developed within the COST733 Action. The database is described in detail by *Philipp et al.* (*2010*), while its in-depth evaluation is provided by *Beck and Philipp* (*2010*). *Huth* (*2010*), *Tveito* (*2010*), and *Schiemann and Frei* (*2010*) present three different approaches to a climatological evaluation of the classifications with respect to temperature and precipitation.

Perhaps the largest portion of papers is devoted to applications of classifications in climatology and meteorology – in two fields that cannot be strictly distinguished from each other. The introduction to this part is provided by the keynote paper by *Jacobeit* (*2010*), reviewing climatological applications of classifications and stressing the need for a proper use of classification methods (and multivariate statistical methods in general). *Cahynová and Huth* (*2010*) discuss relationships between circulation classifications and climate variability and trends. *Ustrnul et al.* (*2010*) investigate effects of circulation types on temperature while *Casado et al.* (*2010*), *Lupikasza* (*2010*), and *Twardosz* (*2010*) deal with circulation effects on precipitation, in the latter paper even on an hourly scale. *Kotarba* (*2010*) analyzes relationships between circulation types and cloudiness determined from satellites; *Pineda et al.* (*2010*) examine a much more localized phenomenon, lightnings, in relation to circulation types. *Kašpar and Müller* (*2010*) and *Müller and Kašpar* (*2010*) study synoptic-scale patterns and the role they play in moisture transport and production of heavy rains. The climatological part of the issue is finalized by the classification of deep cyclones by *Bielec-Bakowska* (*2010*).

The keynote paper by *Bárdossy* (*2010*) reviews the applications of circulation classifications in hydrology. Another example of hydrological application, this time specific to droughts, is brought by *Fleig et al.* (*2010*) Three following papers, *Leśniok et al.*, *Stefan et al.* (*2010*), and *Lykoudis et al.* (*2010*), examine from different points of view atmospheric pollution and the degree to which it

is determined by atmospheric circulation. A specific application of air–mass classifications in studies of human health and mortality is presented by *Kyselý and Huth (2010)*. Finally, *Kassomenos (2010)* and *Rasilla et al. (2010)* demonstrate the utility of circulation classifications in the characterization of the occurrence of wild fires.

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Classifications are one of major tools used in synoptic climatology. We believe that this special issue well documents the variety of methodological approaches as well as their utility in a wide range of applications, and that readers will enjoy it.

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