

## **Further development of WETTREG with respect to novel weather types**

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This study needs to be seen in the context of the development of the statistical downscaling method WETTREG: In 2006 a climate study was presented that covers all of Germany. It was based on the then-existing version WETTREG2006. That study focused on the methodological adaptation of WETTREG to surface measurement data. The relations between large-scale atmospheric patterns and their consequences in the local climate were determined from reanalyses (atmosphere) and data from measuring stations (surface) for the period 1971-2000. The synthesis of local time series, as they would occur in a model-produced future climate, was carried out with the condition to reproduce the changing frequency distribution of these patterns.

In addition to this frequency-determining approach, there was a second study that investigated which future changes in the physical properties of large scale circulation patterns occur as a result of changing climate conditions, simulated by global climate models. The most important result was that the diversity of the patterns as they were derived from the present climate was not sufficient to describe the future climate: Further, more extreme instances of the patterns were to occur.

The implementation of these findings was part of the WETTREG2010 study, for which this report has been compiled. An important aspect is the enlargement of the pool of patterns. These added patterns, the so-called Trans Weather Patterns, are only very rarely occurring in the simulations of the present climate but are subject to a considerable frequency gain in the scenarios of the driving model. This report introduces the concept of Trans Weather Patterns. In order to apply these additional atmospheric patterns, the WETTREG method itself required modifications and further development which were carried out during the project and are documented in this report.

A significant difference to WETTREG2006 is the enhanced incorporation of specifics supplied by the driving model (here: ECHAM5-OM). As a consequence of the clearly stronger adjustment of WETTREG2010 to the prerequisites of the driving model it cannot be excluded that some problematic aspects of that driving model are picked up by WETTREG2010 as well. If, as it is the case in ECHAM5-OM, an insufficient representation of the soil-vegetation-atmosphere-coupling leads to exaggerated summer temperature values, this will have a strong influence on the results of the WETTREG2010 regionalizations.