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Combined Temperature-Precipitation Variations in Austria During the Instrumental Period

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With 9 Figures

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Summary

Using a dense network of carefully tested and homogenized long-term temperature and precipitation data this paper describes climatic variations during the last 150 years for both these important climatic elements. It turned out that the response of precipitation to climate warming is quite different within a small region, of 7 degrees longitude by 2 degrees latitude. In the western parts of Austria an increase of warm and wet climate has occurred, whereas during the same period in the East an increase of warm and dry conditions has occurred. An even larger variety of spatially different trends appears concerning seasonal evolution. The question of climate change cannot be answered in the same way when taking into account larger regions and not only temperature but also other climatic elements.

1. Introduction

Recent climate change discussion strongly concentrates on only one element, namely temperature, thus neglecting a number of other variables that are of great interest to the question of impacts of the predicted future warming on our civilization. One possibility of dealing with the matter of climate change is to investigate time series of instrumental data. For Austria a large number of single station data sets of temperature (Böhm, 1992a) and of precipitation (Auer, 1993) have been prepared (completed, tested and homogenized) for time series analyses. After the discussion of some results of these single element series our paper will present a two-dimensional approach

to describe climate change. The high spatial resolution of the data set allows investigation of the mesoscale structure of climate trends and variations.

2. Single Element Series

2.1 Data

In Böhm (1992b) and Auer (1992) the procedure of data completion, homogeneity-testing and of data adjustment is described in detail. A combined method of studying station history files as well as using the relative homogeneity test developed by Craddock (1979) allows the detection of inhomogeneities in temperature and precipitation time series at a high level of accuracy.

Data adjusting has been carried out assuming constancy of mean differences between temperature data and constancy of mean ratios between precipitation data, respectively of neighboring recording stations or regional means. The procedure of homogenization finally led to a data set of 58 temperature and 62 precipitation time series with stations spread quite evenly over the territory of Austria (compare Fig. 1)

Moreover data adjustment has been carried out for each single series on the basis of monthly values. Seasonal and annual values have been calculated after homogenization of monthly data. The results are highly homogeneous data sets containing