Climatological evaluation of the REMO (REgional MOdel) precipitation simulation over the Alps 1971 – 1999

H. Scheifinger (1), R. Böhm (1), M. Widmann (2) and C. Frei (3)

(1) Central Institute for Meteorology and Geodynamics, Hohe Warte 38, A – 1190 Vienna, Austria, (2) GKSS Institute for Coastal Research, Max-Planck-Straße, D-21502 Geesthacht, Germany, (3) MeteoSwiss, Krähbühlstr. 58, CH – 8044, Switzerland (email: Helfried.Scheifinger@zamg.ac.at / Tel.: +43 1 36026 2410 / Fax.: +43 1 36026 74)

This study evaluates the ability of a regional model (REMO) to simulate monthly precipitation sums over the Greater Alpine Region (GAR). The model was forced by ERA40 reanalysis fields at its boundaries and by assimilating ERA40 grid points within its model domain by the spectral nudging technique. The evaluation resides essentially on a gridded analysis of the ETHZ (Eidgenössische Technische Hochschule Zürich) high resolution rain gauge data interpolated to the REMO grid and to some extent also on the HISTALP (Historical Instrumental climatological Surface Time series of the greater ALPine region) precipitation data set with a monthly resolution. The hourly REMO and daily ETHZ precipitation sums were added up to monthly sums. The time period considered begins with January 1971 and ends with November 1999.

The general spatial distribution of long term mean yearly precipitation sums is simulated with moderate success including features of up- and downwind effects of the topography on the precipitation distribution. The common spatial variance of the long term mean yearly precipit ation sums between ETHZ and REMO is 25%. At the level of individual grid points REMO is not well able to reproduce long term yearly and monthly precipitation sums. A few specific areas can be identified, where the model is unable to come reasonably close to the observed absolute precipitation sums. The topographical effects on the precipitation sums are exaggerated, which means that the precipitation of upwind areas is overestimated and of downwind areas is underestimated. The temporal succession of the seasonal spatial precipitation patterns are largely reproduced by the model.

There is a general desiccation of the model atmosphere to be observed over the simulation period from 1971 – 1999. This general trend towards lower precipitation sums produces a bias on most of the precipitation trends. Apart from this long term bias the spatial distribution of linear trends of the mean yearly precipitation sums is fairly well described by the model. The spatial distribution of the cold season linear trends is also captured by the model to large extent. The spatial distribution of the warm season linear trends is captured by the model only to a minor extent. The same is valid

for the extreme precipitation sums in the 10% and 90% percentile ranges. The model reproduces general time - space variance, as summarised by the EOFs, quite well.

The results of this study are evidence that for a number of above mentioned features of the precipitation fields, REMO can serve as a physically consistent link between the large scale forcings and the local scale precipitation variability.