



Climate Change and Circulation Types in the Alpine Region

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The frequency of circulation types over the Alpine region is explored using 20 different global and regional climate model chains. The projected changes in these circulation types are investigated for the 21st century using the SRES A1B scenario. The multi-model approach relies on the climate models from the ENSEMBLES project and circulation type classifications provided by the COST Action 733. For the latter, the two circulation type classifications GWT (Grosswetter-types, applied to sea level pressure and geopotential height at 500 hPa) and CAP (Cluster Analysis of Principal components, applied to sea level pressure only) are chosen for this study. Overall, the ensemble of climate models capture the frequency of individual circulation types well, as shown by the comparison of circulation types from climate models and re-analysis data between 1980 – 2009. Discrepancies occur during winter when westerlies are overestimated at sea level and at the 500 hPa geopotential height level. The model spread is largest during summer. The frequency of circulation types is simulated best during spring and autumn.

The analysis of circulation types in the climate projections indicates that in winter easterlies are expected to decrease mostly at the benefit of westerlies until the end of the 21st century. In summer projected changes depend on the height level considered. At sea level westerlies are projected to decrease while summer easterlies increase markedly in their frequency. This change is not supported on the 500 hPa geopotential height level.