Geophysical Research Abstracts, Vol. 7, 02413, 2005
SRef-ID: 1607-7962/gra/EGU05-A-02413


# Origin of present-day Antarctic precipitation – a combined study using a trajectory model and isotope data from fresh snow samples

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In the large ice sheets of Greenland and Antarctica valuable information about the past climate is stored. In particular, the ratio of stable isotopes of snow is related to air temperature and thus used for the climatic interpretation of ice cores. However, the isotope content does not depend on temperature alone, other factors, such as seasonality and origin of precipitation can strongly influence the isotope ratio measured in the core. The origin of precipitation is often studied using simple isotope models or general atmospheric circulation models (GCMs). The isotope models do not contain dynamical processes in the atmosphere, but account for cloud microphysics processes, whereas in the GCMs the dynamics of the atmosphere are modelled fully three-dimensionally, but the microphysics processes in the cloud are only parameterised.

In this study we combine a trajectory model with a simple isotope model based on earlier models by Jouzel and Merlivat in order to study the origin of precipitation and also in order to evaluate the isotope model. At the German Antarctic wintering base "Neumayer", a detailed glacio-meteorological program has been carried out since 1981. In particular, fresh snow samples have been taken after each major snowfall event and their isotope ratios (delta-18-O, delta-D) have been analysed. Thus meanwhile we have a data series that is more than 20 years long. This unique data set enables us to calibrate the isotope model independently using the mean annual cycle of 18-O and deuterium, respectively. The isotope model is combined with the trajectory model in two different ways: 1. case studies: using pressure and temperature from the trajectory

model as input for the isotope model for certain precipitation events, or 2. using the trajectory model for defining certain trajectory classes and thus source areas of precipitation and calculating and modelling mean isotope values for each trajectory class. A mixed-origin of precipitation, depending on the season, is possible, too.