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Recent climate variability of the Antarctic Peninsula - isotopic characteristics and tele-connections of hydrological systems

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Antarctica is among the regions with highest recent rapid regional warming (RRR) (Cullather et al. 1996, Vaughan et al. 2003, Schneider et al. 2006), most likely due to post-industria anthropogenic influence. The Antarctic Peninsula (API) has even a stronger tendency (3.4°C (century)-1) and due to its marine climatic influence, a faster warming than the continenta Antarctic is observed (Vaughan et al. 2003). The recent warming trend is estimated to be three times highe (or even more) than the global average of about 0.5°C between 1950-2000. This effect, also known as "polar amplification", shows on one hand the vulnerability of this region to climate and environmental change, with retreating glaciers and reduced snow cover. On the other hand it may be considered as a natural laboratory to study and better understand these effects, teleconnections and feedback mechanisms.The objectives of this project are a contribution to the understanding of the hydrological system in the polar and sub-polar regions of the Antarctic Peninsula (including the nearby islands) and the South of Chile/Argentina: How are the study areas affected by the global climate change and anomalous climatic conditions like El Niño-La Niña phenomena, today and in the last century (or beyond)? Are these changes visible in the isotope record? Which climatic relations and differences exist between the regional climate systems?

To achieve this goal we will compare the oxygen and hydrogen isotope signatures of recent precipitation (snow and rain) to existing climate data and the local hydrological system (lakes, small streams). Older archives such as ice cores and snow pits will be used to expand the measured data series to the past. Stable water isotopes are considered as excellent proxies for tracing air temperature changes (d18O, dD) and through the deuterium excess d (d = dD - 8 * d18O), also for reconstruction of atmospheric moisture sources. Summarising all this climate proxies, it is possible to reconstruct an annual to seasonal resolution record for surface temperatures, wind tendencies and moisture sources of precipitation for the study area. Intercomparing the data sets will enable us to reconstruct the history of climate variability for this area in the last hundred(s) of years.