Geophysical Research Abstracts
Vol. 12, EGU2010-5108, 2010
EGU General Assembly 2010

Decadal variability of NAO during the last millennium inferred from Saharan dust in Alpine ice

Margit Schwikowski (1,2,3), Michael Sigl (1,2,3), Heinz W. Gäggeler (1,2,3), Jacopo Gabrieli (4), Carlo Barbante (4), and Claude Boutron (5)

(1) Paul Scherrer Institute, Villigen PSI, Switzerland (margit.schwikowski@psi.ch, 0041-56-310-4435), (2) Department of Chemistry and Biochemistry, University of Bern, Switzerland, (3) Oeschger Centre for Climate Change Research, University of Bern, Switzerland, (4) Environmental Science Department, University Ca' Foscari of Venice, Italy, (5) Laboratoire de Glaciologie et Géophysique de I'Environnement, University Joseph Fourier of Grenoble, France

Interannual variability of North African atmospheric dust is strongly linked to drought conditions in the Sahel and to the winter North Atlantic Oscillation (NAO). Dust generation and transport are enhanced during winter NAO(+) phases when the North African dust source regions are controlled by high pressure situations leading to less precipitation, and thus to stronger wind erosion of soil material. However, direct Saharan dust observations are limited to the last decades only.

Here, we present a first highly resolved ice core record of Saharan dust from the Alps, spanning the last 1,000 years. We focus thereby on concentrations of Fe, Al, Sr, and Ca which are typical elements present in long-range transported Saharan dust. We show that the mineral dust transport to the Southern Alps is primarily controlled by drought conditions in Northern Africa and by the winter NAO.

Mean dust concentrations of the last 20 years are unprecedented in the context of the last 1,000 years. These elevated Saharan dust concentrations are consistent with the observed widespread increase in dustiness and dust storm frequencies over Northern Africa from direct measurements or from satellite based observations over the last decades. In contrast, between AD 1050 and 1400, when persistent arid conditions in the main source regions of dust in Northern Africa were deduced from tree-ring data and linked to a pervasive positive NAO mode over centuries, no according imprint is recorded in the ice core mineral dust record. We assume that the low-frequency variability of the tree-ring based reconstruction of Moroccan droughts (which also form the basis for the NAO reconstruction) is biased by the method applied to remove the non-climatic growth trends from the tree-ring series. Based on the ice core data we suggest that decadal-scale variability of the NAO (Moroccan droughts) prevailed over the last 1,000 years.