Geophysical Research Abstracts,
Vol. 10, EGU2008-A-01229, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-01229
EGU General Assembly 2008

Tracing dust sources and transport mechanisms in Southern South America using geochemical, remote sensing and ground observation methods

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Aeolian mineral dust atmosphere is an excellent tracer of the atmospheric circulation and transport and is often used as proxy indicator of aridity on the continents. There are different and complementary approaches to track dust mobilization. Satellite imagery is is used evaluate dust dispersion, transport and the connection between dust sources and sinks. Visibility observations can be used as a proxy of dust activity in unpolluted regions when satellite imagery is obstructed by clouds. In addition, one of the most powerful approaches to evaluate present and past dust provenance transported from desert areas and deposited elsewhere in the ocean and continents consist in the characterization of the mineralogical, chemical and isotopic (Sr, Nd and Pb) composition of dust sources. By linking seasonal sampling of aerosols with thin layers of dust accumulated in undisturbed lake and marine sediments or ice layers it is possible to identify rapid changes in sources areas, which can be attributed to seasonal variability in wind systems, trajectories, and intensity.

In order to evaluate present and paleo-atmospheric circulation and transport in southern South America (SSA) we have been conducting seasonal dust sampling, satellites and, ground observations along the Patagonian coast and Central Argentina since 2004. Additionaly, we started a sampling program of surface sediments of the potential dust source areas (PSA) in SSA (e.g., Puna-Altiplano, Central-West Argentina and Patagonia). Sediment samples from the different PSA show distinctive isotopic com-

position thus allowing tracing back the origin of dust collected at the different dust monitoring stations. Furthermore, their unequivocal chemical signature allows linking them with sediments from different continental, marine and ice records in the southern hemisphere, thus enhancing our understanding on paleo-atmospheric circulation and on changes in the climatic conditions of the sources.

Our estimation of horizontal fluxes measured along the Patagonian coast is more than 200 times compared to the previously measured and modelled fluxes. Spikes in dust fluxes are linked to westerly storms producing dust events which typically last for one day. Satellite imagery reveals dust sources are linked to numerous topographic lows of largely diverse dimensions ($\sim$ 10s meter to kilometres) and are widespread in the Patagonian surface. This suggests that Patagonian dust sources are not well represented in global models.