

ADOM - Atmospheric circulation dynamics during the last glacial cycle: Observations and modeling



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Atmospheric circulation is responsible for rapid distribution of heat and moisture across the earth and hence determines our weather and regional climate, today and in the past. Records from eolian deposits consistently suggest that atmospheric dynamics were highly variable during the last glacial cycle, resulting in alternating periods of extremely dusty and non-dusty conditions, on timescales of millennia and shorter (Andersen et al., 2006; GRIP members, 1993; Petit et al., 1999; Porter and An, 1995; Rousseau et al., 2007; Steffensen et al., 2008; Tada et al., 1999). Yet records differ considerably from different regions, archives and proxies. The strong atmospheric variations during the last glacial interval provide particularly good test-cases for how well we understand atmospheric circulation on all levels of conceptual and numerical modeling. However, this requires good knowledge of the patterns of prevailing atmospheric paleocirculation on various regional scales, as well as timing of atmospheric variability relative to other parameters of climatic and environmental change.

The PAGES Working Group ADOM aims to combine eolian-based circulation reconstructions from terrestrial, marine and ice records—in addition to model simulations of past and present atmospheric circulation—to produce detailed knowledge of the processes driving atmospheric dynamics at the regional to hemispheric scale. This knowledge can eventually be upscaled to understand global atmospheric teleconnections.

ADOM will be officially launched at the first of four workshops in November 2009 (www.pages-igbp.org/science/adom/adom-north.html). Titled "High-mid latitude northern atmospheric circulation changes during the last climate cycle", this workshop will focus on the mid- to high-latitude circulation in the Northern Hemisphere where loess records from North America, Europe and Asia, and dust records from Greenland, the North Atlantic and the North Pacific provide a comprehensive database. The workshop will explore strategies to derive quantitative and physically consistent synoptic reconstructions by integration of dust records,

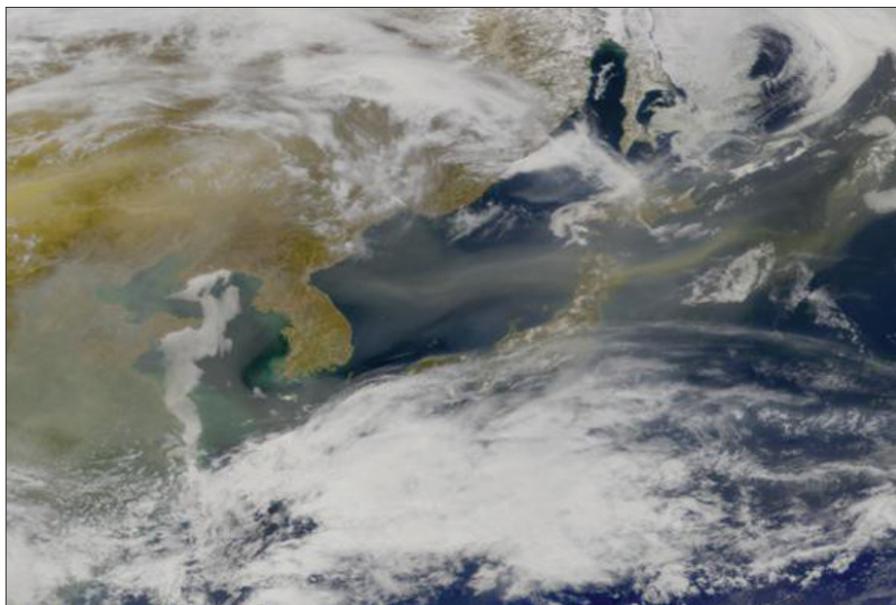


Figure 1: Satellite picture (SeaWiifs) of an Asian dust event (Source: NASA, 2001).

climate observations and model simulations. The specific objectives of this meeting will be to:

- Review datasets and model results relevant to atmospheric paleocirculation
- Define commonalities and differences between regions, archives and proxies
- Identify links between dust deposition and abrupt climatic and environmental change
- Summarize the current knowledge on past atmospheric dynamics
- Compare data records with modeling results
- Identify the critical gaps in knowledge and data for reconstructions and modeling
- Outline group papers

The second and third workshops will similarly address the atmospheric circulation

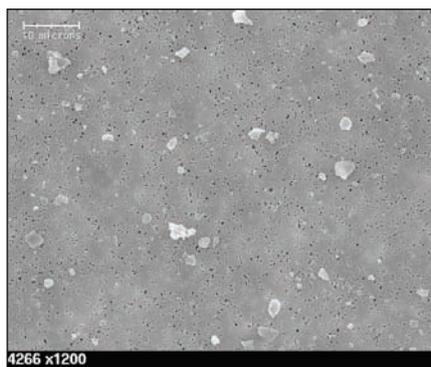


Figure 2: Dust particles filtered from Antarctic ice (EPICA, Photo: J-R Petit)

changes during the last climate cycle but will focus on the low-latitudes and the Southern Hemisphere, respectively. The final workshop will synthesise results on a global scale.

Beyond publication of results in the peer-reviewed literature, ADOM also aims to provide database access to data and model simulations, and contribute to quantifying the past climate forcing from mineral dust aerosols (with PAGES Focus 1 and QUEST-Dust).

Note

For more information on ADOM, please see www.pages-igbp.org/science/adom/

References

- Andersen, K.K. et al., 2006: The Greenland Ice Core Chronology 2005, 15–42 ka, Part 1: constructing the time scale, *Quaternary Science Reviews*, **25**: 3246–3257.
- GRIP members, 1993: Climate instability during the last interglacial period recorded in the GRIP ice core, *Nature*, **364**: 203–207.
- Petit, J.R. et al., 1999: Climate and atmospheric history of the past 420,000 years from the Vostok ice core, Antarctica, *Nature*, **399**: 429–436.
- Porter, S.C. and An, Z.S., 1995: Correlation between climate events in the North Atlantic and China during the last glaciation, *Nature*, **375**: 305–308.
- Rousseau, D.D., Sima, A., Antoine, P., Hatté, C., Lang, A. and Zoeller, L., 2007: Link between European and North Atlantic abrupt climatic changes over the last glaciation, *Geophysical Research Letters*, **34**: doi:10.1029/2007GL031716.

For full references please consult: www.pages-igbp.org/products/newsletters/ref2009_2.html

