

Geophysical Research Abstracts,
Vol. 10, EGU2008-A-04961, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-04961
EGU General Assembly 2008
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2000 years dust storm changes in Asian dust source area: A varve sediment record from Lake Sugan at the northern Qinghai- Tibetan Plateau, China

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Northwest arid China has been recognized as dust provenance of the global atmospheric dust loadings (e.g. the northern Pacific Ocean and the Greenland ice sheet). However, dust storm evolution and dust emission processes in this region during past still remain unclear due to scarce geologic archives. Hydrologically closed lake in the arid zones with a relatively hydrological cycle seems to be a natural collector for emitted sand and dust in dust source area. Here, it is shown that a 2000-year dust storm record is derived from Lake Sugan in the Qaidam Basin at the northern margin of Qinghai-Tibetan Plateau. Grain size distributions (GSDs) of the settled materials during modern dust storms and the lake surface sediments demonstrate that the coarse fraction of the lake sediments is mainly transported by ambient winds during dust storms. Combined with the varve counting chronology, the 2000-year dust storm history was recovered using the indicators of the coarse fraction (56-282.5 μm) and magnetic susceptibility (MS) of the lake sediments. The frequent and/or intensive dust storms occurred during the 4-5th centuries, 1180-1240 AD, 1500-1700 AD and the 20th century. Most of the serious dust storm periods are in agreement with other records from the different regions. Dust storm appears coinciding with strengthening of the Siberian high when colder air mass will frequently encroaches into the dust source areas of China from the high latitudes. Our finding suggests that wind strengths may have an important role in establishment of the connection between dust source areas and distal dust deposition sites, e.g. the Greenland ice sheet.