Atmospheric Chemistry and Physics
An Interactive Open Access Journal of the European Geosciences Union

Atmos. Chem. Phys., 8, 1343-1352, 2008
www.atmos-chem-phys.net/8/1343/2008/

Black carbon record based on a shallow Himalayan ice core and its climatic implications

J. Ming[1,2], H. Cachier[3], C. Xiao[1,2], D. Qin[2], S. Kang[2,4], S. Hou[2], and J. Xu[2]

[1]Institute of Climate System, Chinese Academy of Meteorological Sciences, Beijing 100081, China

[2]State Key Laboratory of Cryospheric Sciences, Cold and Arid Regions Environmental and Engineering Research Institute, Chinese Academy of Sciences, Lanzhou 730000, China

[3]Laboratoire des Sciences du climat et de l'Environnement, CEA-CNRS-University Versailles St Quentin, Gif-sur-Yvette 91198, France

[4]Institute of Tibetan Plateau Research, Chinese Academy of Sciences, Beijing 100085, China

Abstract. A continuous measurement for black carbon (hereafter "BC") in a 40 m shallow ice core retrieved from the East Rongbuk Glacier (hereafter "ERG") in the northeast saddle of Mt. Qomolangma (Everest) provided the first historical record of BC deposition during the past ~50 yrs in the high Himalyas. Apparent increasing trend (smooth average) of BC concentrations was revealed since the mid-1990s. Seasonal variability of BC concentrations in the ice core indicated higher concentrations in monsoon seasons than those in non-monsoon seasons. Backward air trajectory analysis by the HYSPLIT model indicated that South Asia's BC emissions had significant impacts on the BC deposition in the Mt. Qomolangma (Everest) region. The estimated average atmospheric BC concentration in the region was about 80 ng m^{-3} during 1951–2001. And it was suggested BC emitted from South Asia could penetrate into the Tibetan Plateau by climbing over the elevated Himalayas. A significant increasing trend of the radiative forcing simulated by the SNICAR model appeared since 1990, which even exceeded 4.5 W m^{-2} in the summer of 2001. It was suggested that this amplitudes of BC concentrations in the atmosphere over the Himalayas and consequently in the ice in the glaciers could not be neglected when assessing the dual warming effects on glacier melting in the Himalayas.

Final Revised Paper (PDF, 1970 KB) Discussion Paper (ACPD)

Citation: Ming, J., Cachier, H., Xiao, C., Qin, D., Kang, S., Hou, S., and Xu, J.: Black carbon record based on a shallow Himalayan ice core and its climatic implications, Atmos. Chem. Phys., 8, 1343-1352, 2008. Bibtex EndNote Reference Manager