Geophysical Research Abstracts
Vol. 20, EGU2018-2086, 2018
EGU General Assembly 2018

Towards achieving "actual" concentration and deposition values of black carbon at remote and glacial regions of the Himalayans and Tibetan Plateau

Chaoliu Li (1,2), Fangping Yan (3), Shichang Kang (2,4), and Pengfei Chen (4)

(1) Key Laboratory of Tibetan Environment Changes and Land Surface Processes, Institute of Tibetan Plateau Research, Chinese Academy of Sciences, Beijing 100101, China, (2) CAS Center for Excellence in Tibetan Plateau Earth Sciences, Beijing 100101, China, (3) Laboratory of Green Chemistry, Lappeenranta University of Technology, Sammonkatu 12, Mikkeli 50130, Finland, (4) State Key Laboratory of Cryospheric Sciences, Northwest Institute of Eco-Environment and Resources, Chinese Academy of Sciences, Lanzhou, 730000, China

Black carbon (BC) is the second most important warming component in the atmosphere after CO_2. The BC in the Himalayas and the Tibetan Plateau (HTP) has influenced the Indian Monsoon and accelerated the retreat of glaciers. So far, the BC concentrations and deposition rates remain poorly constrained because of the potential influence of carbonates in mineral dust (MD), the reported BC concentrations in the HTP are overestimated. In addition, large discrepancies have been reported among the BC deposition derived from lake cores, ice cores, snowpits and models. A comparison between the BC concentrations in acid (HCl)-treated and untreated total suspected particle samples from the HTP showed that the BC concentrations previously reported for the Nam Co station (central part of the HTP) and the Everest station (northern slope of the central Himalayas) were overestimated by approximately 52±35% and 39±24%, respectively. Additionally, the organic carbon (OC) levels were overestimated by approximately 22±10% and 22±12% for the same reason. Based on previously reported values from the study region, we propose that the actual BC concentrations at the Nam Co and Everest stations are 61 ng m-3 and 154 ng m-3, respectively. Meanwhile, the above data at Nam Co was agree well with that of fine particles (PM2.5), which exclude the potential influence of MD on variations of laser signal during BC measurement. Furthermore, we found the deposition of BC in HTP lake cores was mainly related to river sediment transport from the lake basin and that relatively little BC deposition occurred via atmospheric deposition. Therefore, previously reported BC deposition rates from lake cores overestimated the atmospheric deposition of BC in the HTP. Correspondingly, BC deposition derived from snowpits and ice cores agreed well with those derived from models, implying that the BC depositions of these two methods reflect the actual values in the HTP. Therefore, we propose that the BC deposition in the HTP is 17.9±5.3 mg m-2 a-1, with higher and lower values appearing along the fringes and central areas of the HTP, respectively. These adjusted BC concentrations and deposition values in the HTP are critical for performing accurate evaluations of other BC factors, such as atmospheric distribution, radiative forcing and chemical transport in the HTP.