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Comparing Seasonal Differences of Black Carbon in Tibetan Plateau transported from South Asia using WRF-Chem

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The melting of glaciers and snow on the Qinghai-Tibet Plateau, known as the Earth's "Third Pole" and "World Water Tower", is source of fresh water for hundreds of millions of people in South Asia, Southeast Asia, and East Asia, but it is now suffering from an unprecedented crisis. The black carbon deposited on the surface of the glacier will reduce the snow albedo and absorb more solar radiation, leading to accelerated melting of ice and snow. Previous studies have shown that black carbon from South Asia is one of the main sources of the Qinghai-Tibet Plateau, and the transportation of black carbon to the Qinghai-Tibet Plateau presents obviously seasonal differences. However, the transport of black carbon from South Asia to the Qinghai-Tibet Plateau in different seasons shows a completely opposite trend to wind field conditions. This study uses the WRF-Chem model to study the transmission mechanism of South Asian black carbon to the Tibetan Plateau in April (pre-monsoon), July (summer monsoon) and December (winter monsoon). MIX emission inventory and Peking University's global black carbon emission inventory (PKU-BC) were involved to analyze the seasonal distribution of black carbon concentration, dry and wet deposition in the Qinghai-Tibet Plateau and South Asia, and the distribution of BC concentration and wind field at different altitudes. Combined with the vertical distribution of BC concentration across the Himalayas, the transport mechanism of black carbon in South Asia to Qinghai-Tibet Plateau in different seasons is studied. In the selected three months, December had the highest surface black carbon concentration in South Asia and the Qinghai-Tibet Plateau, while July had the lowest black carbon concentration; Mainly because of the large amount of wet deposition of black carbon brought about by the heavy precipitation in South Asia in July; According to the vertical distribution of black carbon, black carbon can climb up the hillside and eventually reach the southern slope of the Qinghai-Tibet Plateau in April. In July, black carbon is mainly distributed below 3km. In December, black carbon can be uplifted to 4-5km, and finally transported into Qinghai-Tibet Plateau.