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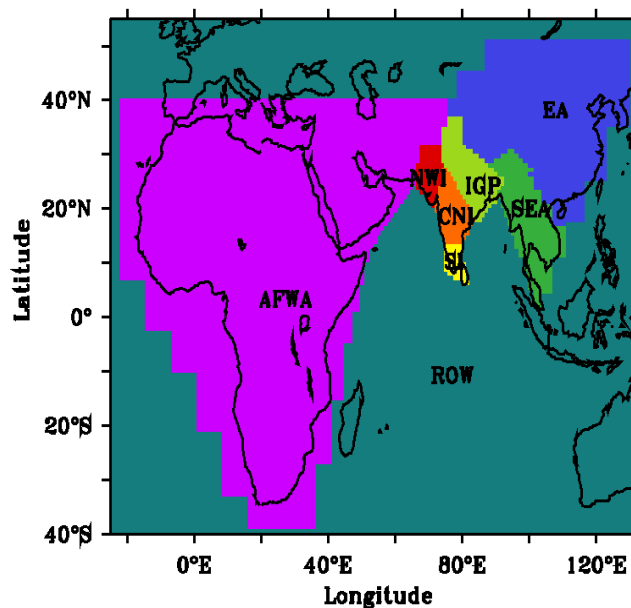
*Supplement of*

## **Simulations of black carbon (BC) aerosol impact over Hindu Kush Himalayan sites: validation, sources, and implications on glacier runoff**

**Sauvik Santra et al.**

*Correspondence to:* Shubha Verma ([shubha@iitkgp.ac.in](mailto:shubha@iitkgp.ac.in))

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. Figure s1: Masked regions on GCM zoom grid representing tagged source regions taken under study; the classification of source regions are as following with different colours indicated in bracket: 1. IGP (light green) 2. CNI (orange), 3. SI (yellow), 4. NWI (red), 5. SEA (green), 6. EA (blue), 7. AFWA (pink), 8. ROW (dark green).

## 1 Description of region- and source-tagged simulation

In order to examine sources of BC aerosol over the HKH region due to emissions from near-by and far-off regions and that from various source sectors (e.g., residential biofuel use, open burning of biomass, and fossil fuel combustion), region- and source-tagged simulations carried out in GCM-indemiss (Verma et al., 2011, 2008) are evaluated. Fig. s1 shows the masked regions on the GCM zoom grid, which include the Indo-Gangetic Plain (IGP), central India (CNI), south India (SI), northwest India (NWI), southeast Asia (SEA), east Asia (EA), Africa-west Asia (AFWA), and rest of the world (ROW). The source regions were classified on the basis of differences in composition of their aerosol emission fluxes and their proximity to the Indian Ocean and the subcontinent (Verma et al., 2007). Out of the parts of Indian region (Indo-Gangetic plain, central India, south India, northwest India), Indo-Gangetic plain has the highest emission flux followed by that of northwest India, central India, and south India. Emission fluxes from the Indo-Gangetic plain, central India, south India are mainly composed of sulfate, organic matter, inorganic matter followed by black carbon. Northwest India emissions are mainly dust followed by sulfate. Southeast Asia emissions are mainly composed of organic matter followed by sulfate. Africa-west Asia emissions are mainly composed of dust and organic matter. Emission flux from east Asia and rest of the world are mainly composed of dust followed by sulfate. In the region-tagged BC simulations, the BC aerosol transport and atmospheric processes are simulated for each geographical region with the emissions outside that region being switched off.

In the source-tagged BC simulations, the BC aerosol transport and atmospheric processes are simulated for each of the source sector – biofuel (BF), fossil fuel (FF), and natural source. The sectors for the BF source include wood and crop-waste for residential cooking and heating, for OB include forest biomass and agricultural residues, and that for the FF source are coal-fired electric utilities, diesel transport, brick kilns, industrial, transportation, and domestic (Reddy and Venkataraman, 2002a, b). The natural source included sulphur from volcanic and biogenic sources, terpenes from the vegetation or natural OM, dust from arid regions, and sea-salt.

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