

Supplementary Materials

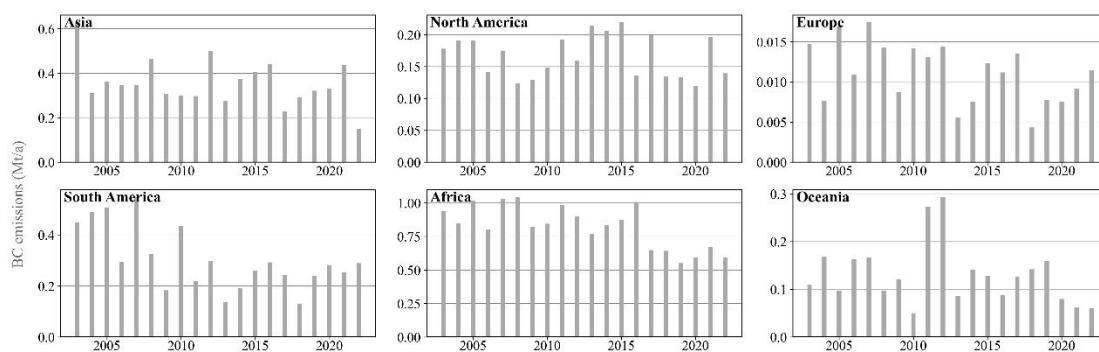


Fig. S1 The emissions of BC (million tons/year) across Asia, North America, Europe, South America, Africa, and Oceania, respectively, during the period 2003–2022. The gray bars denote emissions of BC.

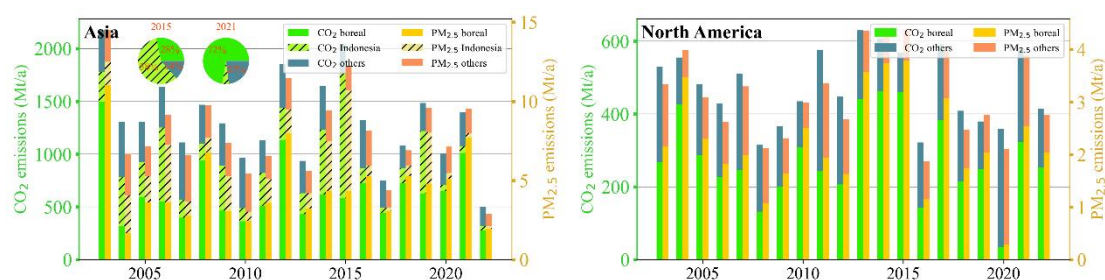


Fig. S2 The emissions of CO₂ (green) and PM_{2.5} (orange) in Asia and North America. The stacked bars indicate the Asian emissions contribution from boreal Asia, Indonesia and the rest of Asia and North American emissions contribution from boreal North America and the rest of North America. The inset pie charts for Asia indicate the sources of its CO₂ emissions contribution in 2015 and 2021. Typical El Niño years include 2004, 2006, 2009, 2015, and 2019.