

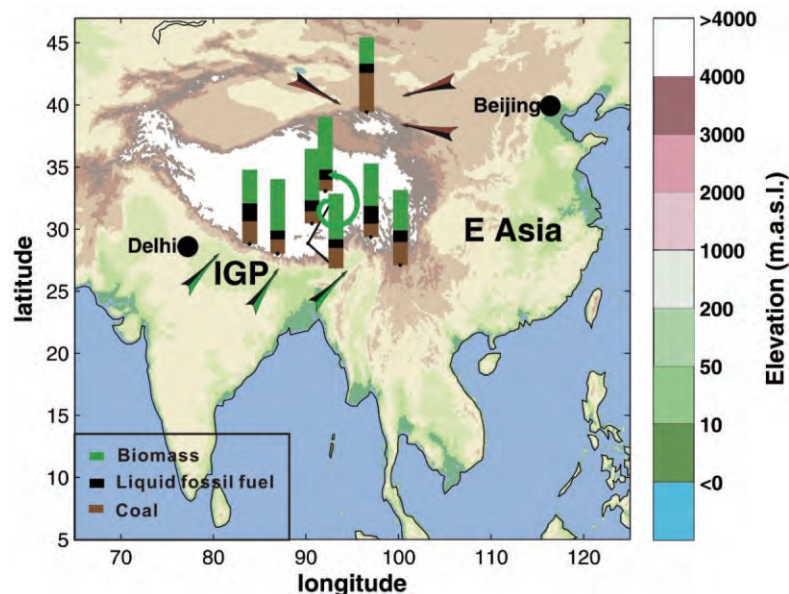
## Sources of black carbon from the Himalayan–Tibetan Plateau glaciers

Subject Index: D01

With the support by the National Natural Science Foundation of China and the Chinese Academy of Sciences, the research team led by Prof. Kang Shichang (康世昌) at the State Key Laboratory of Cryospheric Sciences, Northwest Institute of Eco-Environment and Resources, Chinese Academy of Sciences, constrained the sources of black carbon to the Himalayan–Tibetan Plateau glaciers in *Nature Communications* (2016, 7: 12574).

Glaciers over the Himalayas and Tibetan Plateau are now under accelerating recession. The atmospheric pollutants, particularly black carbon, which can reduce the albedo of glacier surface after their deposition, are recognized one of the important factors driving glacier melt. It is estimated that about 18 percent of China's glacier area has disappeared over the past 50 years, threatening the life of more than a billion people downstream. Kang's group has found strong evidence that pollutants derived from South Asia could be transported to the Tibetan Plateau across the Himalayas. The related research results were published in *Atmospheric Chemistry and Physics* (2015, 15(3): 6007–6021) and *Scientific Reports* (2015, 5: 9580). The knowledge of relative contributions of black carbon from fossil (liquid fossil and coal) combustion and biomass burning remains limited, deeply confining the understanding of radiative, transport and mitigation of black carbon.

To reduce these uncertainties, the dual-carbon-isotope ( $\Delta^{14}\text{C}$  and  $\delta^{13}\text{C}$ ) fingerprint of black carbon was investigated on aerosol and glacier snowpit samples in the most extensive geographical coverage of black carbon on the Tibetan Plateau. Kang and a group of colleagues found that black carbon at the Himalaya has about equal contributions from fossil ( $46 \pm 9\%$ ) and biomass combustion, consistent with the black carbon source fingerprints from northern India, while black carbon in the remote northern Tibetan Plateau is predominantly from fossil combustion ( $66 \pm 16\%$ ), close to Chinese sources. Fossil contribution to black carbon in snowpits of the inner Tibetan Plateau is lower ( $30 \pm 10\%$ ). Therefore, they provided strong isotope-based evidence that biomass-sourced black carbon plays a quantitatively more important role in Tibetan Plateau glacier melting than fossil fuel-sourced black carbon, especially in the inland Tibetan Plateau, and presumably arises mainly from domestic sources. The results of this study may shed light on where all this pollution of the Himalayas and Tibetan Plateau is coming from and provide guidance for effective mitigation actions.



**Figure** Relative contributions of the combustion of three fuel classes to the Himalayan–Tibetan Plateau snowpit sample black carbon.