



The dominant role of snow albedo feedback related to black carbon on enhanced warming over the Himalayas

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During the past decades, obvious warming trend in winter over the Tibetan Plateau has greatly discussed, results emphasis dominated effect of local radiative factors. As a typical radiative factor, the effect of black carbon on snow over the Himalayas area during warming process attracted our attention. In this study, the coupled climate feedback response analysis method (CFRAM) is applied to the temperature over Himalayas to quantify the magnitude of warming induced by different climate feedback processes. The results show that snow-albedo feedback has a warming of around 3 oC that takes primary contributor to enhanced warming over the Himalayas during recent decades, such warming is much higher than the warming induced by dynamic and other radiative factors. Meanwhile, the stronger radiative effect of BC on the warming over Himalayas is also be identified by the sensitive experiments of Black carbon, CO₂, and SO₄ in Community Earth System Model. As a result of strong radiative effect of BC on Himalayas, it also accomplished a strengthened potential evaporation and reduced precipitation, accounting for local drying and desertification, which conversely intensifies warming. These accomplished results suggest more investigation on local radiative effect on system climate and ecosystem are needed, especially in high-altitude cryosphere.