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Potential climatic effects of light absorbing particles over the Third Pole regions

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Light absorbing particles (LAPs) have important impact on regional climate over the Third Pole regions. Carbonaceous and mineral aerosols, which are considered as the anthropogenic and natural sources respectively, can absorb and scatter incident solar radiation in the atmosphere. Meanwhile, LAPs deposition in snow/ice can also change the surface albedo, resulting in perturbations in the surface radiation balance. However, most studies that have made quantitative assessments of the climatic effect of LAPs over the Third Pole regions did not consider the impact of dust on snow/ice at the surface. In this study, a regional climate model RegCM4.3.4 (Regional Climate Model version 4.3.4) coupled with an aerosol–snow/ice feedback module was used to investigate the emission, distribution, and deposition of carbonaceous and dust aerosols. The study was focused on the two issues: 1) the evaluation of model performance; 2) the assessment of climatic effects induced by carbonaceous and mineral dust aerosols, respectively.