Concentrations and depositions of black carbon and insoluble particles in Alaskan snows

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Snow cover in the Arctic is affected by global warming and has strong effects on albedo feedback. Light-absorbing particles such as black carbon (BC) and mineral dust could decrease snow albedo and accelerate snow melt, thus exerts influence on climate. In order to evaluate their impacts on snow albedo, it is important to know accurate concentration and deposition flux of light absorbing particles. Under the GRENE Arctic Climate Change Research Project, we collected seasonal snow cover samples from Alaska. During 2012-2015, we collected snow samples from 22 sites across Alaska in late February or early March. BC particles were measured using a single particle soot photometer (SP2), which is based on the laser-induced incandescence technique. Insoluble particles were measured using a Coulter Counter. From the spatial variations of BC concentrations, our sampling sites can be divided into five regions, i.e. Barrow (71.32°N), Prudhoe Bay (70.19°N), north region (66.56-68.62°N), middle region (63.57-65.9°N) and south region (61.82-63.27°N). The middle region shows the highest BC concentrations. These five regions also show different BC mass size distributions. BC mass size distributions in south region is similar to that in typical ambient air, whereas snow in middle region displays high percentage of large BC particles (>645nm). Mass concentrations of insoluble particles show spatial trend similar to that of BC concentrations. BC and insoluble particle depositions in snow were calculated with snow water equivalent (SWE) and concentrations. Averaged SWE in south region is the highest of three regions, but winter BC depositions is the highest in middle region, as is BC mass concentrations. Winter depositions of insoluble particles show no significant spatial trends.

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