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Characteristics of Dust Deposition at High Elevation Sites in Caucasus Over the Past 190 years Recorded in Ice Cores.

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The nature and extent of both radiative and geochemical impacts of mineral dust on snow pack and glaciers depend on physical and chemical properties of dust particles and its deposition rates. Ice cores can provide information about amount of dust particles in the atmosphere and its characteristic and also give insights on strengths of the dust sources and its changes in the past. A series of shallow ice cores have been obtained in Caucasus mountains, Russia in 2004 – 2015. A 182 meter ice core has been recovered at the Western Plateau of Mt. Elbrus (5115 m a.s.l.) in 2009. The ice cores have been dated using stable isotopes, NH4+ and succinic acid data with the seasonal resolution. Samples were analysed for chemistry, concentrations of dust and black carbon, and particle size distributions. Dust mineralogy was assessed by XRD. Individual dust particles were analysed using SEM. Dust particle number concentration was measured using the Markus Klotz GmbH (Abakus) implemented into the CFA system. Abakus data were calibrated with Coulter Counter multisizer 4. Back trajectory cluster analysis was used to assess main dust source areas. It was shown that Caucasus region experiencing influx of mineral dust from the Sahara and deserts of the Middle East. Mineralogy of dust particles of desert origin was significantly different from the local debris material and contained large proportion of calcite and clay minerals (kaolinite, illite, palygorskite) associated with material of desert origin. Annual dust flux in the Caucasus Mountains was estimated as $\sim$300 μg/cm2 a-1. Particle size distribution depends on individual characteristics of dust deposition event and also on the elevation of the drilling site. The contribution of desert dust deposition was estimated as 35-40 % of the total dust flux. Average annual Ca2+ concentration over the period from 1824 to 2013 was of 150 ppb while some of the strong dust deposition events led to the Ca2+ concentrations reaching 4400 ppb. An increase of dust and Ca2+ concentration was registered since the beginning of XX century. The ice core record depicts also a prominent increase of dust concentration in 1980's which may be related to the increase of dust sources strength in North Africa.