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Long-term variability of aerosol optical properties and radiative effects in Northern Finland

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We introduce long term dataset of aerosol scattering and absorption properties and combined aerosol optical properties measured in Pallas Atmosphere-Ecosystem Supersite in Norhern Finland. The station is located 170 km north of the Arctic Circle. The station is affected by both pristine Arctic air masses as well as long transported air pollution from northern Europe. We studied the optical properties of aerosols and their radiative effects in continental and marine air masses, including seasonal cycles and long-term trends. The average (median) scattering coefficient, backscattering fraction, absorption coefficient and single scattering albedo at the wavelength of 550 nm were 7.9 (4.4) 1/Mm, 0.13 (0.12), 0.74 (0.35) 1/Mm and 0.92 (0.93), respectively. We observed clear seasonal cycles in these variables, the scattering coefficient having high values during summer and low in fall, and absorption coefficient having high values during winter and low in fall. We found that the high values of the absorption coefficient and low values of the single scattering albedo were related to continental air masses from lower latitudes. These aerosols can induce an additional effect on the surface albedo and melting of snow. We observed the signal of the Arctic haze in marine (northern) air masses during March and April. The haze increased the value of the absorption coefficient by almost 80% and that of the scattering coefficient by about 50% compared with the annual-average values. We did not observe any long-term trend in the scattering coefficient, while our analysis showed a clear decreasing trend in the backscattering fraction and scattering Ångström exponent during winter. We also observed clear relationship with temperature and aerosol scattering coefficient. We will present also how these different features affects to aerosol direct radiative forcing.