Contrasting present and future deposition of absorbing aerosols in the Alps with other high mountain ranges worldwide based on GFDL model simulations.

Presented by Paul Ginoux

Snow and ice over high mountain ranges are often not pure but contains absorbing aerosols such as black carbon or dust. These impurities can alter the surface albedo and influence cryosphere melt dynamics and feed back on broader circulation. These effects will depend on the intensity of snowfall accumulation and aerosol deposition, as well as their spatial and temporal distributions.

Here, we present an analysis of a 36-year simulation (1980-2015) with the new Geophysical Fluid Dynamics Laboratory (GFDL) atmospheric model (AM4) using the latest CMIP6 inventory of emission of aerosols, GHGs and other forcing agents, with a 50 km resolution. After briefly presenting the evaluation of AM4 performances by comparing precipitation and aerosol with observations, we will discuss the key features of the variability and trends of snow and aerosol deposition over major mountain ranges in North (Alaska Range and Rockies Mountains) and South (Andes) Americas, Europe (Alps), Central (Caucasus), and East (Hindu Kush, Karakoram, Tian Shan, Hengduan, and Himalayas) Asia. I will show how aerosol absorption in snow alternates between dust and black carbon depending on the season and mountain range in the Tibetan Plateau.
The second part of my talk will focus on contrasting snowfall and deposition of absorbing aerosols over the Alps with other mountain ranges worldwide based on GFDL simulations performed for the up-coming IPCC sixth assessment report. If deposition of black carbon is projected to be decreasing in all regions, this is not the case for mineral dust, which may be the primary source of light absorption in what-is-left-of-snow by the end of this century.