# Parallel Session B: Coupled Models

## B3: Biogeochemical processes

### Climate implications of aerosol induced snow darkening over Himalayas

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Atmospheric aerosols interact with radiation through various pathways. Climate implications of aerosol-cloud-radiation interactions over South Asia have been extensive investigated using dedicated field experiments and modelling. However, studies on aerosol induced snow darkening and its implications on the region hydroclimate are rather limited. The deposition of the absorbing aerosols such as black carbon (BC) and dust on the highly reflecting surfaces like snow and ice significantly reduces the surface albedo (snow darkening effect) which leads to positive radiative forcing (warming) in the earth-atmosphere system. This aerosol induced glacier/snow melting is very important over Himalayan/Tibetan region. Regional climate model (RegCM-4.6.0) coupled with Community Land Model (CLM4.5) which includes Snow, Ice and Aerosol Radiative (SNICAR) was used to investigate the effect of aerosol induced snow albedo feedback on the regional radiation balance and circulation. The deposition of absorbing aerosols decreases the snow albedo of Himalayan-Tibetan region by 0.1-0.2 causing positive radiative forcing of 10-12Wm-2. This snow albedo reduction due to aerosols resulted in increase of the surface temperature of 2-3K and reduction of snow cover fraction by 10-20%.The snow cover reduction was more than 30% in the mid-Himalayan region and northern Tibetan slopes due to its proximity to IGP and Taklimakan desert respectively. Direct radiative effect (scattering and absorption of radiation) of atmospheric aerosols increase the mid tropospheric temperature by 0.5-1.0 K which is further enhanced by 0.2-0.5K due to snow albedo feedback. The aerosol induced snow albedo forcing and its implications on thermal structure, circulation pattern and monsoon rainfall will be discussed in detail during the presentation.

**Keywords:** aerosols, snow darkening, radiative forcing