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Aerosol optical properties variations over the southern and northern slopes of the Himalayas

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The Himalayas is the highest mountain on the earth. It blocks off the aerosols obviously, especially during the monsoon seasons. The aerosol optical properties derived from Aerosol Robotic Network (AERONET) dataset over the southern (Pokhara station in Nepal and EVK2-CNR station in Nepal) and northern (Qomolangma(Mt. Everest) station (QOMS_CAS) in Tibet, China) slopes of the Himalayas are analyzed in this study. The low aerosol optical depth (AOD) at QOMS_CAS and EVK2-CNR indicates they are background sites in Himalaya regions. AOD at Pokhara is much higher than the former two sites with a seasonal variation pattern. This is maybe because Pokhara is more influenced by human activities and India summer monsoon. There are both fine and coarse particle mode aerosol in all three sites. Diurnal variation of AOD and Ångström exponent (AE) has a wide range at all three stations. QOMS_CAS mostly influenced by distant sources reveals AOD has no diurnal cycle in all seasons. Simultaneously, there are smaller particles in the morning and late afternoon, however, particles are larger at noon. The diurnal variation at Pokhara shows a higher AOD value in the morning and late afternoon, and reaches its minimum at noon except JJA (June to August). In all seasons, AOD at EVK2-CNR increases continuously during a day, and reaches maximum at late afternoon due to evolution of mountain-valley flows. AE indicating the particle size has no fixed mode at Pokhara and EVK2-CNR. The aerosols in the northern slope are mostly from distinct regions, and transport from the upper troposphere to atmospheric boundary layer (ABL) probably. The changes of ABL make no apparent effect on aerosol daytime variation. Conversely, the aerosols in the southern slope are mostly from local regions, and maybe spread upwards from the ground gradually. Atmospheric mixing layer height changes with the evolution of the ABL, which diffuses aerosols in the troposphere. Therefore, this process leads aerosol daytime variation.