Geophysical Research Abstracts
Vol. 16, EGU2014-4798, 2014
EGU General Assembly 2014

Observation of particle size distributions and new particle formation at two distinct Indian subcontinental urban locations

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While the formation of new atmospheric aerosol particles and their subsequent growth have been observed under diverse conditions all over the world, to the best of our knowledge, this is only the 6^{th} such study in India. Here, we present the systematic analysis for new particle formation (NPF) from two distinct urban locations in India during summers of two consecutive years. Particle size distributions were measured at Pune (18.53^{o}N, 73.85^{o}E) during 16 April–23 May, 2012 and at Kanpur (26.46^{o}N, 80.32^{o}E) during 16 April–23 May, 2013. The campaign mean particle number concentration in the size range of 4–135 nm at Pune (12.2x10^3 cm^{-3}) was higher than at Kanpur (7.9x10^3 cm^{-3}). Whereas, the condensation sink at Kanpur (12.8x10^{-3} s^{-1}) was higher than at Pune (7.2x10^{-3} s^{-1}). Despite lower particle number concentrations at Kanpur, larger particle sizes resulted in higher condensation sink than at Pune. The mean particle mode diameter at Kanpur was found larger by a factor of 1.8 than at Pune. NPF events were observed frequently at both sites, with higher NPF frequency at Pune (24%) than that at Kanpur (16%). The derived growth rates, GR, and the particle formation rates, J_5, ranged from 3.4–13.3 nm h^{-1} and 0.5–17.5 cm^{-3} s^{-1}, respectively, which are comparable to typical values reported in previous studies. Generally, the particle formation rates were higher at Pune, whereas the growth rates were higher at Kanpur, suggesting that different nucleation and growth processes may be involved at these sites or that distinct atmospheric conditions lead to this discrepancy.