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# Observation of new particle formation at a semi-rural tropical location, Gadanki, in Southern tropical India

Shika Suren (1), Vijay P. Kanawade (2), Christopher Pohlker (3), Diana Rose (3,4), Suman MNS (5), Harish Gadhavi (5), Ashwini Kumar (3), Shiva Nagendra SM (1), Ravikrishna R. (6), Huan Yu (7), Lokesh K. Sahu (8), Jayaraman A. (5), Meinrat O. Andreae (3), Ulrich Poschl (3), and Sachin S. Gunthe (1)

(1) Department of Civil Engineering, Indian Institute of Technology Madras, Chennai, India , (2) Department of Civil Engineering, Indian Institute of Technology Kanpur, Kanpur, India, (3) Max Planck Institute for Chemistry, P. O. Box 3060, Mainz, Germany, (4) Institute of Atmospheric and Environmental Science, Goethe University of Frankfurt am Main, Frankfurt am Main, Germany, (5) National Atmospheric Research Laboratory, Gadanki, India, (6) Department of Chemical Engineering, Indian Institute of Technology Madras, Chennai, India, (7) Nanjing University of Information Science and Technology, Nanjing, Jiangsu, China, (8) Physical Research Laboratory, Ahmedabad, India

We report first measurements of ultrafine particles from a semi-rural location, Gadanki, in southern tropical India. Measurements of particle number size distributions in the diameter range of 5 nm – 32 $\mu$m were performed during 2 May – 31 July 2012. The mean number concentrations of nucleation (NNUC), Aitken (NAIT), accumulation (NACCU), and total particles (NTOT) at this site were (1.1$\pm$0.9)$\times$103 cm-3, (2.2$\pm$1.3)$\times$103 cm-3, (1.5$\pm$1.2)$\times$103 cm-3 and (4.8$\pm$2.4)$\times$103 cm-3, respectively, comparable to other rural to semi-rural locations globally. As the season progressed, total particle number concentrations declined, perhaps due to wet removal of aerosols with the onset of Monsoon in early June. Particle bursts in the nucleation mode size range of 5–25 nm, followed by a sustained growth in size were observed very rarely (only 5 days out of 91 observation days) at our site, less frequently than at most other locations around the world during May-July. An infrequent occurrence of new particle formation (NPF) at our site can be explained by the stronger dispersion associated with high wind speed and a weak gas-phase oxidation chemistry due to diminished solar radiation on persistently cloudy days. The condensation sink was similar on NPF and non NPF event days, suggesting that the pre-existing particle surface was not a limiting factor for NPF occurrence at this site during the entire observational period. The derived particle growth rates (GR>5nm) and formation rates of 5 nm particles (J5) ranged from 2.2–4.7 nm h-1 and 0.4–2.4 cm-3 s-1, with a mean and one standard deviation value of 3.4$\pm$0.9 nm h-1 and 1.2$\pm$2.3 cm-3 s-1, respectively, comparable to previous investigations at rural to semi-rural locations. We propose an improved primary nucleation proxy to estimate nucleation mode particle number concentrations based on satellite data, which could be a step forward in our ability to predict formation of ultrafine particles at least over highly polluted areas.