



## **Pollution impacts on cloud microphysics over the coastal city of Chennai**

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The city of Chennai (Madras) is located in the South-Eastern part of India. It is the fourth largest city in India with a population in excess of 4 million. Major industries are located in the city as well as petroleum refinery and thermal power plants. With the on-going economic boom in India, it is expected that Chennai will encounter unprecedented industrial growth in the coming decade. The National Environmental Engineering Research Institute (NEERI) has undertaken a systematic monitoring of important air pollutants including oxides of sulphur and nitrogen for the city. We have used the NEERI data to initialize a detailed microphysical chemical parcel model to study the impact of these pollutants on the cloud formation over Chennai. Polluted air masses are characterized by increased aerosol number concentration, as well as enhanced ambient concentration levels. The latter effect, may have a tendency to ease the process of activation of aerosol particles into cloud droplets. On the other hand, enhanced aerosol number concentration, would lead to a stiff competition for the available water vapour and this could result in a net lowering of the actual cloud droplet number concentration. We undertake a sensitivity study to ascertain the relative importance of the two processes. In addition, we allow some of the aerosol particles to age in a SO<sub>2</sub>-rich environment. Finally, we quantify the extent of sulphate produced when the aerosol particles undergo a cycle of cloud-processing and then assess the possible

pollution-effects on the optical properties of cumulus clouds formed over Chennai.