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Contrasting aerosol and cloud microphysical processes along the Arabian Sea, Bay of Bengal and the Indian Ocean

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The Indian subcontinent houses an abundance of aerosol particles-there are many different types of aerosols in varying concentrations. Many of them have a profound climatological impact (the Indoex field campaign, Intergovernmental Panel on Climate Change 2007). Air mass over peninsular India contains large amounts of sulphate aerosols along with sea salt particles contributing to CCN (Cloud Condensation Nuclei) concentrations. The uniqueness of the Indian peninsula rests in the fact that it is subjected to two seasons of monsoon activity-while much of the country experiences the traditional south west monsoon, some parts of south eastern India experience the winter or the north-east monsoon. The two monsoons have different dynamical characterizations resulting in significant differences in the distribution patterns of aerosol particles along Arabian Sea, Bay of Bengal and the Indian Ocean. Multi component aerosol systems are complex and have a non linear response to cloud droplet number concentrations in contrast to single aerosol systems.
We have access to aerosol data over southern India along with records of precipitation. This prompted us to undertake a modeling study to investigate how aerosol size distribution, composition and the local meteorology impact upon cloud formation. In particular we have undertaken modeling studies to ascertain favorable/unfavorable combinations of ammonium sulphate and sea salt aerosol particles leading to enhanced/suppressed rates of precipitation. In Europe and the US, modeling studies have always complemented large scale field experiments eg.ACE-2 (Aerosol Characterization Experiment-2). In contrast over the Indian Subcontinent, field data are available with little or no model results. In this first study, we aim to elucidate the mechanistic details of precipitation formation over peninsular India through rigorous mathematical modeling.