

Water adsorption on atmospheric clay minerals as a function of relative humidity: Application of experimental results to Adsorption Activation Theory

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The indirect aerosol effect on climate includes radiative effects from aerosol particles that take up water and form cloud droplets or alter the radiative properties and lifetimes of clouds. This effect is currently one of the largest uncertainties in understanding climate change. In the past, atmospheric climate models have neglected the potentially significant effect of mineral dust aerosol on the indirect climate effect. However, a number of recent studies have revealed the importance of adsorbed water on the cloud condensation nuclei (CCN) activity of insoluble dust particles. Additionally, the recently developed FHH-Adsorption Activation Theory has been used to explain CCN activity of insoluble particles and has been applied to atmospheric models to account for the contribution of insoluble particles to cloud droplet number concentration (CDNC). However, the model results appear to be highly sensitive to the adsorption parameters. In the current work, water adsorption on the three most abundant clay minerals found in the atmosphere using an ATR-FTIR equipped with a flow cell were measured in the laboratory. The FHH adsorption isotherm model was applied to the experimental results to extract experimental FHH adsorption parameters. The adsorption parameters were then used in FHH-Adsorption Activation Theory (FHH-AT) to predict CCN activation of mineral dust aerosol in the atmosphere. The predicted CCN activities for these clays are in excellent agreement with previously reported experimental CCN activity measurements.

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3:15 p.m. Refreshments

3:30 p.m. – Seminar

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