The Role of Amines in Atmospheric Aerosol Formation and Growth

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In recent studies gaseous amines have been shown to have a role in atmospheric nucleation. Specifically, the results from the CLOUD experiment indicate that amines enhance sulphuric acid-water nucleation significantly.

Amines are emitted to atmosphere by a variety of anthropogenic and biogenic processes. Animal husbandry and the ocean produce aliphatic amines while various industrial operations produce aromatic amines. In gas-to-particle conversion amines have two pathways: direct dissolution and acid-neutralizing reactions. However, thus far amines have been incorporated into very few atmospheric models. Therefore their importance in aerosol formation and growth is poorly known.

We examine the impact of the most commonly emitted amines on new particle formation and growth. To evaluate the importance of amines in particle growth we have implemented a simple description of amines to aerosol-climate model ECHAM5-SALSA. The oceanic emissions of amines are calculated using wind speeds and chlorophyll-a concentrations on the surface. The spatial variation of emissions over land are approximated using the GEIA inventory for NH_3. The major processes accounted for the amines in the model are OH chemistry, dry and wet removal, condensation and nucleation. The effect of amines on cloud condensation nuclei and cloud droplet concentrations will also be studied.