

ENV-413: Thermodynamics of the Earth systems

Exercise session for Lecture 8

Download the ISORROPIA code from the Moodle website and use it to solve the problems below:

1. Calculate the ratio of the wet particle mass to the dry particle mass for aerosol consisting of (i) ammonium sulfate, (ii) sodium sulfate, (iii) sodium chloride for relative humidity at 30, 60 and 90% at 25°C. Does the water uptake affect the mass of the aerosol system a lot? Try the same calculation at 0°C. How important are temperature effects on the water uptake?
2. A coastal area is characterized by sea-salt (NaCl) concentrations of $10 \mu\text{g m}^{-3}$.
 - a. Calculate the aerosol concentration and composition at 25°C if the relative humidity is 50% for a total nitric acid concentration from 0 to $100 \mu\text{g m}^{-3}$, zero ammonia and sulfate.
 - b. Repeat the calculation if the total ammonia concentration is $10 \mu\text{g m}^{-3}$ and there is also $5 \mu\text{g m}^{-3}$ of sulfate.