

Thermodynamics of Earth systems

Lecture 9:
Colligative properties and
Phase diagrams

Material covered in Lecture

Part 2: Framework

Phase Equilibria

- Gibbs phase rule: thermodynamic degrees of freedom, phases and components
- Energy in phase changes and chemical reactions

Part 3: Applications

Physical chemistry of water solutions – solution thermodynamics

- Activity and chemical potential
- Ideal solutions – Real solutions
- Equilibrium constants
- Some examples from aerosols (deliquescence and water uptake).
- Aerosol thermodynamic models
- The ISORROPIA-II aerosol thermodynamic model
- Colligative properties (freezing point depression, boiling point elevation)
- Phase diagram (for single and multiple component system);
Clausius-Clapeyron equation;