

Abstract

Oberwolfach Workshop:

Moist Processes in the Atmosphere

Dates:

17 Feb - 23 Feb 2019 (Code: 1908)

Organizers:

Boualem Khouider, Victoria

Rupert Klein, Berlin

Leslie Smith, Madison

Processes related to water in the atmosphere lead to severe uncertainties in weather forecasting and climate research. Atmospheric water vapor and cloud water strongly influence the Earth's energy budget through, e.g., energy conversions associated with phase changes, fluid dynamical effects associated with buoyancy, and through their influence on radiative transport properties of the atmosphere. Given the critical green-house effect of water vapor, it seems astounding that climate modellers cannot with certainty state whether the Earth's cloud system has a positive or negative influence on the global mean temperature. The formation of clouds involves small-scale processes currently unresolved by climate models, and thus cloud cover is one of the main sources of uncertainty. This large uncertainty has its roots in the extremely wide range of length and time scales associated with moist processes, which pose an equally wide range of challenges to mathematical and computational modelling.

New and innovative methods, modelling frameworks, efficient computational techniques, and complex statistical data analysis procedures as well as their mathematical analysis are urgently needed in order to make progress in this new field - from the mathematicians point of view. One of the main goals of this workshop is to show the path forward for current and future applied mathematical scientists, to work hand in hand across the disciplines of mathematics, physics, and atmospheric science, in order to tackle the complex problem of dynamical and thermodynamical processes associated with clouds and moisture, both from the theoretical and the applied view points.