Optimizing the operator splitting in aerosol dynamics

Supervisor: Ali Hoshyaripour, Corinna Hoose
Collaborators: Max Planck Institute of Meteorology

Introduction

Aerosol dynamics is very complex, involving various physical and chemical processes, mainly nucleation (*Nu*), condensation (*Co*), and coagulation (*Ca*). In a generalized form, aerosol dynamics equation is:

$$\frac{\partial}{\partial t} M_{3,i} = -Ca_{3,ij} + Co_{3,i} + Nu_3$$

This equation is solved using operator splitting that separates the integration into multiple fractional steps, instead of integrating all aerosol dynamic processes together in one time step dt. This efficient and powerful method is source of uncertainty in aerosol dynamic modules as various sequences and fractionations can lead to substantially different results.

Research question

Which operator splitting approach makes aerosol dynamics stable, accurate and effective?

Working plan

Step 1: Literature review, learning ICON-ART

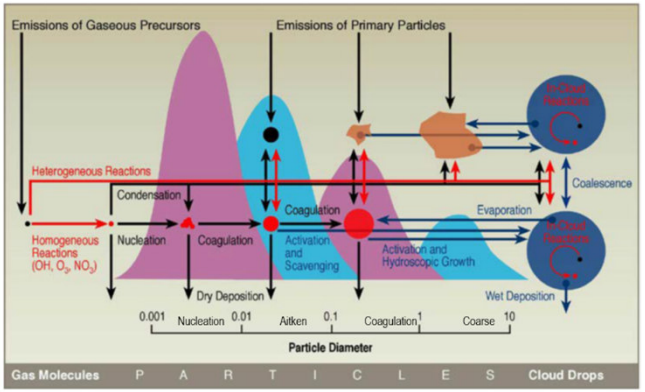
Step 2: Preparation and performing numerical experiments (volcanic eruption)

Step 3: Validation of the results, writing of thesis

Requirements

Motivation, self-organization and team work

Programming: Python (basic), shell & unix (basic)



Heintzenberg et al 2003