LadHyX Seminar — Nov. 9, 10:45

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Settling and collisions of ice crystals in a turbulent cloud

Nucleation from aerosols in clouds leads to the formation of water droplets or ice crystals of very small size. Before they become rain drops of hail particles, the size of the small droplets or crystals must grow by orders of magnitude. The problem of aggregation of droplets induced by turbulence has recently been the subject of many studies.

In this presentation, I will discuss the problem of settling and collisions of ice crystals in a turbulent environment. In the temperature range -20C < T < -10C, the shape of these crystals can be approximated by oblate spheroids. In the case, appropriate in clouds, where the size of the crystals is small compared to the size of the smallest eddies (the Kolmogorov size), the crystals orient themselves in an anisotropic way; the distribution of orientation return to isotropy when the Reynolds number increases. The settling velocity depends on the orientation of the crystals. At small Reynolds numbers, the collision rates can be understood as resulting from differential settling velocities, due to the different orientation. At higher Reynolds numbers, the random advection due to turbulence becomes dominant.