Cloud Physics

Fall 2023

Lecturer

Jong-Jin Baik, office: 501-422, phone number: 880-6990, email address: jjbaik@snu.ac.kr

Assistant

Kyeongjoo Park, office: 501-401, phone number: 880-1474, email address: kjmon121@snu.ac.kr

Lecture Contents

1. Cloud Microphysics
   nucleation, vapor diffusion, collection (coalescence, aggregation, riming), breakup, fallout, ice enhancement, melting
2. Cloud Dynamics
   buoyancy, entrainment, in-cloud rotation
3. Rayleigh-Bénard Convection
   laboratory experiments, linear stability analysis, Lorenz equations
4. Representation of Cloud Processes in Numerical Models
   explicit representation (bin and bulk), implicit representation (cumulus parameterization)
5. Recent Issues in Cloud Physics

References

1. Cloud Dynamics, 2nd edition, R. A. Houze, Jr., 2014, Academic Press, 432 pp.
2. An Introduction to Clouds, U. Lohmann, F. Lüönd, and F. Mahrt, 2016, Cambridge University Press, 391 pp.
3. Physics and Chemistry of Clouds, D. Lamb and J. Verlinde, 2011, Cambridge University Press, 584 pp.
4. A Short Course in Cloud Physics, 3rd edition, R. R. Rogers and M. K. Yau, 1989, Pergamon Press, 293 pp.
5. Microphysics of Clouds and Precipitation, H. R. Pruppacher and J. D. Klett, 1997, Kluwer Academic Publishers, 954 pp.
6. Cloud and Precipitation Microphysics, J. M. Straka, 2009, Cambridge University Press, 392 pp.
7. Atmospheric Convection, K. A. Emanuel, 1994, Oxford University Press, 580 pp.
8. Fluid Mechanics, 6th edition, P. K. Kundu, I. M. Cohen, and D. R. Dowling, 2016, Academic Press, 921 pp.
9. Bénard Cells and Taylor Vortices, E. L. Koschmieder, 1993, Cambridge University Press, 337 pp.
10. Atmospheric Chemistry and Physics, 3rd edition, J. H. Seinfeld and S. N. Pandis, 2016, Wiley, 1120 pp.

Grading

mid-term exam: 30%

final exam: 30%

homework: 30%

term-paper presentation: 10%

* homework: solving problems, reading and summarizing articles

Problems and articles will be given in the class.

* term-paper presentation: Students select their own topics related to cloud microphysics.