Clouds and Precipitation

Type of Module	Module Code
Advanced Module	AM-METCLOUD

Identification Number	Workload	Credit Points	Term	Offered Every	Start	Duration
MN-GM-METCLOUD	180 h	6 CP	1. – 3. Semester	WiSe	Winter Term Only	1 Semester

1	Course Types	Contact Time	Private Study	Planned Group Size
	a) Lectures	30 h	60 h	15
	b) Exercise	30 h	60 h	

2 Aims of the module and acquired skills

- Understanding the role of clouds for meteorology and in the climate system
- Knowledge of cloud microphysical processes
- Understanding the mechanisms for precipitation formation and efficiency
- Ability to interprete remote sensing observations of clouds and precipitation
- Understanding the links of cloud physics with dynamic meteorology, atmospheric radiative transfer and climatology.
- Computer practice for problem solving, critical assessment and discussion of scientific work presentation technique, time managagement

3 Contents of the module

- Basic overview of clouds in the atmosphere
- Thermodynamic concepts
- Homogeneous & heteorogeneous nucleation; Köhler theory
- Development of cloud droplet spectra (diffusional growth, collision-coalescence, entrainment, turbulence, breakup)
- Ice nucleation, ice crystal habits and ice microphysical processes
- Precipitation formation, thunderstorm development and life cycle, severe storms
- Modification of clouds
- In-situ measurements and remote sensing of cloud parameters including radar polarimetry
- Representation of clouds in numerical weather prediction and climate models, e.g. DWD models COSMO and ICON

4 Teaching Methods

Lectures and exercises - Excercises with compulsory attendance

5 Prerequisites (for the Module)

Formal: None
With regard to the contents: Basics of mathematics, physics and meteorology (mandatory)

6 Type of Examination

Written examination (graded).

7	**Credits Awarded** Successful participation in the exercises (50 % of the possible points have to be obtained) and passing of the examination.
8	**Compatibility with other Curricula** • Other modules of equal value can be admitted and announced by the examination board after agreement. • Suitable as an elective course for mathematics, physics and geoscience students
9	**Proportion of Final Grade** 6/114
10	**Module Coordinator** S. Crewell
11	**Further Information** **Recommended Literature:** Rogers, R. R. & M. K. Yau, 1989: "A short course in cloud physics", 3rd Edition, Butterworth- Heinemann, Int. Series in Nat. Philosophy, Vol. 113 Further Literature: Pruppacher und Klett, 1997: „Microphysics of cloud and precipitation“ AOS Library, Vol. 18, Kluwer Academic Publishers