Radiation

Type of Module	Module Code
Advanced Module	AM-METRAD

Identification Number	Workload	Credit Points	Term	Offered Every	Start	Duration
MN-GM-METRAD	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	45 h	45 h	15
	b) Exercise	30 h	60 h	

2 Aims of the module and acquired skills

- Understanding the relevance of atmospheric radiation for weather and climate
- Understanding the interaction of atmospheric radiation with atmospheric gases, aerosols, clouds and precipitation
- Basic knowledge of modern remote sensing methods
- Solving problems in atmospheric radiation and cloud physics
- Computational techniques to address radiative transfer
- Programming experience and presentation skills
- Evaluation and interpretation of radiation sensor measurements
- Critical assessment and discussion of scientific work, presentation techniques, faculity of abstraction, conceptional, analytic and logical way of thinking

3 Contents of the module

- Basic concepts and definitions, EM waves, electromagnetic spectrum
- Reflection and refraction
- Thermal emission, Planck's function, radiation laws, brightness temperature
- Absorption and scattering by atmospheric gases and particles
- Radiative transfer in different spectral regions,
- Broadband fluxes and heating rates, atmospheric radiation budget
- Measurements of atmospheric radiation, ground-based & satellite
- Remote sensing of atmospheric water vapor, clouds and precipitation.

4 Teaching Methods

Lecture, exercises (compulsory attendance)

Exercises: Task sheets for strengthening the understanding of atmospheric radiation concepts, PC-exercises on radiative transfer & heating rates determined with the COSMO model, Evaluation, interpretation and presentation of broadband short- and long-wave measurements of atmospheric radiation (surface and satellite-based), Remote sensing applications

5 Prerequisites (for the Module)

Formal: None
With regard to the contents: Basic knowledges in Classical mechanics, ordinary differential equations, Laplace equation in spherical coordinates.

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** U. Löhnert
11	**Further Information**