EF2240 Space Physics, 6 hp

Period 1

This course gives a broad overview of space physics and plasma phenomena from the Earth's vicinity and outwards; The sun and the solar wind, and how they affect the near-earth environment. The magnetosphere and ionosphere; their origin, structure and dynamics. Aurora, geomagnetic storms, substorms and space weather. The space environment around other celestial bodies. Interstellar and intergalactic plasma, and cosmic radiation. The goal of the course is also to give an orientation about modern unsolved problems and methods of space physics research, and how very simple mathematical models can be used to approximately and qualitatively understand many space physics phenomena.

Three examples of space plasmas: the sun in ultraviolet light (why not visible light?), northern lights (why is it red at high altitudes and green at lower ones?), and an interstellar cloud (what are its dimensions?)

Goals

At the end of the course you should be able to

- define what a plasma is, and classify various types of plasma.
- describe the plasma physical properties of various regions of space, with emphasis of the near-earth region.
- explain how some important plasma populations in the solar system (e.g. Earth’s ionosphere and magnetosphere) get their basic properties and how these properties can vary between the planets.
- make order of magnitude estimates of some properties of space plasmas and space physics phenomena, for example the power dissipated in the
• aurora or the magnitude of electric currents floating from the magnetosphere into the ionosphere.
• do simple analyses of measurement data from satellites and ground-based instruments. (E.g. calculate currents in space from magnetometer data.)
• make models of some space physics phenomena by applying basic physical laws expressed with simple mathematics. (An example would be to model the basic shape of the magnetosphere or estimate the temperature of a sunspot.)
• describe to interested laymen or “the man in the street” what we can learn from space physics and how it affects our everyday life (for example by various space weather phenomena.)

**Content**

The plasma state. Typical properties of space plasmas. The sun and the solar wind, and how they affect the Earth’s space environment. The magnetosphere and the ionosphere, their origin, structure and dynamics. The aurora and geomagnetic storms and substorms. Space weather. Space environment of other celestial bodies. Interstellar and intergalactic plasma and cosmic radiation. Current research topics within space physics.

**Litterature**


Lecture notes and extra hand-out material.

*The literature is free of cost!*

**Examination**

TEN1 - Examination, 6.0 cr, grade scale: A, B, C, D, E, FX, F

**Offered by**

EES/Space and Plasma Physics

**Contact**

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Academic Level (A-D): *D*
Subject Area: 
Educational Level: *Second cycle*
Grade Scale: *A, B, C, D, E, FX, F*