



GEO1343 Remote sensing

[30h+30h exercises] 5 credits

This course is not taught in 2005-2006

Language: French

Level: First cycle

Aims

Knowledge : The students will acquire a good knowledge of the different applications of remote sensing, and a capacity to decide which sensors and which image processing and interpretation methods are most appropriate for a given application.

Skills : The students will gain understanding of the bases of remote sensing and will be able to process and interpret satellite data on a given region, using a image processing software on PC. Emphasis is put on optical remote sensing for terrestrial ecosystem applications.

Main themes

Prerequisites : Notions of statistics, general physics course.

The course has three components:

- 1: The presentation during lectures of the theoretical and methodological bases of remote sensing;
- 2: The application of image processing and interpretation methods to Landsat data on a region of Belgium, using image processing software on PC;
- 3: The exploration of a large range of remote sensing applications and of the methods used in each application, on the basis of CD-ROMs demonstrating case studies.

Physical bases of remote sensing:

- Definitions: radiant energy, radiant flux, radiant flux density, radiance;
- Interactions between energy and the surface of the earth: laws of Stefan-Boltzmann and Wien.
- Spectral reflectance curves ;
- Atmospheric effects;
- Physical interactions with thermal infra-red energy.

The sensors used in remote sensing:

- Landsat MSS and TM, SPOT;
- AVHRR, Vegetation, MODIS;
- the new high spatial resolution sensors.

Image processing:

- Corrections for non-systematic and systematic geometric distortions
- Radiometric corrections
- Extraction of statistics from images
- Contrast enhancement
- Spatial filtering
- Supervised classification
- Unsupervised classification
- Classification errors estimation
- Change detection methods
- Multispectral transformations: Tasseled cap transformation; principal components analysis;
- Notions of microwave remote sensing.

Practical work:

Processing of a Landsat TM image of Belgium:

- 1st session Introduction to image processing software
- 2nd session Color composites and contrast enhancement
- 3rd session Design of a scientific project
- 4th and 5th sessions Geometric correction
- 6th session Unsupervised classification
- 7th session Supervised classification
- 8th session Accuracy assessment of classification

Other information (prerequisite, evaluation (assessment methods), course materials recommended readings, ...)

Support: Wilmet J. 1996. Télédétection aérospatiale: méthodes et applications. SIDES, Fontenay-sous-Bois, ISBN 2 86861 097 8.

Other recommended book: Richards J. 1986. remote Sensing Digital Image Analysis, Springer-Verlag, 2ème édition.

Human resources: 1 professor and 1 assistant.

Continuous evaluation based on:

- Two tests during the trimester: (i) physical basis of teledetection and (ii) image processing technique (10% of final result for each test, so 20% for both);
- two practical work reports for each processing step (30% of final result for the overall of reports);
- a work on teledetection applications: answer to several questions, based on CD-ROMs (20% of final result).

Final evaluation: based on written examination (30% of final result).