Academic Year: 2017/2018
Course: Remote sensing applied to climatology
Coordinator: António Lopes
Teaching Staff: António Lopes
ECTS: 6 Weekly Hours: 4h Typology: Theoretical / Practical classes

Contents

1. THE CLIMATE STUDIES FROM "SPACE".
   - 1.1 Definitions, concepts and physical principles and laws of Remote Sensing (RS).
   - 1.2 Time and space resolutions: a problem in regional and local climate studies.
   - 1.3 From global to microclimatic scales: examples and applications.
2. REMOTE SENSING SYSTEMS, DATA ACQUISITION AND TECHNIQUES.
   - 2.1 Platforms and sensors used in climatological studies.
   - 2.2 Techniques of climate RS (from observation to complex modelling).
   - 2.3 Thermal remote sensing.
   - 2.4 Principles of meteorological radar.
   - 2.5 Principles of nephanalysis.
3. MODELLING AND DATA ANALYSIS
   - 3.1 Image observation and contrast enhancement.
   - 3.2 Radiometric calibrations and atmospheric corrections.
   - 3.3 Image classifications, vegetation indices and biomass modelling.
   - 3.4 Algorithms and principles of exoatmospheric albedo, emissivity and Land Surface Temperatures (LST).
4. CASE STUDIES AND APLICATIONS
   - 4.1 The effect of smoke plumes from wild fires in the human health.
   - 4.2 Consequences of sandstorms on human health and agriculture.
   - 4.3 The Local Climate Zones as a tool for the urban climate and urban climate changes assessment.
   - 4.4 The Surface Urban Heat Island pattern.
   - 4.5 Experimental work with a portable thermal camera.

Objectives and skills

Objectives:
At the end of the course the students should know the physical basics of remote sensing, the methods and techniques related to the science of RS and they should be familiar with applications at different climatological scales.
Skills:
The students will recognize the potentialities and limitations of thermal and other remote sensing images; they should know how to develop a remote sensing project using software and remote sensing data; they should be able to apply several algorithms to obtain climatic parameters and integrate them in a GIS; and use a thermal camera and integrate the results in a microclimatic project.

References

Chander, G., Markham, B. L., & Helder, D. L. (2009). Summary of current radiometric calibration coefficients for Landsat MSS, TM, ETM+, and EO-1 ALI sensors. *Remote Sensing of Environment*, *113*(5), 893–903.

Fonseca, A.; Fernandes, J. (2004) – Detecção Remota, Lidel, Lisboa. 224p.

Lopes, A. (2003) - Modificações no clima de Lisboa como consequência do crescimento urbano. Vento, ilha de calor de superfície e balanço energético. Doutoramento em Geografia Física, UL (pol).

Plana-Fattori, A.; J. Caballos (1996) - Glossário de Termos Técnicos em Radiação Atmosférica. Contribuições do Instituto Astronômico e Geofísico da Universidade de São Paulo, S. Paulo, No.004: 14.

Quattrochi, D.; Luvall J. (2004) - Thermal Remote Sensing in Land Surface Processes, CRC Press, Boca Raton, Florida.

Stewart, I. D., & Oke, T. R. (2012). Local climate zones for urban temperature studies. *Bulletin of the American Meteorological Society*, *93*(12), 1879–1900.

Knowledge evaluation methods and their partial grades

Normal regime - 1 oral presentation (25% of the final grade); 2 practical works (2 x 25%); 1 theoretical and practical test (25 %).