UCL Université catholique de Louvain

LPHY2253

2015-2016

Remote sensing of climate change

5.0 credits	22.5 h + 15.0 h	2q

Teacher(s) :	Fussen Didier ;
Language :	Anglais
Place of the course	Louvain-la-Neuve
Prerequisites :	Elements of spectroscopy, optics, signal processing and inverse problems (linear algebra) are useful but not indispensable.
Main themes :	The Earth's geophysical system and the radiative transfer ; remote sensing from space ; data processing in space applications ; climatic variables and climatologies.
Aims :	To understand the general context of the geophysical frame and of the methods used in the assessment of ground and atmospheric climatic changes, with a focus on spatial techniques and applications. One aims to understand what is accessible to remote sounding from past and present experiences and to show the fundamentals of data processing. *The contribution of this Teaching Unit to the development and command of the skills and learning outcomes of the programme(s) can be accessed at the end of this sheet, in the section entitled "Programmes/courses offering this Teaching Unit".*
Evaluation methods :	Presentation (prepared) about remote sensing questions from a topics list
Teaching methods :	Lecture
Content :	-- Summary about the geophysical system and radiative transfer -- vertical structure of the atmosphere -- general atmospheric circulation, composition and chemistry -- solar irradiance and Earth's radiative budget -- light-matter interaction and multiple scattering: albedo, aerosols and clouds -- Observation methods -- observation geometry from space; emission and absorption, nadir and limb i. low altitude and sun-synchroneous orbits ii. geographical coverage and spatial resolution -- spectrometers and imagers from UV up to millimetric waves i. UV-Vis-near infrared ii. infrared iii. micro-waves -- satellite altimetry i. ocean ii. ice iii. climate -- 30 years of space remote sensing: successes and future i. SAGE-ORA ii. ENVISAT-GOMOS iii. CRYOSAT Iv. forthcoming missions et programs -- ground-based networks and space measurement validation -- Remote sensing data processing -- application domain: ranges and space-time resolution -- atmospheric corrections

	i. refraction and atmospheric turbulence ii. aerosols and spectral interferences iii. differential spectroscopy -- inverse methods in geophysics i. forward model ii. gain matrix, averaging kernel and linear problems iii. regularization techniques iv. error budget -- Climatic variables: measurements and climatologies -- state of the art for the essential climatic variables i. ESA essential climatic variables: present status ii. temporal global characterization: cycles and trends iii. climatic variable matrix and detectability b. open questions in remote sensing
Bibliography :	Aeronomy Of The Middle Atmosphere: Chemistry And Physics Of The Stratosphere And Mesosphere by G. Brasseur and S. Solomon Inverse methods for atmospheric sounding by Clive Rodgers Several general textbooks (see http://www.uclouvain.be/322260.html)
Faculty or entity in charge:	PHYS

Programmes / formations proposant cette unité d'enseignement (UE)				
Intitulé du programme	Sigle	Credits	Prerequis	Acquis d'apprentissage
Master [120] in Physics	PHYS2M	5	-	
Master [120] in Geography : Climatology	CLIM2M	5	-	