天空地井协同感知空间信息学科建设项目
杰出科学家系列学术报告（短期课程）

题目：GNSS-R：基本原理及其在陆地与海洋方面的应用

时间：2022 年 11 月 5 日下午 14:00-18:00

腾讯会议：ID：709-8243-4809

主办：中国矿业大学环境与测绘学院、天空地井协同感知空间信息学科建设项目

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加泰罗尼亚理工大学教授，IEEE Fellow。于 1993 年加入加泰罗尼亚理工大学信号理论与通信学院的电磁学与光子学研究组，担任助理教授，1997 年任副教授，2007 年任正教授。2022 年 9 月起，任阿联酋大学客座教授。主要研究工作包括：1）微波遥感，特别是利用孔径合成进行微波辐射测量（博士论文研究方向为 MIRAS 仪器，该仪器成为欧空局 SMOS 任务唯一有效载荷）；2）GNSS-R；3）射频干扰检测及去除；4）微纳卫星搭载新型遥感传感器相关研究。目前已在国际学术期刊上发表论文 250 余篇，出版著作 9 本；完成了 515 多个会议报告。Google Scholar 和 Scopus 的 h-index 分别为 58 和 46，被引用次数分别为 13611/9415 次。2020 年被斯坦福大学评为全球所有领域前 1%的研究人员。

讲座内容简介:

全球导航卫星系统（GNSS）发射的信号受到来陆地及海洋表面的强烈反射，并且陆地及海洋表面的介电常数、分层结构和表面粗糙度会改变反射信号的散射特性。已有许多技术方法被提出根据这些反射信号来反演例如海洋表面风场、土壤湿度等地球物理参数。

全球导航卫星系统反射测量技术（GNSS-R）可使用搭载在小型卫星、气球或无人机上的小型、低功率、无源的仪器进行对地观测。早期用于研究的星载 GNSS-R 数据主要来至 DMC 卫星（2003 年）、Tech Demo Sat-1（2014 年）、8 颗卫星的 CYGNSS 星座（2016 年）、欧空局 FSSCat 2x6U 立方体卫星任务（2020 年）、2 颗中国 BuFeng-1 卫星（A/B）和 Spire Global 公司携带 GNSS-R 有效载荷收集。已批准的相关卫星计划任务包括欧空局的 HydroGNSS（专注于水文监测）、中国的 FY-3E 等。此外，GNSS-R 技术也可以利用其他从 P 波段到 K 波段频率的信号（SoOp）进行对地观测。

本课程将介绍利用 GNSS 和 SoOp 反射信号对地观测的基本原理、信号处理及相关应用，重点介绍基于卫星数据的相关应用和技术方法。

Construction Program of Space-Air-Ground-Well Cooperative Awareness Spatial Information Project, Distinguished Scientist Seminar Series (Short Course)

Topic：GNSS Reflectometry: principles and land/ocean applications

Date：14:00-18:00 (BST), 05-Nov.-2022

VooV Meeting Room ID: 709-8243-4809

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Speaker: Prof. Adriano Camps
CommSens-Lab, Dept of Signal Theory and Communications, Universitat Politècnica de Catalunya; and IEEC, Barcelona, Spain.
Visiting professor at UAE University, Al Ain, Abu Dhabi, UAE

Biography: Adriano Camps joined the Electromagnetics and Photonics Eng. Group, Dept. of Signal Theory and Communications, UPC, as an Assistant Professor in 1993, Associate Professor in 1997, and Full Professor since 2007. In 1999, he was on sabbatical leave at the Microwave Remote Sensing Lab., of the Univ. of Massachusetts, Amherst. Since September 2022 he is a visiting professor at the UAE University, Al Ain, Abu Dhabi, UAE. His research interests are focused in: 1) microwave remote sensing, with special emphasis in microwave radiometry by aperture synthesis (PhD Thesis was about the MIRAS instrument which became the single payload of ESA's SMOS mission), 2) remote sensing using signals of opportunity (GNSS-R), 3) radio frequency interference detection and mitigation, and 4) nanosatellites as a tool to test innovative remote sensors. His publication record includes over 251 papers in peer-reviewed journals, 9 book chapters and the book Emery and Camps, "Introduction to Satellite Remote Sensing. Atmosphere, Ocean, Land and Cryosphere Applications," Elsevier, 2017, 860 pages), and more than 515 conference presentations. According to Google Scholar/Scopus his h-index is 58 / 46, and his publications have received more than 13611 /9415 citations. According to the 2020 Stanford ranking, he is ranked in the top 1% of all researchers in all categories.

Abstract: Signals from Global Navigation Satellite Systems (GNSS), i.e., GPS, GLONASS, Galileo and COMPASS, exhibit strong reflections from the Earth and ocean surface. Dielectric constant, layered structure, and surface roughness modify the scattering properties of the reflected signals. Different methods have been developed to retrieve geophysical data such as ocean surface winds, soil moisture, above ground vegetation, sea ice extension and type, etc.
GNSS reflectometry (GNSS-R) methods enable the use of small, low power, passive instruments, that can be boarded on small satellites, balloons and UAV's. Early research sets of satellite-based GNSS-R data were first collected by the UK-DMC satellite (2003), Tech Demo Sat-1 (2014), the 8-satellite CYGNSS constellation (2016), ESA FSSCat 2x6U cubesat mission (2020), two Chinese BuFeng-1 satellites (A/B) and several commercial cubesats from Spire Global Inc. that carry

GNSS-R payloads. Future approved missions include ESA's HydroGNSS, focused on hydrology monitoring and China's FY-3E. GNSS-R methods have also been applied to other Signals of Opportunity (SoOp) in other frequencies from P-band to K-band.

This introductory course will present the fundamental principles, signal processing and applications of GNSS and SoOp reflectometry measurements, with focus on satellite-based applications and methodologies.