

SAR Polarimetry: From Basics to Applications

Eric Pottier

Abstract

SAR polarimetry represents today a very active area of research in Radar Remote Sensing, and it becomes important to train and prepare the future generation to this very important topic.

The aim of this tutorial is to provide a substantial and balanced introduction to the basic theory, scattering concepts, systems and advanced concepts, and applications typical to radar polarimetric remote sensing. This tutorial on SAR polarimetry touches several subjects: basic theory, scattering modeling, data representations, coherent and incoherent target decompositions, speckle filtering, terrain and land-use classification, man-made target analysis, etc. This lecture will be illustrated by ALOS-PALSAR, RadarSat2 and TerraSAR-X polarimetric SAR images. The connection to polarimetric SAR interferometry (Pol-InSAR), polarimetric SAR tomography (Pol-TomSAR) and compact/hybrid polarimetric SAR will be also reviewed.

This lecture is intended to scientists, engineers and students engaged in the fields of Radar Remote Sensing and interested in Polarimetric SAR image analysis and applications. Some background in SAR processing techniques and microwave scattering would be an advantage and familiarity in matrix algebra is required.

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Eric Pottier (Fellow, 2011) received the MSc (87) and Ph.D. (90) in signal processing and telecommunication from the University of Rennes 1 and defended his Habilitation from the University of Nantes in 1998 on the topic Contribution to Radar Polarimetry: From Theoretical Approach to Applications. From 1988 to 1999 he held an associate professor position at IRESTE -University of Nantes, France where he was the head of the Polarimetry Group of the Electronic and Informatic Systems laboratory. Since 1999, he is full professor at the University of Rennes 1, France, where he was the Head of the SAPHIR team (SAR Polarimetry Holography Interferometry Radargrammetry) of the Image Processing and Remote Sensing Group from 1999 to 2011. He is presently the Head Director of the Institute of Electronics and Telecommunications of Rennes (I.E.T.R – CNRS UMR 6164) – a staff of more than 370 Professors, Associate-Professors, Assistant-Professors, Researchers and PhD Students.

His current activities of research and education are centered in the topics of analog electronics, microwave theory and radar imaging with emphasis in radar polarimetry. His research covers a wide spectrum of areas in connection with a number of different applications of Radar and SAR data. His experience is within a number of disciplines related to processing and analysis of Radar data (ISAR Target Imaging, RCS analysis and reduction, scatterer fluctuating modelisation, scatterer time-frequency analysis, SAR system modelling and simulation) and

POLSAR data (polarimetric speckle analysis and reduction, polarimetric segmentation, and classification, polarimetric theorem decomposition) to fundamentals and basic theory of polarimetry.

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