

A Review of Polarimetric SAR Algorithms and Their Applications

Jong-Sen Lee¹ Wolfgang-Martin Boerner² Dale L. Schuler¹ Thomas L. Ainsworth¹
Irena Hajnsek³ Kostas P. Papathanassiou³ Ernst Lüneburg⁴

ABSTRACT

In this paper, we provide a review of polarimetric synthetic aperture radar applications and analytical algorithms that are necessary tools for these applications. We first introduce coherent polarimetric optimization algorithms, then some for the partially coherent case, compare three frequently applied target matrix decomposition algorithms, and show their major differences. Topics of polarization orientation angle estimation and speckle filtering are also discussed and illustrated with examples. The important applications of terrain and land-use classification are described from the concept of the maximum likelihood classifier based on the Wishart distribution. In addition, recently developed techniques focused on soil moisture, surface roughness, polarimetric SAR interferometry and SAR tomography are outlined. Most of the topics discussed are interrelated, and these comparative assessments are discussed throughout this paper

¹Remote Sensing Division, Naval Research Laboratory

²University of Illinois at Chicago

³German Aerospace Center (DLR), Microwaves and Radar Institute, Pol-InSAR Working Group

⁴EML Consultants, Georg-Schmid Weg 4, D-82234 Wessling, Germany