OVERVIEW OF THE POLSARPRO V4.0 SOFTWARE
THE OPEN SOURCE TOOLBOX FOR POLARIMETRIC AND INTERFEROMETRIC POLARIMETRIC SAR DATA PROCESSING.

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1. INTRODUCTION

PolSARpro is a polarimetric SAR data processing and educational tool developed under contract to the European Space Agency by a consortium led by SAPHIR team from IETR at the University of Rennes 1, The Microwaves and Radar Institute (HR) of DLR and AEL Consultants, together with Dr Mark L. Williams.

The PolSARpro v4.0 software aims to facilitate the accessibility and exploitation of multi-polarised SAR datasets. The first objective of the current project is to provide an Educational Software that offers a tool for self-education in the field of Polarimetric SAR data analysis at University level and a comprehensive suite of functions for the scientific exploitation of fully and partially polarimetric multi-data sets and the development of applications for such data.

The PolSARpro v4.0 software establishes a foundation for the exploitation of Polarimetric techniques for scientific developments and stimulates research and applications developments using PolSAR and PolInSAR data.

2. CONTEXT AND PRINCIPAL OBJECTIVES

Due to, both, the ESA's desire to augment his collection of software packages, known as the Envisat Toolboxes, and the feedback from the Workshop on *"Applications of SAR Polarimetry and Polarimetric Interferometry"*, held at ESA-ESRIN, Frascati, Italy, on 14-16 January 2003, it was proposed to expand the existing PolSARpro software to handle data from current and future spaceborne missions (in addition to those airborne missions already supported), thus providing a comprehensive suite of functions for the scientific exploitation of fully and partially polarimetric data and the development of applications for such data.

PolSARpro v2.0 was developed under contract to ESA ("Development of a Polarimetric SAR Image Analysis Tool", ESA–ESRIN Contract n° 17863/03/I–LG). Today a new version of the sotfware (PolSARpro v4.0) is continued to be developed under contract to ESA ("Continued Development of PolSARpro Software", C.C.N to ESA–ESRIN Contract n° 17863/03/I–LG) by a consortium comprising I.E.T.R at the University of Rennes 1, DLR-HR, AELc and Dr Mark L. Williams.

The objective of the current project is to provide an Educational Software that offers a tool for self-education in the field of Polarimetric SAR data analysis at University level and a comprehensive suite of functions for the scientific exploitation of fully and partially polarimetric multi-data sets and the development of applications for such data.

The PolSARpro v4.0 Software will establish a foundation for the exploitation of Polarimetric techniques for scientific developments and stimulate research and applications developments using PolSAR and PolInSAR data.

3. SOFTWARE PORTABILITY AND DEVELOPMENT LANGUAGE

PolSARpro v4.0 Software is developed to be accessible to a wide range of users, from novices (in terms of training) to experts in the field of Polarimetry and Interferometric Polarimetric SAR data processing. For this, the tool is conceived as a flexible environment, proposing a friendly and intuitive graphical user interface (GUI), enabling the user to select a function, set its parameters and run the software. The PolSARPro v4.0 software is a complementary Toolbox to existing commercial SAR image processing packages (ENVI, PCI …) and must be considered as a Polarimetric SAR data processing software

which proposes well-established algorithms in the field of polarimetric and polarimetric-interferometric radar signal processing with high-level functionalities for in-depth analysis and for the scientific exploitation of fully and partially polarimetric data to the development of the corresponding remote sensing applications.

The PolSARpro v4.0 software proposes a graphical user interface (GUI) written in Tcl-Tk (more than 263369 lines managing 154 widget windows) and contains today around 681 C routines (279839 lines) which perform the different processing functions. All the development languages and compilers used in PolSARpro are open source and completely free. There is no use of any 4th generation programming languages (such as IDL or MATLAB) thus avoiding any licensing problem and associated cost.

The PolSARpro v4.0 software runs today on the following platforms: Windows 98+, Windows 2000, Windows NT 4.0, Windows XP, Linux I386, Unix-Solaris and tomorrow on Macintosh OS.

As the software will be made available following the Open Source Software Development (OSSD) approach, where the source code of the C Routines will be made available for free download on the Internet, it is thus possible for the users to develop additional new modules following the flexible structure of the environment. Users can easily understand how modules can be extracted from the Tool, modified and / or incorporated into their own systems. As it can be seen, the proposed open software environment approach enables the user to select a function, set its parameters and run the routine on his own system, independently of the PolSARpro environment. This approach can also encourage users to modify the routines to meet their individual requirements, and then to share the fruits of their work with other users.

4. THE POLSARPRO V4.0 SOFTWARE

The PolSARpro v4.0 software proposes a great collection of well-established algorithms and tools designed to handle and convert polarimetric data from a range of polarimetric Airborne Sensors (AIRSAR, Convair, EMISAR, ESAR, PISAR, RAMSES) and from a range of past and new Spaceborne Sensors (ENVISAT-ASAR, ALOS-PALSAR, RADARSAT2, TerraSAR X, SIRc).

The PolSARpro version 4.0 will be released in January 2009 and will be available to download free of charge (source code, elements software packages, tutorial, lecture notes …) from the ESA Web Portal (Earthnet) at: http://earth.esa.int/polsarpro. This web site provides:

- Details of the project
- Access to the tutorial and software
- Information about status of the development
- Demonstration Sample Datasets
- Recently obtained results

Currently, around 800 users are registered from 60 different countries.

A global overview of all the main and new functionalities proposed in the PolSARpro v4.0 Software will be presented during the symposium. A specific demonstration will be proposed mainly based on the validation of the ESA PolSARpro toolbox in processing the new and recent full polarimetric RADARSAT-2 and ALOS-PALSAR data sets.

5. ACKNOWLEDGMENTS