SAHARASAR: AN INTERACTIVE SAR IMAGE DATABASE FOR DESERT MAPPING. S. Lopez[1] and Ph. Paillou[1], [1]University of Bordeaux, UMR CNRS 5804 – LAB, Bâtiment B18N, allée Geoffroy Saint-Hilaire, 33615 Pessac Cedex, France (sylvia.lopez@u-bordeaux.fr, philippe.paillou@u-bordeaux.fr).

Introduction: Space-borne Synthetic Aperture Radar (SAR) allows the mapping of continental surfaces at centimetre-scale wavelengths. It is an active remote sensing technique, producing high resolution images sensitive to surface topography and roughness, and to soil water content. In hyper-arid regions, SAR is able to probe the subsurface down to several meters, revealing paleo-hydrography hidden under sandy soils [1], [2].

In 2006, the Japanese Space Agency (JAXA) launched the Advanced Land Observing Satellite (ALOS), carrying a L-band imaging radar named PALSAR. A full coverage of the Sahara and Arabia was acquired during summer 2007, delivering tens of Gigabytes of radar images. This first and unique global coverage of African deserts allowed the discovery of major paleo-rivers in Libya and Mauritania [3], [4]. The whole dataset is managed with the help of a specific tool we developed: Saharasar. It is freely accessible through a dedicated web site [5], and constitutes a unique tool for the scientific community to study the palaeo-environment and palaeoclimate of North Africa and Arabia.

Data Processing: A full coverage of the Sahara and Arabia was acquired by the PALSAR sensor, in dual-polarization mode, during June and July 2017. The 10 m full-resolution data were processed by JAXA to produce 50 m geocoded strips, which were ingested into our data processing and mosaicking software. We developed a fully automated data processing chain that produces geocoded 1° x 1° SAR scenes, which can be superposed to the corresponding SRTM (Shuttle Radar Topography Mission) topography tiles. More than 400 dual-polarization PALSAR strips were needed in order to cover the entire Saharan and Arabian deserts (Fig. 1). The final mosaic covers latitudes between 17-37°N and longitudes between 17°W and 60°E.

Saharasar: The whole PALSAR dataset is stored on a file server, and the metadata are managed in a Mysql database with spatial attributes. For the Saharasar frontend, allowing users to navigate and visualize the radar data, we initially used the Openlayers framework, and later migrated to a 3D-rendered version, using the Cesium javascript library. For the earth background layer, we use the Bing global imagery, which is proposed by default in most of Cesium applications. For the other information layers, i.e. PALSAR images, linear features extracted from radar images using gradient filtering, and hydrographic network computed from topography using Global Mapper, we installed and configured a Web Mapping Server (Mapserver), which also allows both raster and vector data display on the Cesium Globe (Fig. 2). In the future, in order to increase visualization performances, we plan to update our Mapserver version and use the Tile Map Services capabilities, in order to distribute the vector layers computed from SAR images and SRTM topography.

References: [1] McCauley J. F., et al. (1982) *Science*, *218*, 1004-1020. [2] Elachi C., et al. (1984) *IEEE TGARS*, *GE-22*, 383-388. [3] Paillou Ph., et al. (2009) *EPSL*, *277*, 327-333. [4] Skonieczny Ch., et al. (2015) *Nature Comm*., doi: 10.1038 / NCOMMS9751. [5] http://saharasar.obs.u-bordeaux1.fr/

Acknowledgments: The authors would like to thank JAXA for providing PALSAR data in the framework of the Kyoto & Carbon Protocol project. This work was financially supported by the Centre National d'Etudes Spatiales – CNES.

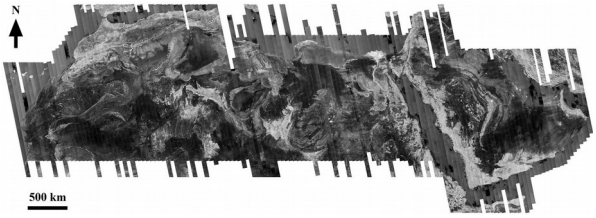

Figure 1: PALSAR strips acquired by JAXA over Sahara and Arabia during summer 2017.

Figure 2: The Saharasar interface.