



A Radarsat-2 Polarimetric Analysis Over The UNESCO Site In Danger Of Samarra (Iraq)

Nicole Dore (1,2), Jolanda Patruno (1,2), Eric Pottier (2), and Mattia Crespi (1)

(1) Sapienza University of Rome, Italy (nicole.dore00@gmail.com), (2) Université Rennes1, France (eric.pottier@univ-rennes1.fr)

This work has as goal the detection of archaeological probable buried remains and the monitoring of the external ones.

The archaeological site taken into account for this purpose is the area of the ancient octagonal city of al-Qadisiyya funded by Harun al-Rashid. This city, located in the southern part of the Samarra territory, was abandoned unfinished when the caliph moved to Raqqa (Syria) in 796 A.D. Bigness of the structures, unstable political situation and agricultural expansion threats, that let the city of Samarra be inscribed in the UNESO list of sites in danger since 2007, gave us a reason more to investigate this area.

The study was carried out with four fine quad-pol imagery of the Canadian satellite RADARSAT-2, launched in December 2007. However C-band lower capability of penetration compared to ALOS PALSAR L-band, the choice of this satellite is due to its higher spatial resolution compared to the PALSAR one. Thanks to the higher spatial resolution and the location of the site in a semi desert area, we succeeded in balancing a probable lower waves penetration.

Our analysis focused on four polarimetric images, two with a 23° incidence angle and two with a 45° incidence angle, acquired in different moments of the year 2012. The difference between the angles was motivated, respectively, by the possibility of a higher penetration of the microwaves in the ground and by the higher possibility of double bounce response in the case of presence of buried structures. The time spacing, on the other hand, allowed a temporal analysis over different months of the same year accompanied by meteorological condition available on the web for the zone.

This type of analysis, however, allowed the identification of the qanāt (the underground channel present in the northern part of the octagonal city of al-Qadisiyya) and other structures, thanks to differences visible in all the products.

The potentiality of this SAR research for archaeology is well known, in particular for those areas of the Globe where surveys in situ are not allowed because of political instability (as in the case of Samarra), or for those zones in which a cloud cover is always present and where optical satellites cannot acquire as radar does in any kind of illumination and in any sky coverage.