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Geological and geophysical investigation in the North Stelae Park of Aksum (Ethiopia) as contribution for the re-erection of the Roma Stela.

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The present work reports the main results of a geological and geophysical field surveys carried out in the Northern Stelae Park of Aksum (Ethiopia). This research is part of the environmental impact assessment for the construction site for the re-erection of the Stela n. 2 (or Roma Stela), returned from Italy in April 2005. The Aksum World Heritage site, inscribed in the World Heritage list in 1980, is characterized by impressive pre-Christian monuments, monolithic obelisks or stelae erected as mortuary structures. The project for re-erecting the Stela n. 2 in the Aksum World Heritage Site has been funded by the Italian Government after agreements between Italy and Ethiopia taken in 1947, 1956, 1997 and 2004. the Obelisk returned to Aksum in three successive flights between 19 and 23 April 2005 and a project for its re-erection in the original place has been designed and approved. In order to better characterize the site the construction site for the re-erection of the Stela n. 2 in the Northern Stelae Park of Aksum, Ethiopia different topics has been investigated. The composition of the ground, including the geological, geomorphological, hydrogeological characteristics, soil types and potential seismicity are an important aspect in the assessment of the impact of the construction site on the landscape, considered as an integral between environmental features and the historical-archaeological context. The site characterization has been performed trough scientific literature collection supplemented by borehole information. In addition to the available information a field survey was carried out to confirm information found on the various analyzed documents as well as to improve field data and mapping through two distinct scales of analysis. A medium-scale based on 1:25,000 and a site-scale analysis of the Northern Stelae Park based on a topographic

base mapping at 1:2,000 scale in order to reconstruct a detailed geology around the construction site. In order to define and identify the potential short-term impacts of the construction site, and the long-term impacts associated with the operation of landscaping of the area on local surface and underground water quality and drainage in the vicinity the main superficial water drainage system has been investigated. Geophysical survey with georadar acquisition and electrical tomography has been performed with the aim to investigate a 3-4 m depth of the underground for a better characterization of the area surrounding the site where the Stela 2 will be re-erected and to explore the sacred archaeological area of the Axum in order to detect and safeguard the unknown archaeological structures present in the area between Stela 2 and Stela 3 during the works for the re-erection of Stela 2. The georadar data were acquired with instrument commercialized by IDS Corporation. This instrument, being endowed with two channels, allowed to acquire data simultaneously along the same profile with 200 and 600 MHz antenna frequencies. Electrical tomography has been performed by means of a Seyscal Pro (IRIS) Instrument equipped with 48 electrodes. Along the same profile data with dipole-dipole, Schlumberger and Wenner spreads have been acquired. The analysis of the georadar and electrical tomography data showed a good correlation and the joint interpretation allowed to better characterize the detected anomalies. In the parking area, a depth of about 1-2m with the georadar and about 4m with the tomography have been investigated. The first meter consists of very inhomogeneous materials probably due to recent human activity in fact the sewer and the rest of the modern circular fountain are well detected. We obtained that same anomalies needs to be taken carefully in consideration due to its unclear origin; it likely can be associated to a collector or a tank. The Stelae 2 and 3 area, consists of 1.5-2.0m of inhomogeneous material, probably blocks and debris, especially the first meter. Same anomalies risulted very important since they are probably referred to structures. The joint interpretation of geophysical data, calibrated with geological field surveys, allowed to perform a potential map of risk which will be taken into account during the re-erection of the Stela 2.