SUBSIDENCE DETECTING AND MONITORING OF MOSUL DAM BY MULTI-PASS DIFFERENTIAL SAR INTERFEROMETRY USING SENTINEL 1A SATELLITE IMAGES FROM 2014 TO 2016

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ABSTRACT

It is well known that building a largest dam which holds about 11.1 cubic kilometres (2.7 cu mi) of water on soft gypsum rock, which is constantly eroding leads to catastrophic' collapse of the dam and an enormous wall of water that might sweep downstream anything in its path, together with bodies, buildings, cars, unexploded ordnances and dangerous chemicals with probably killing many thousands of people. This paper demonstrates the subsidence rate for Mosul dam from 2014 to 2016. The Differential SAR Interferometry (DInSAR) technic has been applied to review the vertical surface movement (movement of the dam body to downward), because an interferogram provides information about height variations present on the imaged surface Furthermore, the information obtained from phase difference in an interferogram can be adjusted to compensate for topography, resulting in information that can be related to very small relative movements of the dam body (centimeter or millimeter scale). Three datasets of SAR images, provided by sentinel 1A Mission, are acquired from October 16, 2014, November 28, 2015 and February 08, 2016. DInSAR data show a subsidence rate largely located within of the Dam body, with a subsidence rate from about 7–9 mm/yr within the period 2014–2015 to about 8–10 mm/yr between 2015 and 2016, The observed subsidence is likely caused by two reasons first one is related to engineering geology problems, the soluble gypsum, anhydrite, marl, and limestone beneath the dam body, each of that is soluble in water and extending to a great when Water began to run through and washout those mineral vanes after the construction of the dam, and the second reason is related to engineering problems, the continued method of grouting beneath dam body seems has never solved the matter that means grouting ineffective and should push matters to additional deterioration of the foundation layers of rocks beneath the lake similarly because the dam itself. This deterioration is probably created by the continuing grouting, which is inflicting the gypsum vanes to get larger with time, this is often an obvious by the generation of underground cavities in situ of the dissolved gypsum and therefore the movement of the big quantities of the grouting materials, wherever ground surface is showing subsidence all around the dam. based on interferometric results and geological/ geotechnical observations, the explanation of the detected subsidence permits to confirm the Collapse at Any Time so as to warn the Iraqi government and all world for creating the most effective steps to stop happen this ruinous and dramatic collapse. This result encourages us that DInSAR which is successor of sentinel 1A /SAR that allows to measure surface and dam's deformations up to millimetre accuracies and must be more useful tool for detecting and monitoring dam subsidence on long time scales when used in conjunction with geotechnical measurements and other geologic information.

Keywords: *sentinel 1a, dinsar, interferometry, subsidence, geotechnical*