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MT-InSAR monitoring of ground deformation around the Haoud Berkaoui sinkhole (SE Algeria)

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We investigate the surface displacement in the Haoud Berkaoui (Sahara, southeast Algeria) area affected by an oil well accident since 1978, using an advanced MT-InSAR analysis. Located in the Sahara oil fields the Haoud Berkaoui is an important drill where numerous wells were open to extract oil starting from 1970s. Of these, OKN32 and OKN32BIS wells collapsed due to dissolution of evaporatic rocks resulting in rapid ground subsidence and eventually a spectacular crater 320 m in diameter and 80 in deep today. We apply the Small Baseline (SB) and Persistent Scatterer (PS) InSAR approaches to retrieve deformation maps and displacement time series from ERS1 and ERS2 data acquired between 1992 and 2002. Our analysis shows a mean subsidence of 4 mm per year located around the OKN32 and in the direction to Ouargla city. We evaluate the possible propagation and the direction of the subsidence by studying the spatial temporal variation of subsidence together with the distribution of the other oil wells in the same area. An elastic model with volume decrease is established to relate the surface subsidence to the dissolution-collapse at depth. The study of this incident helps in the understanding of the subsidence process and the mitigation of further underground collapse that may affect neighboring urban areas.