



Analysis of small surface deformation in urban areas monitored by differential and PS interferometry : a pluridisciplinary approach on Butte Montmartre (Paris - France)

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Urban sites, particularly those with a differentiated relief characterized by more or less strong slopes, present usually ground deformations phenomena which might cause disorders and disturbances on constructions. This is the case of Butte Montmartre where Inspection Generale des Carrières of Ville de Paris register numerous small deformations affecting buildings specially in its southeastern part. It might be due to several geological, geotechnical, and hydrogeological processes such as landslides, compaction of manmade grounds and buried openpits, gypsum dissolution, technical quality of constructions, phreatic nappes variations. We applied herein radar differential and Persistent Scatterer interferometry to objectify, locate, characterize, quantify, and monitor those small movements. To do so, we processed and analyzed numerous images of European radar satellites (ERS 1 & 2, ENVISAT) available since 1992 up to present.

At the same time, we analyzed and modeled the geological, geomorphological and hydrogeological contexts, and the consequences of past activities that changed the natural environment: water springs, sources catchment, gypsum extraction, urban development, drainage works and strengthening of sub-soil injections, etc.

This multidisciplinary approach allow us to highlight and explain some of geological, hydrogeological and geotechnical factors causing these centimetric movements affecting Butte Montmartre buildings. Furthermore, our results will lead us to establish several geotechnical conceptual models defining more precisely the technical measures adapted to the Butte Montmartre mitigation.