

The karst phenomena of the Boukadir region (Chlef-Algeria) and their potential risks

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ABSTRACT: — There are many karstic areas around the Mediterranean basin including in Algeria. In northwestern Algeria, in Boukadir, different forms of karstic dissolutions are outcropping along the northern foot of the Ouarsenis mountain range composed of lithothamnium limestones of the Upper Miocene. About 1400m north of this calcareous mountain front, a large collapse sinkhole occurred in the Chelif Basin on June, 16th 1988 (Ourabia & Bennallal, 1989). It broke the national road RN4 that connects the Capital Algiers to the large city of Oran. Despite this large event and visible karstic dissolutions, Boukadir has not yet been classified among the karstic areas of Algeria.

In this study, we re-evaluate the karstic risk in Boukadir by using rainfall data over the last 50 years, field work, remote sensing data, geological maps (Brives, A., 1911), drilling, stratigraphic sections, geological cross-sections and petrographic analyses. We first examine the climatic conditions that prevailed during the unique occurrence of the collapse sinkhole, then we re-evaluate the geological and structural context and finally we made an inventory of the dissolution forms.

The climate analysis shows a rain deficit the year before the collapse sinkhole. Regarding the geological context, the 80 to 150 m thick Lithothamnium platform is typical of the HST-T2 phase of the Messinian that occurred 5.9 Ma ago; the calcareous sediments rest upon Upper Miocene Marine blue marl, and are overlain in the Chelif Basin by the Marine Zanclean marl (~ 5.3 Ma) (Cornée J-J & al. 2004), and younger Pleistocene continental and Quaternary alluvial sediments. The structural data highlight that the carbonate platform has varying dip from east to west in the foothills and is affected by faulting. The major left-lateral Relizane Strike-slip Fault that runs parallel to the piedmont offsets vertically the platform. Other secondary faults running parallel to the Relizane Fault also deform the carbonate platform. The outcropping limestone shows different dissolving karstic forms. The most frequent ones are interstratal dissolutions along bedding surfaces in river valleys. We observe only two large sinkholes filling by clay in study area.

Dissolution characteristics documented in the calcareous piedmont cannot explain the size of the 1988 sinkhole. We infer that this large structure must be related to the fault network of Relizane Fault zone located near the sinkhole. In conclusion, the karst risk is limited to the covered karst in front of the outcropping limestone Ouranasis that is faulted; it defines a 2 km wide band in the Chelif.

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