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Control Exerted By Rock Anisotropy On Chemical Compaction Localization In Lower Cretaceous Limestones Of The Apulian Platform (Murge Plateau, Southern Italy)

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In this contribution we present the first results of an ongoing work aimed at assessing the geological, petrophysical and mechanical factors affecting chemical compaction localization (overburden-induced pressure solution) in tight platform limestones. The products of such compaction include bed-parallel stylolites and dissolution seams, both representing structural features that may reduce the vertical permeability of the rock due to the presence of clayish insoluble residue along their surfaces.
By combining field and laboratory studies (sedimentological, structural, petrographic and petrophysical analyses, as well as laboratory experiments), the Lower Cretaceous peritidal limestones of the Bari Formation exposed at the Murge Plateau are investigated. These limestones are crosscut by bed-parallel stylolites that are more abundant (up to 10 times longer and less spaced from each other) in the microbial laminated limestones than in the other facies (micritic limestones and calcarenites). The ubiquitous presence of bed-parallel laminae within the microbial limestones is clearly inferred as the major factor controlling localization and development of the aforementioned stylolites relative to the other facies, which are more homogeneous and isotropic. In addition, the scaling relationships relative to both spacing and length of the stylolites can be expressed mathematically according to the characteristics of the different facies and the permeability anisotropy.
The results of this work are therefore consistent with a major role played by the depositional setting and, hence, by the lithological characteristics of limestones on the nucleation and development of burial-related, bed-parallel dissolution features. Considering the impact that such features may have on subsurface fluid flow, the acquired knowledge can help the management of geofluids as well as the overall prediction of carbonate reservoir quality.