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# Stylolites in carbonate rocks: morphologies and their effect on rock permeability.

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Stylolites are ubiquitous features found in sedimentary rocks.
They form due to pressure-dissolution, i.e. due to the dissolution of calcite in stressed zones, and are associated with reprecipitating material in neighboring lowly stressed ones. They accumulate slowly soluble materials as they grow.
They typically form clay-enriched plane-like structures, and the surrounding pores are often filled with precipitation material. Hence, they play an important role in modifying the transport properties of the host rock.
They can play a role in slowing down the fluid flow, owing to the porosity reduction and clay presence.
Using X-ray tomographic on stylolites, we find that some of them do not only contain clay, but also long open microscopic cracks within the clay.
The stylolites can thus both play a role of permeability barrier, and of permeability drain.

Analyzing the microstructure allows to estimate this permeability changes.

We also present the result of permeability measurements performed on calcite of the Eastern Paris basin, under isotropic confining stress. We find that up to a closing pressure, the longitudinal permeability is indeed orders of magnitudes above the transverse one, which is found to be close to the one of the intact rock.

Using naturally observed stylolite networks on outcrops, the connectivity properties can be inferred, and a macroscopic scale dependent anisotropic permeability distribution is computed.

Eventually, the morphology of the faces of natural stylolites of well logs in Bure-sur-Marne, in the eastern Paris basin, is analyzed. In addition to elements useful for permeability assessment, this morphology allows to constrain the formation stress of these stylolites, and gives indications on the deformation history of the basin.