METHOD

For experiments with gypsum, pure $CaSO_4$, $0.5H_2O$ (bassanite) powder was carefully mixed with 10% of illite, then mixed with water with the proportion of one volume of water for two volumes of powder. The mélange was let drying for more than a week at room humidity and temperature. The same preparation was used for all samples. Once dry, the solidified gypsum plaster was cut into small cubes of 1 cm of side.

For experiment with diatomite, due to the very low strength of the rock, the indenting was made perpendicular to the initial layer. Details of the geological context is given in (Pastre et al., 2004). We selected the samples that contain the minimum of ash layers. A general view of the presented indented sample is given in Fig. 5A with its initial layering.

RESULTS

As said in the text, other experiments were performed with the same layering development as the sample of gypsum plaster shown in Fig. 5B.

DISCUSSION

In natural deformation the dissolution bands are of various width. From the observations of stress-driven layering that developed in natural rock deformation, the width of the dissolution bands seems to be connected with the initial content in insoluble species: the higher the insoluble content, the weaker the localization is. Very localized structures such as stylolites develop in rocks with an initial low content of insoluble elements (Fig. 6A). Conversely, with a relatively high initial content of insoluble elements, the width of the zone of dissolution could be relatively large (Fig. 6B and 6C). However, the microstructure of the rocks could also play a role: the size of the initial heterogeneities (fossil, crystal…) or the size of the heterogeneities that develop during the deformation such a sealed voids or fractures, vein folding, etc.… (Gratier et al., 2013). The role of the initial insoluble elements could be tested by running the same type of experiments on gypsum plaster with various initial contents of illite.

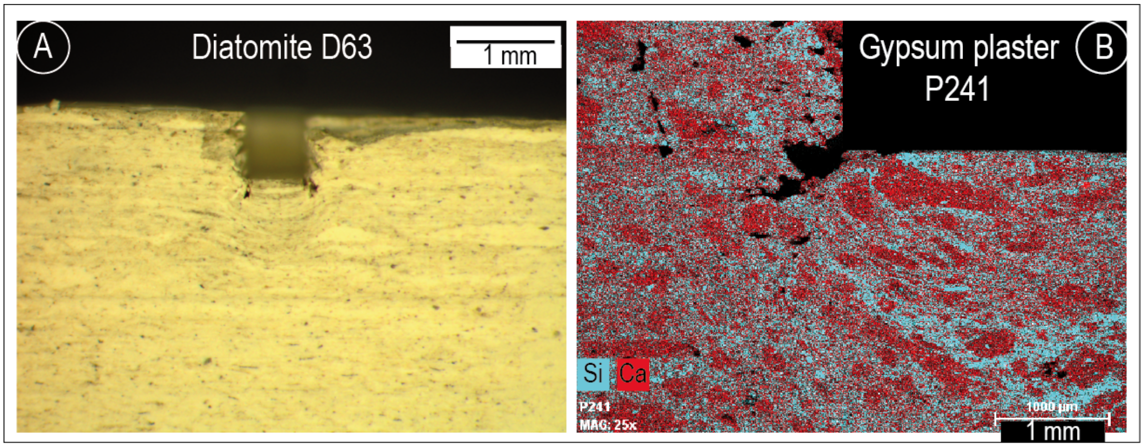

Figure DR1. A: General view of the diatomite sample presented in Fig. 3; B: SEM-EDS images of another indented gypsum plaster sample showing the distribution map of the soluble species (gypsum = Ca, red) and insoluble species (illite = Si, blue) around the indenter. The black areas correspond to voids, initial or induced by the wire sawing process.

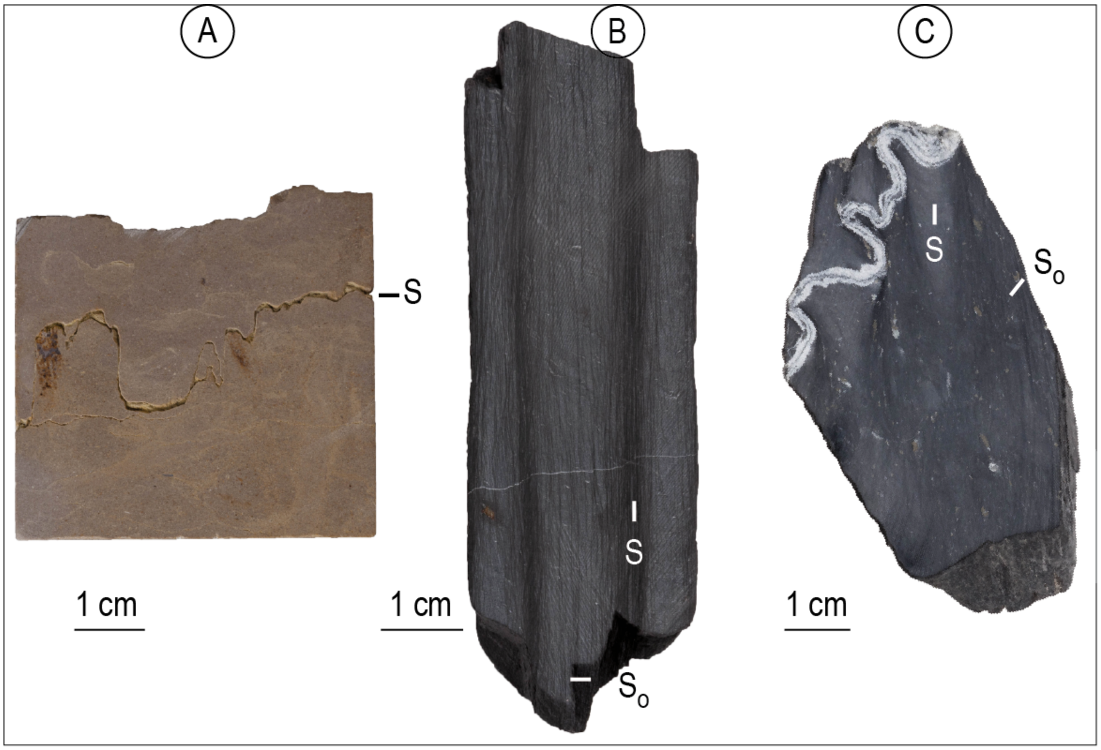

Figure DR2. Various widths of dissolution bands in layering development resulting from natural deformation in carbonate rocks: (A) stylolite (B) spaced dissolution cleavage (C) dissolution cleavage around ptygmatic fold (S = dissolution band, S_o = stratification).

Table DR1: Samples and experimental conditions for indenter experiments.

Samples	Minerals Soluble/Insoluble	Indenter diameter (mm)	Temperature (°C)	Differential Stress (MPa)	Confining Pressure (MPa)	Saturated Solution	Duration days	Figure numbers
P001 Plaster	Gypsum	1	30	6.00	0.1	water	90	1F
P213 Plaster	Gypsum /Illite	2	40	3.00	0.1	water	323	1E
P231 Plaster	Gypsum /Illite	0.6 x 4	40	4.1	0.1	water	346	1G
P012 Plaster	Gypsum /Illite	1	40	12.4	0.1	water	60	2
P241 Plaster	Gypsum/illite	5	40	2	0.1	water	335	5 (annex)
P002 Plaster	Gypsum /Illite	1	40	12.4	0.1	dry then water	20 + 20	1E
D52 Diatomite	Silica /Volcanic ash	2	150	3.6	20	NaOH M	67	1H
D63 Diatomite	Silica /Volcanic ash	0.6 x 4	150	6.1	20	NaOH M	131	3