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Microstructure preserving cryo-sampling of friable faults

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Microstructures of deformation bands and faults in uncemented, friable sediments are of particular interest, as they give insight on the mechanical and chemical processes of deformation in granular material under extremely low burial conditions. However, structure preserving sampling of the microfabric is hardly possible, as common geoscientific rock sampling techniques immediately would destroy the original pore geometries and obliterate evidence of grain fracturing or flaking.
We present two unconventional probing-methods to guarantee conservation of all original microstructures for further preparation of thin sections, admitting analysis using cathodoluminescence, electron microprobe and scanning electron microscope techniques.
During suitable weather conditions well below freezing temperature of water, we sampled coarse, friable sands by carefully sprinkling water onto the area of interest. After some few minutes, the uppermost 2-4 cm of the sample are fixated, and can oriented be removed from their position without internal destruction. In order to protect the sample during transport to the lab, it is embedded in a plaster bandage, with the top left uncovered to permit later dehydration. This way, the dried sample can be saturated with resin, enabling proper polishing for thin section preparation.
Alternatively, if climatic or weather conditions do not permit natural freezing of the samples, we used liquid nitrogen, which is available in most labs at low cost. The nitrogen can be easily held in place by an insulating cup, and causes instant freezing of a suitably sized sample. The following procedure is identical to the aforementioned method.
In summary, the microstructures observed indicate that the both sampling techniques perfectly preserve the sedimentary and deformation fabrics, and can thus be recommended for gathering of samples from friable sediments.