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"Naturally occurring asbestos" (NOA) hazard in the Alps and Corsica, France: insights from geological mapping and petrological study

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The term asbestos refers to six silicate minerals from amphibole and serpentine groups. By definition, it consists in bundles of thin and flexible long fibers, with high-tensile strength, and chemical and heat resistance. In contrast to asbestos found within commercial products and mining, the specific term "naturally occurring asbestos" (NOA) refers to asbestiform minerals occurring within rocks or soils that can be released by human activities or weathering processes. The fact that the exposure to asbestos is related to lung pathologies is now widely demonstrated (e.g. asbestosis, mesothelioma and lung cancer). However, if health risks associated with exposure to NOA exist, they are not yet well documented. The crystallization of natural asbestos occurs in specific Mg-rich lithologies associated with peculiar structural and metamorphic conditions. By recognizing and combining such specific geologic criteria, the presence or the absence of asbestos in bedrock terrains can be reasonably predicted and maps of NOA hazard can be drawn.

We present here new results of geological mapping and petrological study concerning the evaluation of the NOA hazard in the Alps and Corsica, in France. The three folds approach consists in (1) a determination of lithologies with potential NOA from a bibliographic compilation and extraction of target zones from a geological geodatabase (2) a geological mapping of the target zones followed by a petrological characterization of sampled asbestiform minerals in the laboratory (optical microscopy, TEM, SEM, and Raman spectroscopy technics), and (3) the drawing of the final map of NOA hazard, at regional-scale.

Occurrence criteria can be retained as follows:
1. NOA are abundant in the internal zones of the Alps and Corsica, especially within ophiolitic complexes. Natural asbestos are mostly concentrated within ultramafic rocks but can also occur within basic lithologies such as Mg-metagabbros, metabasalts and meta-pillow-lavas,
2. Asbestos is commonly located within fractures, shear-bands or shear-planes, developed during late retrograde metamorphic history,
3. Tremolite-actinolite-type asbestos is abundant both in ultramafic and mafic rocks,
4. Natural asbestos occur in few places within the external zones of the Alps, especially within hercynian ophiolitic massifs or concentrated in late Alpine fractures affecting leptyno-amphibolic lithologies.