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# The Asbestos Risk in Meta-Ophiolitic Rocks: A Protocol for Preliminary Field and Laboratory Investigations During Geological Mapping

# 121

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## Abstract

We report the results of preliminary field and laboratory multidisciplinary investigations developed during the geological mapping of the 1:50,000 Spigno Monferrato quadrangle (Project of Geological mapping, Regione Liguria); this study was aimed: (1) to georefer and classify meta-ophiolitic outcrops, not only on the basis of the occurrence of asbestos-bearing rocks, but also with regard to the potential risks induced by the release of asbestos fibers into the environment; (2) to test a pilot protocol for the selection and classification of the most significant asbestos-bearing outcrops in meta-ophiolitic terrains. The results indicate that asbestos minerals occur widely in serpentinite (chrysotile) and to lesser extent in chlorite-amphibole schist and amphibole-bearing metabasite (mainly tremolite, actinolite, and riebeckite). The highest asbestos fiber concentrations in the studied rocks and their potential to be released are strictly related to the tectonic fabric of the host rocks, with mylonitic and cataclastic zones representing the worst scenario. As mylonitic and cataclastic rocks along shear and fault zones are mostly foliated and brecciated, they represent critical sites for accelerated erosion. Hence, their exposure to weathering and physical erosion commonly determines the natural release of asbestos fibers and fiber-bundles that accumulate in the debris at the foot of the outcrops and in the derived soils.

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## Keywords

Asbestos • Serpentinites • Meta-ophiolitic rocks • Chrysotile • Voltri massif

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## 121.1 Introduction

In the last decades there has been a growing interest in the study of a natural-occurring asbestos, by both the scientific community (see for example Bellopede et al. 2009; Hendrickx 2009; Swayze et al. 2009; Giacomini et al. 2010; Vignaroli et al. 2011; Gaggero et al. 2013) and national and

local authorities. In fact, the outcrops of meta-ophiolitic rocks, such as serpentinites, serpentine-schists, amphibolites and chlorite-amphibole schists, can represent a significant source for asbestos fiber dispersion in air, water and soils either through natural erosion processes or excavation activities. In Italy, other than the asbestos-related laws (National Law 257/1992; D.M. 06/09/1994; D.M. 14/05/1996; D.M. 101/2003), several national and regional laws refer to the environmental health hazards induced by excavations of soils and rocks (D. Lgs 152/2006 and following modifications; D.M. 161/2012); such laws impose not only to preliminarily investigate, characterize and certify the asbestos bulk concentrations, but also to map the exposure of the asbestos-bearing rocks.

In Liguria are present some of the widest Italian meta-ophiolite outcrops, occurring either in the Alpine (i.e., Voltri Massif, Cravasco-Voltaggio-Montenotte Unit) or in the

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