

## SCIENCE

### Geology of the Villalvernia – Varzi Line Between Scrivia and Curone valleys (NW Italy)

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The External Ligurian and Epiligurian Units in the Northern Apennines of Italy are tectonically juxtaposed with the Tertiary Piedmont Basin along the Villalvernia – Varzi Line, which represents a regional scale fault zone, E-striking. Our map, at the 1:20,000 scale, describes the tectono-stratigraphic evolution of this sector that resulted from multistage faulting along that fault zone. Four main tectonic stages are defined on the basis of the crosscutting relationships between mapped faults and stratigraphic unconformities: late Priabonian – Rupelian, Chattian – early Miocene, late Serravallian – Tortonian, and late Messinian – early Pliocene. Our results demonstrate that since the late Burdigalian, the Villalvernia – Varzi Line was sealed by the gravitational emplacement of a chaotic rock body. The deposition of the late Serravallian – early Messinian succession is controlled by NW-striking strike-slip faults that crosscut to the west the Villalvernia – Varzi Line. Extensional tectonics related to regional scale N-dipping tilting characterized the late Messinian – early Pliocene time interval.

**Keywords:** External Ligurian Units; Tertiary Piedmont Basin; Villalvernia – Varzi Line; tectono-stratigraphic evolution; olistostromes

#### 1. Introduction

The Villalvernia – Varzi Line (Figure 1) is an E-striking and steeply dipping regional fault zone, separating the External Ligurian Units and Epiligurian Units of the Northern Apennines, to the North, from the Tertiary Piedmont Basin, to the South. It has controlled the early Oligocene – Miocene tectono-sedimentary evolution of this area (e.g. Boni, 1961; Di Giulio & Galbiati, 1995; Felletti, 2002; Gelati, Bruzzi, Catasta, & Cattaneo, 1974; Ghibaud, Clari, & Perello, 1985; Mosca, Polino, Rogledi, & Rossi, 2010; Mutti et al., 1995), and played also a significant role in the westward-indentation of the Adria microplate (i.e. part of the African plate) with the Western Alpine belt (see also Castellarin, 1994; Laubscher et al., 1992; Mosca et al., 2010 and reference therein). Moreover, the sector South of the Villalvernia-Varzi Line (i.e. the Borbera Grue zone of the Tertiary Piedmont Basin) represents one of the few seismic sectors of the Piedmont Region in NW Italy as shown by recent seismic events (INGV, 2007) that

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