



Large Vertical Breccia Bodies (LVBBs): an outcrop study in Cretaceous near-slope basinal carbonates of Apulia margin, Italy.

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Large Vertical Breccia Bodies (LVBBs) have been described in various rocks and depositional environments all around the world ranging from sedimentary to volcanic settings. They may have various dimensions, shapes and can be formed by a variety of distinct processes or their interactions. In the subsurface, these vertical breccias can represent pathways for the intraformational migration of the fluids by enhancing the effective porosity of the host rock and thus enhancing the flow of the geofluids and/or hosting various mineralizations that have important economic impact. In some cases, later mineralization can contrarily reduce the permeability of LVBBs with respect to the surrounding formation.

LVBBs were documented in the slope and near-slope basinal carbonates in Gargano in southern Italy. These breccias are usually restricted to interpretation on seismic sections. The documented breccia bodies are up to 50 m in diameter and extend upwards for more than 80 m in sea cliffs. The base of the breccia bodies is always below current levels of sea level, whilst the tops are mostly eroded or capped by surrounding Cretaceous carbonates. The most common formation hosting breccias is the Maiolica Fm, which is a 300 – 500 m thick succession of basinal cherty pelagic limestone intercalated with calcarenites and horizons of Mass Transport Deposits (MTDs). The MTDs in the surrounding carbonates can be correlated across the chaotic breccia bodies, indicating no significant or slight vertical offset along the margins. The laterally discordant intraformational breccias present in Gargano Promontory vary in their dimensions (decimetres to tens of meters), geometry (pipe-like to irregular shape), and texture of the sediment infill (aligned to chaotic arrangement of the clasts).

The results of this study allowed us to propose that:

- 1) the chaotic appearance of the LVBBs indicates that the collapses have been of a great magnitude; 2) the timing of the LVBBs formation is constrained at least in two periods. The passing dolomitic fluids suggest that some of the LVBBs were formed in the Lower Cretaceous, meanwhile several LVBBs in the northern part of Gargano are filled by fragments of Pliocene carbonates which suggests their younger origin; 3) there are two most plausible mechanisms for the LVBBs formation: in case of the Early Cretaceous LVBBs, their formation is most likely a consequence of the gravitational extension in the vicinity of the carbonate platform and in case of the younger breccias, solution collapses are the most likely process of their origin.