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Paleotopographic study of a rheomorphic rhyolitic welded ignimbrite: Monte Ulmus (Sardinia - Italy)

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Monte Ulmus Ignimbrite (MUI) is a high-grade, rhyolitic, welded, locally rheomorphic, low-aspect-ratio ignimbrite. Three main pyroclastic flow units (in the sense of Smith, 1960), preceded by a basal fall-out deposit (F) have been distinguished, named A, B1 and B2. Each flow unit is constituted by different lithofacies strongly related to the morphology at emplacement. Unit A is a 2 to 32 m thick, reddish to grey, fine grained, high-grade, welded ignimbrite that crops out mainly in Sant'Antioco Island. A basal vitrophyre, 30 cm thick, represents the base of unit A, overlain by a massive glassy lithofacies. These two lithofacies develop independently by paleotopography. In paletopographic lows, the main part of the ignimbrite is characterized by the presence of a rheomorphic facies with thinly spaced sheet joints and decimetric to decametric rheomorphic folds. This rheomorphic portion of unit A develops a secondary vesiculation and a granophyric crystallization style. Units B1 and B2, 5 to 52 m thick, crop out mainly in San Pietro Island and Sulcis area. They are represented by a poorly porphyritic, Quartz- and Sanidine-bearing, high grade deposit in which four different lithofacies have been described. These units are characterized by a high concentration of different, randomly oriented, juvenile pyroclasts and present rheomorphic deformation in correspondence of topographic lows. Vertical variation of textural features along MUI clearly reflect into the observed variation of bulk rock density. On topographic highs, discontinuities in the textural and physical features along the ignimbrite sequence clearly trace the transition between different flow units. On topographic lows and on gently dipping paleovalley slopes, the rheomorphic processes smoothed the discontinuities between the different flow units, locally inducing secondary vesiculation which disturbs the vertical density profile. The occurrence of coarse lithic boulders in the northern sector of San Pietro Island, and the inferred dispersal of the fall deposits at the base of the ignimbrite suggest that the source was possibly located north-northeast of the San Pietro Island.