New insight into the geometry and dynamics of Permian volcano-sedimentary sequences in the Argentera-Mercantour Massif (south-western Alps, France)

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Résumé

Permo-Carboniferous intra-mountain basins largely developed in Western Europe as a response to post-Variscan orogenic collapse and represent key archives of crustal dynamics and paleoenvironments during this major geodynamic event. This tectono-thermal episode led to a general basin-and-range type morphology with significant associated volcanic systems. If large Permian volcanic systems are known in southern France (Esterel), Corsica and Italy, only rare studies detail volcanic sequences within the French Alpine belt. Their large exposure in the Argentera-Mercantour massif offers key insights into the geodynamics of the Variscan-Alpine tectono-thermal transition. Previous studies from the 50s determined that the Permian Argentera sequences were filled of sedimentary deposits with a variable proportion of volcanic clasts, deposited in subaqueous to subaerial environment under semi-arid conditions. The geological map (at 1:100000 scale) of this basin was produced by Faure-Muret in 1955, forming a valuable resource for regional geological knowledge. It was further covered by the 1:50000 scale geological mapping program. Yet, the facies and dynamics of volcanic and volcanogenic deposits in this continental basin thus remain to be studied.
Our investigations are based on the description and integration of different facies units to better understand the volcanic and volcanogenic contexts. Most of the volcanic deposits in the Merveilles Valley consist of current surges with high-angle cross-stratification, welded ignimbrites (diffuse-bedded lapilli-tuff, massive tuff breccia, massive crystal tuff and crystal-rich cross-stratified tuff) made up of former glassy pyroclasts devitrified to microcrystalline groundmass and flattened fiammes, intercalated by massive hyaloclastite breccia deposit. These explosive eruptions have given rise to several pyroclastic density currents that are found usually embedded within the lacustrine facies (microbial green claystones alternating with bioturbated purple silts) and debris flow deposits.

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This research provides: (1) an update of the geological map (at 1:8000 scale) of the Permian series on the crystalline substrate of the Merveilles Valley, and (2) a model of the volcano-sedimentary system, controlled by syn-sedimentary normal faults and by the resultant topography inherited of the crystalline substrate. Further work will allow dating and characterizing the chemistry of this volcanic system and comparing them to the Briançonnais zone to better reconstruct late Variscan paleogeography.

Mots-Clés: South western Alps, Argentera massif, ignimbrite, Permian volcano sedimentary basin, lacustrine deposits