
Sedimentary Sandstone Dykes and Sills: Geometry and Mechanisms. Lessons from the Aptian-Albian Sandstone Dykes of the Vocontian basin, SE France. A Tribute to Bernard Beaudoin

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Résumé

Exceptional field examples of sedimentary sandstone dykes and sills are encased in the Aptian-Albian Formation of the Vocontian basin of the French Subalpine chains. They constitute superb analogues for industry, since similar sandstone intrusions have been imaged by reflexion seismic or intersected by drilling in many deep turbiditic series around the world (e.g., South Atlantic, North Sea, etc.).

Thanks to exceptional outcrops in terms of both scale and quality, as well as a well-constrained stratigraphic and paleogeographic setting, the sandstone dykes of Bevens, Lesches-en-Diois, Nyons, and Rosans provide ideal sites for field seminars or industry-academia consortia. At Bevens and Rosans, the sandstone dykes are located beneath their feeder bodies, indicating a **per descensum** (downward) sand injection, whereas those at Nyons lie above and are thus fed **per ascensum** (upward). At Nyons, the injectites are situated above and connected to a massive, channelized Upper Albian sandstone body. They form decameter-scale accumulations, either massive or composed of closely spaced dykes and sills. At both Bevens and Rosans, the injectites form complex networks of laterally developed dykes and sills below their respective feeder bodies. At Rosans, the feeder body is a deeply erosive Upper Aptian sandstone situated above a slump hundreds of meters thick, which is never cut across by the dyke network. At Bevens, this feeder is dated to the Upper Albian. Here, the dykes cut through over 150 meters of alternating Aptian-Albian marl-limestone beds in present-day configuration.

These clastic injectites appear as a typical facies of certain turbidite systems - massive, erosive, and channelized. Their morphological individual characteristics or of the network and the geometric relationships with their feeder provide valuable training pictures usefully to reservoir modelling and fluids characterization. On other hands the timing of sand injection into the fracture network and the properties of these fractures can parameterize models and simulations of the mechanical behavior of the marl-limestone massif during emplacement of the feeder bodies and these injectites. Finally, Vocontian clastic injections could be compared to other outcropping examples in locations such as California, elsewhere in France (e.g., Annot and Champsaur sandstones), Gabon, Morocco, Quebec, Sicily, and Tunisia.

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Mots-Clés: sand injection, injectite, clastic sill, clastic dyke, turbidite, massive sand, vocontian basin, France