Geophysical Research Abstracts, Vol. 8, 04809, 2006
SRef-ID: 1607-7962/gra/EGU06-A-04809

New biostratigraphic, petrographic, and sedimentological data from the Voirons massif, Gurnigel nappe, Haute Savoie, France. Implications for alpine geology

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In this paper, we review biostratigraphic, petrographic and sedimentological data recently acquired in the Voirons massif by the authors and several MS and PhD students from the University of Geneva. These data considerably modify the age, the structure, and the paleogeographic origin of this mountain range.

The Voirons massif is situated in the Chablais Prealps, Haute-Savoie, France. It belongs to the Gurnigel nappe which is thought to derive from an ultrabriançonnais or south-penninic realm. The massif includes three stratigraphic units that have been dated so far with calcareous nannofossils and dinoflagellates: the Voirons sandstones (Danian-Ypresian), the Vouan conglomerates (Ypresian-Lutetian) and the Boege marls (Lutetian-Bartonian). These units have been interpreted as deep-water turbidites and characteristically contain lithoclasts of south-alpine affinity. The Voirons massif is diversely described as one large, eastward-dipping tectonic slice, or as an imbricate structure including three slivers named, from bottom up, Branta, Saxel and Tête du Char, respectively.

During the past 10 years, we have re-examined and re-sampled key outcrops to study benthic and planktonic foraminifer assemblages, as well as sandstone petrography and sedimentology. Our biostratigraphic results are the following: the Voirons sandstones range from the Danian (planktonic foraminifera zone P2) to the late Priabonian-Rupelian (P16-20); the Vouan conglomerates span the late Priabonian and the Rupelian (P16-20); the Boege marls extend from the Bartonian to the Priabonian (P14-

17). Further, petrographic analysis of the Voirons sandstones revealed the occurrence of rare, but unmistakable fragments of diabase, similar to those found in large quantity in north-Helvetic flyschs. Finally, sedimentary structures strongly suggest that the Boege marls, contrary to the other stratigraphic units from the Voirons massif, are locally overturned.

Our new biostratigraphic data, which rejuvenate the lithologic units from the Voirons massif, and the marked petrographic resemblance between the Voirons sandstones and coeval Ultrahelvetic flysch units from the Chablais Prealps (especially the presence of rare fragments of diabase) raise the question of the paleogeographic origin of this part of the Gurnigel nappe. An internal (e.g. south Penninic) provenance can no longer be defended because of the middle Eocene closure of these basins. In conclusion, the sediments forming the Chablaisian part of the Gurnigel nappe were likely deposited in a more external paleogeographic domain, possibly the Valais domain or the innermost part of the North Alpine foreland basin. Moreover, we suggest that the Boege marls, which are slightly older than the underlying Vouan conglomerates and locally overturned, probably form an independent tectonic unit. Hopefully, our results will trigger new stratigraphic and paleontological research on the Gurnigel nappe, both in the Chablais and the Swiss Prealps, to better constrain its paleogeographic origin.