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Are the Alps an alpine-type orogeny? A multi-disciplinary mapping project

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The European Alps are a wonderful mountain belt not only due to the beauty of the landscape, but also due to its geology. There are studied for nearly 200 years and still new discoveries surprise us! Many data and knowledge are available and always remain lively debates about some basics: how many oceans were involved during the Alpine orogeny? What kind of subduction (oceanic or intra-continental) were active? How old are the subductions? …). However, due to the vast amount of knowledge accumulated over several decades, the Alps offer the opportunity to better understand mechanisms of formation of alpine-type orogeny with even more details.
Based on a vast collection of data on the Alps gathered all along more than a hundred years, this compilation also takes into account most recent works (e.g. Schmid et al., 2004; Bousquet et al., 2008, Berger & Bousquet, 2008; Handy et al., 2010; Bousquet et al., 2012a, b), this mapping project at the scale of one million covers a domain spanning from Corsica until the Vienna basin. We are acquiring and compiling geological, structural, metamorphic, geophysical and geochemical data.
Based on several maps and cross-section, we are able to evidence substantial differences in the geodynamical evolution along strike the Alpine orogeny.

The Western Alps did not reach the mature stage of a head-on colliding belt as is indicated by a continuous metamorphic evolution, representing all the subduction related processes ranging from lower greenschist to UHP conditions. All the metamorphic rocks behind the frontal thrust (Pennine front) were already exhumed to upper crustal level during ongoing oceanic and continental subduction and before collision with the external domain from around 32 Ma onwards. Hence, the Western Alps can be seen as a frozen subduction zone. Since then only exhumation by erosional processes affected the inner parts of the orogeny. The rest of the Alpine orogeny later underwent a more important collision process due to the ongoing head-on geometry of subduction and collision. It therefore often but not always shows a bimodal metamorphic evolution with two distinct P and T peaks. In the Central Alps, the thermal overprint migrated with time from the backstop in the south (32 Ma) towards the north (18 Ma). The intensity of the thermal overprint relates to the amount of crustal material incorporated to the orogenic wedge
With this in mind, this work is representative of a state of the art at a given moment, giving cause to a number of questions, and constituting therefore only a fundamental element for future discussions. From this perspective, this mapping project proposes a global approach of this Alpine belt chain

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