

THE SUBDUCTION-EXHUMATION CYCLE IN THE LIGURIAN ALPS: NEW RADIOMETRIC CONSTRAINTS FROM THE VOLTRI MASSIF AND THE TERTIARY PIEMONTESE BASIN

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ABSTRACT

We present ³⁹Ar-⁴⁰Ar dating of phengite, muscovite and paragonite of samples from the HP Voltri massif (Western Alps) and from the conglomerates of the Tertiary molasses which overlie the metamorphic basement. The phengite bearing rocks analysed display peak eclogitic and blueschist facies parageneses, locally showing complex greenschist - facies replacement textures. ³⁹Ar-⁴⁰Ar dating of white micas yielded Eocene ages interpreted as the time of different metamorphic equilibrations. In particular, high-Si phengites from eclogite clasts record a ca. 49 Ma age for the eclogite peak and ca. 43 Ma for the blueschist retrogression; phengites from a blueschist basement sample record a ca. 40 Ma for the metamorphic peak; low-Si muscovite from a metasediment dates the formation of the greenschist paragenesis at ca. 33 Ma. The internal discordance of age spectra is proportional to the chemical complexity of the micas. Our data document that the rock samples analyzed reached peak HP conditions at different times over a time - span of ca. 10

Ma. The subduction to peak blueschist conditions is in fact still going on during the exhumation of higher-pressure, eclogite-facies rocks. Our results therefore fit a tectonic model with different ophiolitic slices subducted at different moments, over a time span ranging from Lower Eocene until the Eocene-Oligocene boundary. This implies that the subduction and exhumation processes occurred simultaneously, allowing the uprising HP-rocks to escape thermal re-equilibration.

Our data require a decoupling of exhumation from erosion: exhumation was largely accomplished before significant erosion of the wedge. Initially, it was likely driven by the buoyancy effect of antigorite serpentinites; subsequently it may have been associated with the development of blueschist shear zones. Fast exhumation was not accompanied by a high uplift of the mountain chain, whose erosion and input into the sedimentary basin occurred more than 10 Ma later.

