A CONTINUOUS SUBDUCTION-EXHUMATION CYCLE IN THE LIGURIAN ALPS: NEW CONSTRAINTS FROM ^{39}Ar / ^{40}Ar DATING OF ALPINE HIGH-PRESSURE ROCKS

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The Voltri massif (Ligurian Western Alps) underwent alpine high-pressure metamorphism (550 °C, 18 - 19 kbar) and is overlain by late to post-orogenic Tertiary conglomerates. We present ^{39}Ar - ^{40}Ar dating of phengite, muscovite and paragonite of samples from the Voltri eclogite to blueschist-facies metabasites and metasediments and from eclogite clasts of the Tertiary conglomerates. We have performed a careful electron microprobe study of mineral assemblages and of mica compositional zonations to be able to link the age to the metamorphic stage. As a consequence, we interpret the resulting ^{39}Ar - ^{40}Ar Eocene ages as the time of different metamorphic equilibrations. In particular, high-Si phengites from eclogite clasts record a ~49 Ma age for the eclogite peak and ~43 Ma for the blueschist retrogression; phengites from a blueschist basement sample record ~40 Ma for the metamorphic peak; low-Si muscovite from a metasediment dates the formation of the greenschist paragenesis at ~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 ~10 Ma. The subduction to peak blueschist conditions is in fact still going on during the exhumation of higher-pressure, eclogite-facies rocks. We therefore suggest 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. 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.