HIGH PRESSURE MAFIC AND ULTRAMAFIC BODIES ASSOCIATED WITH CALC-SILICATE ROCKS – A FORMER OCEAN FLOOR SEQUENCE AND ITS EVOLUTION IN THE NORTHERN CIMA-LUNGA UNIT, CENTRAL ALPS

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The Cima-Lunga unit corresponds tectonically to the middle Penninic Adula nappe and is situated in the Lepontine gneiss dome of the Central Alps. In the region of Cima di Gagnone it consists mainly of pelitic and semipelitic gneisses and micaschists interlayered by thin bands of amphibolites and orthogneisses. These gneisses contain a suite of mafic and ultramafic lenses, some of which preserve evidence of an Eocene high-pressure subduction metamorphism (45 to 40 Ma; BECKER, 1993, GEBAUER, 1996). In the ultramafic lenses, lherzolitic and harzburgitic peridotites predominate, sometimes interlayered by dunites and, rarely, pyroxenites. Boudinaged olivine-tremolite-chlorite veins are common and sometimes show pseudomorphs of olivine and ilmenite after titanian-clinohumite. Commonly these peridotites are closely associated with metarodingites, eclogites, calcite marbles and sometimes very coarse-grained diopside calc-silicate rocks. The metarodingites normally occur as aligned boudins within the ultramafic lenses. The coarse-grained calcsilicates are sometimes discordant to primary structures in the peridotites, indicating pre-Alpine sedimentary or tectonic contacts. They often interconnect different ultramafic boudins, exhibit up to 1000 ppm Cr and 500 ppm Ni (bulk-rock analyses of diopside calcsilicates), and contain fragments of metarodingites. These rock associations are restricted mainly to a discrete zone of about 50–100 m thickness within the surrounding gneisses. The origin and pre-Alpine evolution of these rock associations is still unknown and a matter of debate.

The ultramafic lenses may represent former subcontinental or suboceanic mantle with relics of a primary mantle layering as indicated by dunite and rare pyroxenite layers.

Before subduction and Alpine deformation and metamorphism, the ultramafic rocks were probably exposed at the sea floor, where they were partially serpentinised. This can be demonstrated by the following field observations: 1) MOR-type basaltic dykes crosscut the layering at a low angle. 2) These dykes were rodingitised to different degrees during serpentinisation of the enclosing ultramafic rocks (EVANS et al., 1979). Boudinage of these rodingites could have taken place either during convergence within the partly serpentinised ultramafic rocks (anologous to the Erro-Tobbio unit, western Alps; SCAMBELLURI et al., 1995) or during subduction in recrystallised chlorite peridotites. 3) Coarse-grained diopside calcsilicate rocks containing fragments of basaltic dykes and showing elevated amounts of Cr and Ni may represent ophicarbonate breccias. These were deposited either as sediments on top of the exposed ultramafic rocks, or as fracture fillings along oceanic fracture zones. 4) Titanian-clinohumite often forms within olivine-diopside-chlorite-magnetite veins during prograde evolution of serpentinised ultramafic rocks (e.g. Erro-Tobbio, SCAMBELLURI et al., 1995; Malenco, TROMMSDORFF & EVANS, 1980). These observations suggest that the mafic, ultramafic and calcsilicate rock association found in the northern Cima-Lunga unit represents a relict Tethyan ocean floor sequence.

During Tertiary convergence this oceanic floor sequence was subducted reaching peak metamorphic conditions of 20–25 kbar and 750–800 °C in Eocene (EVANS et al., 1979). Thereby peridotitic and eclogitic rocks were strongly deformed, resulting in the formation of a »tectonic mélange« (TROMMSDORFF, 1990). Subsequently, parts of this mélange were uplifted and incorporated into the Alpine nappe pile during continent-continent collision. They have been overprinted together with the surrounding gneisses by at least three different late-Alpine deformation phases (D1 to D3; GROND et al., 1995) and partly recrystallised under amphibolite facies conditions.

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