

Doming induced by rapid exhumed serpentinite bodies in the subduction mélangé and the associated structures: a case study of the Yuli Belt in eastern Taiwan

*Jian-Cheng Lee^{1,6}, Gong-Ruei Ho^{1,6}, Kai-Hsiang Yang^{1,6}, Yuan-Hsi Lee^{2,6}, En-Chao Yeh^{3,6}, Wei Lo^{4,6}, Ching-Ho Tsai^{5,6}

1. Academia Sinica, 2. National Chung Cheng University, 3. National Taiwan Normal University, 4. National Taipei University of Technology, 5. National Dung Hwa University, 6. The Yuli Exhumation Study team (YES Team)

Based on field investigations, microscopic observations, petrological analyses, and geochronological data, this study intends to characterize the seemingly doming structures induced by the relatively higher strength serpentinite bodies surrounded by pelitic rocks in the subduction mélangé, which exhumed to the surface. Our case study is the Yuli Belt of eastern Taiwan in the Eurasian continental margin (e.g., the eastern Central Range in Taiwan). During subduction and exhumation of the Yuli Belt, the Philippine Sea plate has been approaching in the vicinity of Taiwan since the Miocene time. The Yuli belt is composed of continental margin rocks that contain high-pressure minerals (omphacite, glaucophane, garnet) with Miocene-Pliocene ages (15-10 Ma) suggesting rapid exhumation from mantle depths of 40-50 km.

We conducted detailed field surveys around the Serpentinite bodies within the Yuli belt in the Chingshui River area. We found that the km-scale-wide serpentinite bodies served as stronger competent rock bodies. So that the surrounding pelitic schist, which served as weaker incompetent rock units, shows bending or folding of the main cleavage set S2. Note that we tentatively called the main deformational composition layers S2 (for the sake of field investigations), which also developed a regional penetrative cleavage set. It is worth noting that the edge of the serpentinite bodies has formed a series of layers of metasomatism products, such as chlorite schist and talc schist. These serpentinite-edge-schist developed a dominant vertical cleavage, with orientations generally parallel or sub-parallel to the edge shape of the serpentinite body. We also commonly observed breccia deformation bands sub-parallel to the main cleavage in the serpentinite edge, implying strongly mechanical shearing has been occurred around the edge of serpentinite in contact with the surrounding pelitic schist.

The deforming and bending of the S2 cleavage (i.e., main composition layers and the most penetrative cleavage) of the pelitic schist surrounding the km-wide serpentinite bodies indicates that the pelitic rocks encountered the serpentinite bodies after they have already formed the S2-related structures, probably during the exhumation process rather than the subduction process? Finally, in the regional scale, the shallow dipping S2 (and S3) outside the serpentinite bodies reveal a dome-shape (or anticlinal-form shape) character, strongly suggesting an upward serpentinite bodies and unroofing process during the rapid exhumation of the eastern Central Range of Taiwan.

Keywords: Doming, Serpentinite, Exhumation, Yuli belt, Taiwan