Permeability and its anisotropy on creeping Chihshang Fault, Taiwan

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The Chihshang Fault in eastern Taiwan is a 20-km-long segment of the Longitudinal Valley Fault that a plate-suture boundary fault between the Eurasian continental margin and the Philippine Sea Plate has fastest shallow creep in the world and infrequently occurs earthquakes (Magnitude greater than 6). Here we performed permeability measurements on Lichi Mélange and conglomerate with an intra-vessel oil pressure apparatus (YOKO2) at room temperature at isotropic confining pressure, using helium as pore fluid. We made samples, with dip and normal direction of fault, from retrieved rock cores in WAN-2 borehole and attempted to build the permeability structure across creeping Chihshang Fault. Generally, intrinsic permeabilities of Lichi Mélange were lower than that of conglomerate and intrinsic permeabilities in dip direction were higher than that in normal direction. But the permeability differed in rock type and was associated with shear structures that fault zone architecture is not typical as simple mode suggested by Caine et al. (1996). The results show Lichi Mélange was a natural aquifuge blocking the fluid flow that may be responsible for fluid-rock interaction and seasonal fluctuation on creeping Chihshang Fault. The heterogeneous Lichi Mélange has complicated composition as other Mélange that the microstructural observation would be conducted for investigating the relationship between microstructures and permeability in creeping Chihshang Fault. Taking microstructures, permeability anisotropy and the fault zone architecture into consideration, we may depict the permeability structures of Chihshang Fault and further provide the information of matrix permeability for hydraulic properties in the field.

Keywords: creeping Chihshang Fault, Lichi Mélange, permeability anisotropy

