

## **Fault multi-activations defined by structural and geothermo-chronological approaches: Case of Yeonghae fault, Korea**

SEONGSIK HONG<sup>1</sup> HO SIM<sup>2</sup> SUNG-JA CHOI<sup>3</sup> YUNGOO SONG<sup>4</sup>

<sup>1</sup>Yonsei Univ. BK21+ institute of earth.Atmosphere.Astronomy, Seoul, Korea., [phil916@yonsei.ac.kr](mailto:phil916@yonsei.ac.kr)

<sup>2</sup>Yonsei Univ. BK21+ institute of earth.Atmosphere.Astronomy, Seoul, Korea., [simhone@yonsei.ac.kr](mailto:simhone@yonsei.ac.kr)

<sup>3</sup>Yonsei Univ. BK21+ earth.Atmosphere.Astronomy, Seoul, Korea., [yungoo@yonsei.ac.kr](mailto:yungoo@yonsei.ac.kr)

<sup>4</sup> Institute of Korea Institute of Geoscience and Mineral Resources, Daejeon, Korea., [sjchoi@kigam.re.kr](mailto:sjchoi@kigam.re.kr)

Yeonghae fault is the northern part of Yangsan fault line (YFL), and is the east segment of Yeonghae pull-apart-basin formed by sinistral movement of YFL. A combination study of field description and structural analysis, micro-textural and mineralogical analysis, and geothermo-chronological analysis for Yeonghae fault was performed to define the history developing the fault architecture. Yeonghae fault was initiated between the Paleoproterozoic biotite gneiss and the Mesozoic sedimentary rock. Attitude of the fault plane is N30°E/65°E. The fault zone consists of fault gouge zone, fault breccia zone, and fault damage zone, and each appears several times repeatedly within the whole fault width of about 200m. Moreover the most dominant slickensides in the fault zone is close to horizontal, indicating that the strike-slip movement is the main motion of the fault. The structural features occurred in each fault zone, such as fault foliation, fault drag, shear surface, were interpreted based on field observation, microtextural analysis, and 3D-SPO analysis. The results strongly indicate that Yeonghae fault has been reactivated 4 times in minimum with alternate changes of dextral and sinistral strike-slip motions, which developed the complex architecture of Yeonghae fault. Illite fundamental particle (R1 or R3 illite-smectite interstratified mineral), poorly crystalline illite (1Md), and chlorite are defined as a main authigenic fault clay in extremely fine fraction (<0.1μm) by XRD analysis for oriented-mount samples, which provide fault activation timings by using illite age analysis (IAA) and thermal histories by using chlorite geothermometry. The combined approaches reconstruct the activation histories of Yeonghae fault successfully.