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Variations in lithology, drainage, and fault geometry along the Yangsan Fault in Korea: implications for segmentation of intraplate strike-slip fault system

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The geometry of surface ruptures associated with large strike-slip earthquakes is generally complex. The complexity is mainly controlled by inherited structures, in particular crustal-scale segmentation in a given fault system. Structural discontinuities between neighboring segments play a critical role on whether an earthquake rupture propagates or terminates during earthquake slip, and hence to investigate segmentation is one of the essential tools to understand cycle models of large earthquakes. However, it is not easy to investigate segment geometry for active fault systems if there is no large earthquake involving surface ruptures during the historical period. This issue is a big challenge in assess seismic hazards for slow-moving active faults, in particular intraplate regions. Here, we test along-variations in lithology, drainage, and inherited structures along the Yangsan Fault; one of the major active strike-slip faults in Korean Peninsula, to investigate its segment geometry. Note that although stratigraphic evidences of large earthquakes have been recognized at about 20 sites along the Yangsan Fault, there were rare reports of traces of active faults based on geomorphic evidences. We analyze locations of boundaries between geomorphic patterns, such as river systems, and geologic features, such as rock types and structural patterns, along the Yangsan fault valley. The results indicate that flowing directions of streams along the fault valley are abruptly opposite at some areas. In these areas, together with geomorphic variations, geologic inheritances are also heterogeneous as follows: 1) rock types are abruptly changed, and 2) faults are structurally discontinued. The spatial correlations between these features suggest that the Yangsan fault consists of at least 13 segments in crustal-scale.