# 2D Visco-elasto-plastic numerical modeling of buckling and uplift on passive margin under compression: implications for topography of SE Korea and the East Sea (Japan Sea)

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The continental margin, which shows prominent topographical structures such as buckling, uplift, and fault, is categorized into the active and passive margins. Although the passive margins are considered geophysically stable, it is likely to be reactivated into the active margins such as subduction zone due to external forces and its own gravitational weight. Previous studies, based on geophysical observations (e.g., seismic reflection, tomography, gravity anomaly, and marine terrace uplift), suggested that the EW compression exerting on SE Korean Peninsula induced a buckling structure with ~60-70 km wavelength and uplift rate of ~0.3 m/ky. In this study, we reproduced the Korean passive margin associated with buckling and uplift structures, and found the clear correlation between the strength of oceanic lithosphere and wavelength of buckling structure. We developed the passive margin model with 2D visco-elasto-plastic finite element method in the Lagrangian manner. Due to the lack of available geophysical data for inferring rheological structure beneath the Korea Peninsula and the East Sea (Japan Sea), we performed a parametric numerical simulation with a wide range of rheology. In the reference model, the domain composed of the mantle, oceanic and continental (upper and lower) crusts is compressed horizontally by constant velocity boundary condition (i.e., ~3-6 cm/yr). The reference model exhibits a buckling structure with ~200 km wavelength on oceanic crust and uplift rate of ~0.6 m/ky on continental crust. We experimented with varying the variables using the strength of oceanic lithosphere as a variable. Our model showed that different strength of oceanic lithosphere caused the buckling with different amplitude to that of the reference model. The stronger strength of oceanic lithosphere, the buckling structure becomes bigger. We suggest that the Korea passive margin with buckling and uplift structure has developed due to the combination of young oceanic lithosphere and EW compression.

Keywords: Korean Peninsula, buckling, uplift, East Sea (Japan Sea), visco-elasto-plastic

 