SCG63-02 Room:102A Time:May 25 11:15-11:30

Glaciation and material cycling within the overriding plate wedge: Climate-tectonics interaction in the southern Alaska

KIOKA, Arata[1*] ; ASAHI, Hirofumi[2] ; WORTHINGTON, Lindsay L.[3] ; DAVIES-WALCZAK, Maureen[4] ; OJIMA, Takanori[1] ; JAEGER, John M.[5] ; GULICK, Sean S.[6] ; LEVAY, Leah[7] ; NAKAMURA, Atsunori[8] ; SUTO, Itsuki[9] ; ASHI, Juichiro[1]

[1]Dept. Ocean Floor Geosci., Atmos. Ocean Res. Inst., UTokyo, Japan, [2]Korea Polar Res. Inst., S. Korea, [3]Dept. Earth Planet. Sci., UNM, USA, [4]Coll. Earth Ocean Atmos. Sci., Oregon State Univ., USA, [5]Dept. Geol. Sci., UFL, USA, [6]Inst. Geophys., Jackson Sch. Geosci., UT Austin, USA, [7]IODP, TAMU, USA, [8]Analy. Center Envir. Study, Atmos. Ocean Res. Inst., UTokyo, Japan, [9]Dept. Earth Envir. Sci., Nagoya U., Japan

Recent studies have revealed that climatic changes had driven tectonic perturbations. Plate subduction zones in the subpolar regions, including the southern Alaska and the southern Chile margins, have experienced proximal ice-sheet advances several times during the Late Cenozoic. Glaciers are highly efficient erosive agents and their presence and extent are known to control underlying topography. However, there is little understanding of the dynamic interplay between tectonics and glaciation-deglaciation in these settings. Moreover, the relationship between plate convergence rates and taper angles in the outer wedges of these glaciated accretionary margins deviates from the strong correlation observed in other non-glaciated accretionary margins. Herein we present mechanical variations of the tapered-wedge overriding the North American plate on the southern Alaska subduction margin coupled with glacial erosion associated with the maximum extent of the adjacent Cordilleran ice-sheet around the Mid-Pleistocene Transition. Changes in the taper-wedge geometry influence material cycling and fluid distribution as well as deformation, thermal regime, and seismicity in the wedge. We estimate the geometry of the Cordilleran ice-sheet during its maximum extent using the modified 2-D Shallow-Shelf Approximation to reconstruct approximate rates of glacial erosion. The calculated glacial erosion rates are constrained by offshore sedimentary records from recent IODP Expedition 341 as well as seismic images. We find evidence that the extent of glaciation is considered to definitely affect long-term mechanics of the outer taper-wedge. The large glaciations post-MPT promote an extensionally critical state and enhances fluid and gas escape from the wedge to the seafloor. This is likely responsible for the absence of offshore mud volcanoes and bottom-simulating reflectors indicative of marine methane hydrates in the southern Alaska margin.

Keywords: Climate-tectonics interaction, Cordilleran ice-sheet, glacial erosion, taper wedge, material cycling, Gulf of Alaska