

# Non-flexure Off-Trench Intraplate Earthquakes in Subduction Zones: Expressions of Nonuniformity of Slip History along Megathrust Subduction Boundaries and an Example from Alaska

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Off-trench intraplate earthquakes not only reflect the stress effects of the downward deflection of oceanic lithosphere but also the effects of heterogeneous forces resisting slip on megathrust boundaries, particularly as they relate to differences in the chronologies of great and giant interplate thrust earthquakes in adjacent megathrust sectors of subduction systems. A case in point is the off-trench region of the Gulf of Alaska corresponding to the area of slip associated with the great 1964 Alaska earthquake. A ~N-S band of very large strike-slip earthquakes at latitude about 143.5° degrees W beginning in 1987 and an E-W region of ~E-W band of large ~strike-slip events at ~56°N (including the recent Mw 7.9 event on 23 January 2018) define an off-trench region that reflects ~trench normal slip along the 1964 megathrust. To the east, the inclined plate boundary has not slipped since 1896 and this segment represents the collision zone of the Yakutat Terrane. To the west, the instrumental record in the Semidi segment between Kodiak Island and the Shumagin Islands has not shown events that represent more than about 1 m as far back as 1788 and probably earlier (Kirby et al. 2013). Thus the region bounded by these large post-1964 off-trench intraplate strike-slip earthquakes define the downdip rupture region that slipped in 1964. We interpret these findings in light of the likelihood of time-dependent stress transfer controlled by the rheology of the offshore Pacific Plate. We also investigate similar trends among subduction systems elsewhere.

Keywords: Subduction systems, Off-trench earthquakes, Strike-slip earthquakes, Alaska