Postseismic Expansion of Aftershock Zones Following Interplate Thrust-Type Earthquakes in the Vanuatu (New Hebrides) Island Arc

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Large, interplate, thrust-type earthquakes in the northern (1966, Ms=7.7), central (1981, Ms=7.0), and southern (1980, Ms=7.2) parts of the central Vanuatu (New Hebrides) island arc all had aftershock zones that expanded in area following the mainshocks. Growth in the areas of aftershock zones has been noted for earthquakes at other convergent plate boundaries including Japan, the Aleutians, and Alaska. Detailed observations of the expansion have been obtained for three recent (1979-1981) earthquakes (Ms=6-7) using Cornell's networks of seismograph and tilt instruments. For each event the aftershocks in the first few hours defined an area that was consistent with the rupture zone for an earthquake with the observed seismic moment. The small size of the coseismic rupture zone is supported by measurements of coseismic tilting obtained near the epicenters. During the days following each mainshock, the area of the aftershock zone increased 5 to 10 times the area of the inferred rupture zone. The implied migration of stress away from the region of coseismic slip is manifested by aftershocks located both along the interplate thrust zone and in the overriding and descending plates. The growth of aftershock area (A) versus time (t) is best described by a function of the form $A(t) = A_0 \ln (kt + 1)$, which has the same form as the cumulative version of Omori's aftershock law.

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