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Introduction

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This is a companion volume to PAGEOPH's vol. 140, N. 2, 1993, and, as its predecessor, it reports recent research on seismicity, mechanics and seismic potential in shallow subduction zones around the world.

The volume opens with four papers concerning Alaska-Aleutians subduction segment, three of them presenting new inversions for two great earthquakes that ruptured that region: the 1957 Aleutian earthquake and 1964 Prince William Sound event.

All available waveform data (body, surface and tsunami waves) are included in the analysis of seismic moment, rupture area and slip distribution of the 9 March 1957 Aleutian earthquake (JOHNSON *et al.*), which is also compared to the 1986 Andreanof Islands that reruptured a segment of the 1957 rupture area.

A new seismic inversion based on *P*-wave data of the March 28, 1964 Prince William Sound earthquake follows (CHRISTENSEN and BECK), the results showing that, except the well-known, very large dominant asperity in the epicentral region, there was a second major, but smaller, asperity in the Kodiak Island area. The historical earthquake data for the region are discussed as well, and a comparison is made with the rupture process and asperity distributions of the 1957 Aleutian, 1965 Rat Islands and 1986 Andreanof Islands earthquakes.

A detailed geodetic inversion of the 1964 Prince William Sound earthquake is presented next (HOLDAHL and SAUBER). Previous seismologic, geologic and geodetic studies of the region were used to constrain the geometry of the fault surface. The inversion provides the most detailed description of the fault geometry and slip to date, consisting of a mosaic of 68 fault planes. The results suggest again a variable slip distribution with a few local maxima, one of them around Kodiak Island (but not exactly in the same place as asperity found by CHRISTENSEN and BECK).

Seismicity trends and potential for large earthquakes in the Alaska-Aleutian region are discussed next (BUFE *et al.*). Analysis of historic earthquake recurrence data and time-to-failure analysis applied to recent decades of instrumental data are used to argue for the high likelihood of a gap-filling thrust earthquake in the Alaska-Aleutian subduction zone within this decade.

The rupture process of large earthquakes in the northern Mexico subduction zone is analyzed next (RUFF and MILLER). The results include, among others, the distribution of spatial concentrations of slip (asperities) for some of the earthquakes. The overall asperity distribution for the northern Mexico segment is found to consist of one clear asperity, in the epicentral region of the 1973 Colima earthquake, and a scattering of diffuse and overlapping regions of high moment release for the remainder of the segment. This character of asperity distribution is then compared to other subduction zones, and implications for future earthquake sizes and sequences are discussed. An important contribution of this work is also the detailed description of a new method of the moment tensor rate function (MTRF) inversion, presented in the Appendix. Although the advantage of the new method is not fully utilized here because of the lack of the mechanism change during the rupture process, the method is a very useful contribution for future studies of earthquake source process.

In the following paper, deviations of slip vector azimuths of interplate thrust earthquakes from expected plate convergence directions for major world trenches are surveyed and interpreted in terms of forearc rheology (MCCAFFREY). This global study shows the variability of forearc deformation, ranging from elastic to viscous. In general, continental forearcs deform less than the oceanic ones. Attempted correlations of the apparent forearc rheology with backarc spreading, convergence rate, slab dip, arc curvature, and downdip length of the thrust contact are poor, however it is found that great subduction zone earthquakes originate in subduction segments which are more elastic (that is deviations of slip in interplate events from directions of plate convergence are small) than others.

The last paper in the present volume (BARRIENTOS) investigates the possible causal relationship between large subduction earthquakes and volcanic eruptions, exemplified by the eruption of the Puyehue-Cordón Caulle volcanic system forty-eight hours after the occurrence of the May 22, 1960 ($M_w = 9.5$) Chile earthquake. It is postulated here that the shallow extensional deformation associated with the occurrence of a large subduction earthquake alters the stress field, allowing the magma to migrate from the deep chambers toward the surface, if the particular volcano is in a mature stage of its eruptive cycle.