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EARTH STRAIN MEASUREMENTS; AMCHITKA AND ADAK ISLANDS, ALASKA

by

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ABSTRACT

Improved strainmeter instrumentation has allowed the recording of nearly continuous earth strain measurements in the Westcentral Aleutian Islands. The addition of an Automatic-Recentering Device to the transducers of the instruments has provided the improvement required so that strains of the order of 10^{-8} may be measured in an environment where strains as large as 10^{-6} may occur.

Strainmeter data for four sites are shown and discussed. The sites are on Amchitka and Adak Islands, and at each site at least 3 components of strain were measured. Weather data pertaining to the islands is also shown.

A correlation between instrumental thermal response and annual cycle of apparent strain exists. The mechanical alinement of the transducer or its placement relative to the standard of length of the strainmeter are believed to be the controlling factors in the thermal response of the instrument.

Quasi-static strain steps associated with earthquakes are detected. Post earthquake creep is offered as an explanation for the mechanism causing the quasi-static steps.

Strain episodes are shown to have durations from a few hours to several days. The beginning of a strain episode may be from 5 to 20 days prior to the more easily recognizable phases of very rapid compression followed by rapid extension. These episodes are associated with rain, most are not tectonic.

Secular strains at each strainmeter site are shown to be non-monotonic functions of time. The explanation of complex secular strains may be the existence of a time varying dislocation surface. No changes in the secular strains are found at the time of the Cannikin nuclear experiment.

Strains of the order of 10^{-8} are detected and associated with post earthquake creep. The magnitudes of strain episodes vary from a few parts in 10^{8} to a few parts in 10^{6}. Annual and secular strains vary from a few parts to several parts in 10^{6}. The time durations for these types of strains are from a few hours for the creep events to a few years for the secular strains. Therefore, both the amplitude and time recording are required to range over at least two orders of magnitude to obtain the data for this paper.

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