

Discussion of Analog Seismic Data, and (at last) an Origin Time for the First Nuclear Explosion (TRINITY)

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Radio timing services failed for the first nuclear test (TRINITY, 16 July 1945), but were available to determine the origin time of an earlier 108 ton TNT explosion, conducted nearby on 7 May, 1945. We have scanned and digitized the vertical-component analog seismograms recorded at Tucson Observatory (TUCO, at a distance of 437 km) for both events. These regional signals include Pn and Pg, and presumably Sn and Lg. We applied cross-correlation methods of analysis to the regional seismic window, finding that the faint signals of 7 May provide a satisfactory cross-correlation peak when compared with the 16 July signals. Our best estimate of TRINITY's origin time is 11:29:24.5 (GMT), good to a few tenths of a s. This result is significantly different from official reports. We give this specific result in the context of making three general points: (1) analog records are necessary to document the wide range of features of nuclear explosion seismograms; (2) modern cross-correlation methods of analysing seismograms can be effective and simple to use, in application to analog recordings of complicated weak regional seismic signals; and (3) there is merit in developing a complete list of basic parameters of historic nuclear test explosions.

E-mail

richards@LDEO.columbia.edu

Promotional text

Our work improves analysis of seismic signals from past nuclear explosions, and corrects information on the first such explosion. We apply modern methods of analysis to data from the pre-digital era, and thus enable older data to contribute to nuclear-test-ban monitoring today.

Oral preference format

in-person

Primary author: Mr RICHARDS, Paul Granston (Lamont-Doherty Earth Observatory, Columbia University)

Co-authors: Ms LOPEZ LUNA, Jocely (Columbia University); Mr SCHAFF, David (Lamont-Doherty Earth Observatory, Columbia University); Mr KIM, Won-Young (Lamont-Doherty Earth Observatory, Columbia University); Mr WILDING, John D. (California Institute of Technology); Mr EKSTROM, Goran (Lamont-Doherty Earth Observatory, Columbia University)

Presenter: Mr RICHARDS, Paul Granston (Lamont-Doherty Earth Observatory, Columbia University)

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