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Brune J N. Tectonic stress and the spectra of seismic shear waves from earthquakes. *J. Geophys. Res.* 75:4997-5009, 1970.
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An earthquake source model is derived by considering the effective stress available to accelerate the sides of the fault. The model describes near- and far-field displacement-time functions and spectra and includes the effect of fractional stress drop. The predictions of the model are consistent with observed data, provided effective stresses (those above friction) are about 100 bars, giving upper limits for ground motion during earthquakes of about 100 cm/sec in velocity and 2 g in acceleration. [The *SCI*® indicates that this paper has been cited in over 440 publications.]

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This paper was written at a time when an understanding of high-frequency radiation from earthquakes was just beginning to develop. An understanding of the radiation of low-frequency energy (wavelength long compared to source size) was already well advanced because of the application of point dislocation theory by T. Maruyama,[1] K. Aki, and others, and in particular because of the application of the concept of seismic moment by Aki.[2] Understanding high-frequency radiation also required overcoming more formidable obstacles because of the complexity in both earth structure and the rupture process.

My interest in writing the paper was stimulated by discussions with Horst Stockel, a graduate student, in connection with his qualifying examination at the California Institute of Technology (Caltech) while I was in the process of moving from Caltech to the University of California, San Diego (UCSD). The qualifying exam identified many of the uncertainties about source physics of earthquakes, but it left me with the feeling that there should be a simple way to get approximate answers for the radiated spectrum for frequencies higher than the corner frequency (wavelengths shorter than the source dimension).

For a year or so after my move to the Institute of Geophysics and Planetary Physics, UCSD, I had minimal administrative and departmental responsibilities and minimal phone interruptions, which allowed me to concentrate fully on what seemed to be the most exciting problem in seismology.

A useful result was obtained by relating the waveform and radiated energy to the effective stress (stress available above the frictional resisting stress). I subsequently discovered that the initial step in relating the near-fault ground velocity to the stress drop and shear-wave velocity had been performed earlier by H. Jeffreys.[3]

Further development of some of the ideas in the paper required extensive field measurement of high-frequency radiation from many earthquakes, and this is, in part, why there have been many references to the paper in the literature: the data it contains have been compared to actual data in numerous papers, including several by me and my students, which were published in the succeeding years with the advent of high-quality digital field recordings of earthquakes.[4,5] Recognition of the importance of understanding high-frequency radiation in estimating the ground motions expected during large earthquakes[6] and of the consequent need for design requirements for sensitive structures, such as hospitals and nuclear power plants located in seismically active areas, were other developments.

Since I am an experimental seismologist, I thought of the paper as primarily providing a framework for designing field experiments and not as a rigorous theoretical development. But in the process of writing the paper, I became more and more excited about its implications and was eager to share it as soon as possible. This urgency, coupled with my general lack of ability in rigorous mathematics, led to several minor errors in the publication, which were pointed out by others and corrected in a subsequent publication.[7]

One of the controversial alternative mechanisms of the paper, the "partial stress drop" mechanism, is a topic of current interest; some direct observational support for this alternative was obtained from the recent devastating Mexico earthquake of September 19, 1985.

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2. **Aki K.** Generation and propagation of G waves from the Niigata earthquake of June 16, 1964. Part 2. Estimation of earthquake moment, released energy, and stress-strain drop from the G wave spectrum. *Bull. Earthquake Res. Inst.* 44:73-88, 1966. (Cited 165 times.)
3. **Jeffreys H.** *The Earth: its origin, history, and physical constitution.* Cambridge, England: Cambridge University Press, 1962. 438 p. (Cited 1,020 times.)
4. **Tucker B E & Brune J N.** Source mechanism and m_b—M_S analysis of aftershocks of the San Fernando earthquake. *Geophys. J. Roy. Astron. Soc.* 49:371-426, 1977. (Cited 25 times.)
5. **Fletcher J, Haar L, Hanks T, Baker L, Vernon F, Berger J & Brune J.** The digital array at Anza, California: processing and initial interpretation of source parameters. *J. Geophys. Res.* 92:369-82, 1987.
6. **Trifunac M.** Stress estimates for the San Fernando, California, earthquake of February 9, 1971: main event and thirteen aftershocks. *Bull. Seismol. Soc. Amer.* 62:721-50, 1972. (Cited 35 times.)
7. **Brune J N.** Correction. *J. Geophys. Res.* 76:5002, 1971. (Cited 125 times.)