High-Frequency Shear Wave Generation at Pre-existing Cracks[1]

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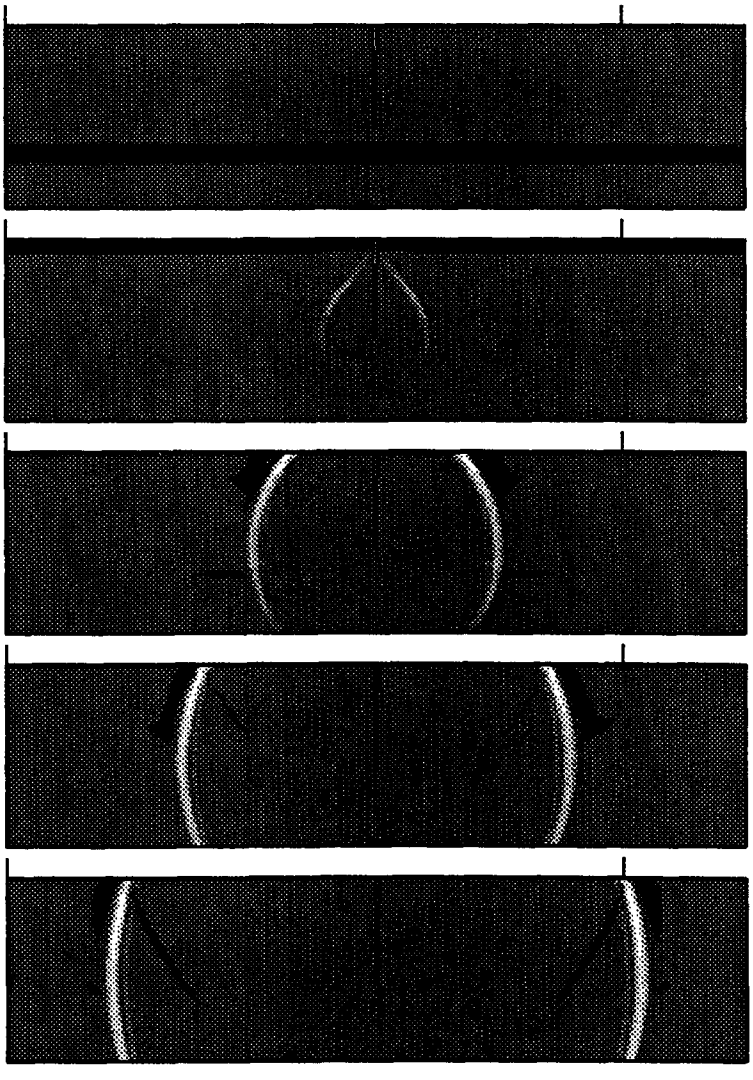
Recent observational studies indicate that, relative to decoupled explosions, tamped explosions tend to have a larger high-frequency L_g /P ratio. Discrimination using such ratios is promising, and yet little is known about the basis for this discriminant. Improved fundamental understanding of the reasons this discriminant may be successful is desired. A plausible explanation offered by Blandford (1995) is that tamped explosions generate more high-frequency S waves due to the cracks in the source region.



Simple linear finite-difference [LFD] calculations have been conducted to test the hypothesis whether a non-growing radial fracture can cause strong P-to-S scattering in the source region. In this experiment, the free-surface boundary (*i.e.*, von Neumann) conditions (*cf.*, Jih *et al.*, 1988) were actually applied to the crack walls. The needle tip radiates S waves as if it was a point shear source. Thus the *"cracking theory"* seems to be able to provide a physical justification for the discrimination using high-frequency S/P ratios. Follow-up research shall utilize both linear and non-linear calculations to explore the seismic coupling near the source, where pre-existing cracks nucleate new fractures which granulate the rock. Results obtained under several federally funded projects shall be integrated as well.

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