A numerical investigation of seismic waves propagated through anisotropy in the fault zone

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Seismic anisotropy, varying velocity with the propagation direction, have developed our understandings for the physical properties around the fault zone. Anisotropic media is an inherent feature in the Earth and the distortion of seismograms due to the existence of them is reported in many observations.

We investigate influences of anisotropy on the seismogram at stations around the fault zone. We build the synthetic seismograms in a homogeneous transversely isotropic medium between isotropic half-space. The transversely isotropic model has symmetric properties around a single axis, and this model is the most common type of anisotropy. We perform the computations by propagator matrix method for a buried strike slip dislocation source. This procedure is appropriate for the case in which subsurface structure is divided by uniform layers. In this study the structure consists of the fault zone including the alignment of cracks and the surrounding host rock.

The response of the wavefield for crack densities 0.02, 0.06 and 0.1 in Hudson's (1981) crack model shows that the travel times and the phases are strongly altered by the presence of anisotropy. These variations mainly depends on the percent of anisotropy and the offset from the fault. Nearly around the fault, especially on the orthogonal component to the strike of the fault the seismogram are significantly effected by the slow S-wave structure. Our results indicate one possibility that the observations and modeling of anisotropic waves are one of tools to detect the fault zone.