Your Name

Instructor Name

Course Number

Date

Seismic Waves

During certain earthquakes (subduction zone quakes), the seafloor can jolt suddenly upwards, and it creates a ridge of water on the ocean’s surface. This ridge of water collapses to either side, creating tsunami waves (and troughs) that move rapidly and engulf the land. On the oceanic side (because subduction zones are usually parallel to land), the waves can travel across the ocean and cause havoc in places on the other side of the ocean, as evidenced by the 2004 Indian Ocean tsunami. “P” wave is the primary wave (compressional wave) and “S” wave is secondary wave (shear wave). When an earthquake happens, P wave and S wave will be moving away from the epicenter. P wave will travel faster than S wave (Castro and Munguia). These waves are recorded on seismograph at a particular station and the difference in arrival time between P & S wave can be used to determine distance from the station to the epicenter of an earthquake. Both P and S waves are formed as a result of the earthquake, and the only thing that distinguishes P wave from S wave is the mode of propagation (Castro and Munguia). The mode of propagation could either be shear or compression. As far as the properties are concerned; it can travel not only through liquids but also the solids. However, S wave can travel through rigid crust of earth only moves slower than that of a P wave.

When seismologists locate earthquakes, they compute the quadruple of numbers that represent the hypocenter. These are origin time and the three coordinates: x, y, and z. The epicenteris just the projection of the hypocenter on the earth’s surface and discards origin time and depth information. One of the assumptions seismologists use, while locating the earthquake, is that the source structure can be represented by a simple summation of impulse forces (such as a double-couple point source) (Ide and Takeo). Seismologists also assume that the origin times for both compressional and shear waves (P and S waves) are the same. Finally, seismologists assume or at least hope, that the event is confined to both a limited hypo-central region and a limit time interval (Ide and Takeo). These assumptions work much better for small, local events than for mega-events. Analysis of true global events is done in painstaking detail on an individual basis.

**Works Cited**

Castro, R. R., and L. Munguia. “Attenuation of P and S Waves in the Oaxaca, Mexico, Subduction Zone.” *Physics of the Earth and Planetary Interiors*, vol. 76, no. 3–4, 1993, pp. 179–187.

Ide, Satoshi, and Minoru Takeo. “Determination of Constitutive Relations of Fault Slip Based on Seismic Wave Analysis.” *Journal of Geophysical Research: Solid Earth*, vol. 102, no. B12, 1997, pp. 27379–27391.