



Observability of Multiply Reflected P Waves

Michel Foundotos (1) and Guust Nolet (2)

(1) University of Nice (Sophia Antipolis), Geosciences Azur, France (foundoto@geoazur.unice.fr), (2) University of Nice (Sophia Antipolis), Geosciences Azur, France (nolet@geoazur.unice.fr)

In order to constrain the shallow structure of the Earth in global tomography, Love and Rayleigh waves are often used. However these waves are mostly sensitive to the S wave velocity structure. P-wave energy is either evanescent, or leaking away at every surface reflection that generates an S wave which travels much deeper into the mantle. For that reason, to study the shallow P velocity structure of the Earth, we need to study P-waves at regional distances if a good seismic station coverage is available. Otherwise we can use multiple P reflections at teleseismic distance when regional data are not available (as in the oceans for instance). The major aim of this work was first of all to ensure that these multiply reflected P waves can adequately be observed in real data and also to investigate how many reflections at the surface these reflected waves can still be seen and to investigate how strongly the amplitude of multiply reflected P diminishes because of energy loss into S waves.

For this study we are comparing the synthetic predictions computed with a Spectral Element Method for a spherically symmetric earth (Nissen-Meyer et al, 2007) with observed data. Attention will be made on Synthetics with and without oceanic reflection points and compare these with observations. We used 300 events recorded (90000 seismograms) from the dense network of US ARRAY, which allows us to make a very large number of observations. Our study shows that three times reflected PPP waves are very well observed for epicentral distances > 60 degrees and for events with

$M_w > 5.5$, despite the ray-theoretical prediction that at certain distances almost all of their compressional energy is converted to shear waves. However, the four times reflected PPPP waves do not appear everywhere clearly. PPPP can be observed for epicentral distances > 90 degrees.