Finite frequency kernel for seismic velocity structure under the Japanese Islands

Seiji Tsuboi[1]; Masayuki Obayashi[2]; Junko Yoshimitsu[3]

[1] IFREE; [2] IFREE, JAMSTEC; [3] JAMSTEC,IFREE

Recent progress in large scale computing by using Spectral-Element Method and the Earth Simulator have shown their possibilities in full-waveform inversion of seismic structure. Specifically Liu and Tromp (2006) has shown that it becomes feasible to compute finite frequency kernel for seismic velocity structure based on adjoint method. Here we show the examples of finite frequency adjoint kernels for seismic velocity structure under Japanese Islands. We use SPECFEM3D with 484 CPUs of SGI Altix cluster system of JAMSTEC to calculate finite frequency kernel, which is accurate up to 6 second. We use one chunk simulation of SPECFEM3D and set up the chunk size with 45 degree by 45 degree. We chose the earthquake, which occurred on June 3, 2002 in Bonin Islands, and compute kernel for stations in continent China to see sensitivity of raypaths along the structure under the Japanese Islands. Adjoint kernel requires one forward simulation and backward simulation. Each simulation can be achieved within 2 hours of CPU time with SGI Altix cluster. However it is necessary to save the absorbing boundary conditions after the forward simulation, which requires hundred megabytes of disk space. We will discuss feasible resolution of the finite frequency kernel by using the state of the art super computer, such as the Earth Simulator, to perform inversion for the seismic velocity structure under the Japanese Islands.