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Can3

Purpose

Assess the precision of modeling in a layered halfspace (with a constant gradient in material properties in the layers) with a wavefield generated by a single vertical force at the free surface and a point DC source in depth. The two sources produce considerably different wavefields. The three layers represent the layering below the TST station in the 3D Mygdonian basin model IV2 of the E2VP-I project.

Coordinate System

Right-handed Cartesian, *x* positive North, *y* positive East, *z* positive downward, all coordinates in meters.

Grid

The original reason for performing additional simulations for the set of canonical models is to clarify the differences between solutions submitted by teams for the Mygdonian basin model. Therefore the simulations for the canonical models have to be performed using the spatial discretizations used for simulating the submitted E2VP-I solutions. In particular, because the three layers represent the layering below the TST station in the 3D Mygdonian basin model IV2, the spatial discretization for the Can3 model should be identical (or, if really inevitable, at least as close as possible) with the one used originally at the TST site.

New participants of the E2VP-II may design their spatial discretization with respect to the requirement on the frequency range – see the section below.

Minimum vertical size of the model = 5000 m

Material Properties

3 vertically constant-gradient elastic horizontal layers over a homogeneous halfspace

H [m]	v_p [m/s]	v_s [m/s]	density [kg/m^3]	Q_p	Q_s
17.3	1500-1600	200-250	2100	Inf.	Inf.
72.5	1600-2200	250-500	2100-2130	Inf.	Inf.
115.6	2200-2800	500-900	2130-2250	Inf.	Inf.
Inf.	4500	2600	2600	Inf.	Inf.

Tab. 1 Material parameters

Source = 2 sources acting together

Source 1
Single vertical force (positive downward) at the free surface, $\vec{f} = (0, 0, s)$. Taking the epicenter as the origin of the coordinate system, the source is at (0, 0, 0) m. The force time history is s(t) = A D(t), where $A = 5 \cdot 10^{11}$ and D(t) is a band-pass filtered Dirac pulse given in the file single_force_for_Can2_Can3.txt.

Source 2
Point double-couple.
Strike 22.5˚, Dip 90.0˚, Rake 0.0˚ ($\Phi_S = 22.5°, \quad \delta = 90°, \quad \lambda = 0°$)
$M_0 = 10^{18}$ Nm .
The moment time history is given in file moment_time_history_for_Can2-Can5.txt. It is the time integral of the Dirac pulse D(t) defined above.
Source depth = 3 000 m. Taking the epicenter as the origin of the coordinate system, the source is at (0, 0, 3 000) m.

Receivers

- one surface profile in the direction of the grid line/Cartesian axis x; receiver spacing is 100 m
- one surface profile in the direction of the grid/Cartesian xy-plane diagonal; receiver spacing along the diagonal is 100 m
- maximum epicentral distance: 5 km
- one vertical profile at distance of 1000 m from epicenter along the x-axis; the profile spans the free surface and the bottom of the grid; receiver spacing is 50 m
- one vertical profile at grid point (707.1, 707.1 ,0) m on the xy-plane diagonal; the profile spans the free surface and the bottom of the grid; receiver spacing is 50 m

The receiver positions are specified in the file rec_coordinates_for_Can2_Can3.txt

Time Window

Time window for all receivers is 0 – 40 s.

Frequency Range

Note for those who did not participate in the E2VP-I simulations for the I2c model: the simulation for I2c was required to be accurate enough up to 4 Hz.

Output Information

Time histories of particle velocities (in meters/sec) for all receivers.
Required time step is 0.05 s.

To ensure uniformity in any comparison, do not apply any additional filtering to time series apart from the specified source function.

Reference Solution

DWN (Hisada's code).