



## Backing up tsunami source profile using wave-form inversion along a wave ray

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There are several ways to determine the initial tsunami wave profile at source. Alternative methods are still on demand as direct measurements are not available.

Deep-ocean tsunami detectors (tsunameters) make it possible to obtain tsunami-wave time series right after the wave has reached the detector. For the coastal area of Japan with only 5 optimally located detectors, it takes at most 10 minutes after an earthquake to acquire tsunami-wave time series. Methods for computation the tsunami wave kinematics can help determine location of the source area (initial water surface displacement) and its center where the maximum water level elevation has taken place. The profile of the initial surface displacement can be approximately determined with the help of a one-dimensional wave-form inversion along tsunami wave rays. During the tsunami travel-time computation, a number of wave-ray traces connecting tsunami source and tsunameters can be defined. The inverse one-dimensional tsunami propagation along these wave rays (in the frame of the shallow-water differential model) is to be numerically simulated. The time in this computation must be inverted. As the initial conditions (Cauchy data), time-series obtained at tsunameter should be taken. The initial time is the moment when the wave has reached the tsunameter. Calculations must be stopped when time has reached the zero value. Wave profile at that point of time will be proportional to the approximate cross-section of the initial water surface displacement. Magnification coefficient (to account dissipation within 1D model) can be determined from the wave-ray tube divergence. Method was preliminary tested with the available deep-ocean actual tsunami records.