2011年東北地方太平洋沖地震津波の遠地DARTデータに基づく海面変位の津波インバージョン
Tsunami inversion for sea surface displacement from far-field DART data of the 2011 Tohoku tsunami

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We re-examined the 2011 Tohoku tsunami source using far-field DART data, which was not used in previous waveform inversions. Only near-field stations around Japan were used in most inversion studies of the 2011 tsunami. Although the number of available tsunami gauges such as tidal gauge, ocean-bottom pressure gauge and DART increased after the 2004 Indian Ocean tsunami, most tsunami gauges are coastal gauges and DART gauges in the deep ocean are still fewer. For an accurate and reliable tsunami waveform inversion, the azimuthal coverage of stations is important. For a better station coverage, tsunami waveforms recorded at far-field stations must be utilized.
Problems that prevented to use far-field tsunami data in inversion were travel time-delay and polarity reversal of tsunami waveforms recorded at far-field stations. However, Watada et al. (2014, JGR) proposed a phase correction method, which corrects the tsunami waveforms simulated by solving the linear shallow water equations into a dispersive waveform which accounts for the effects of elastic tsunami loadings on the Earth, compression of seawater, and gravitational potential change associated with tsunami propagation. With the phase correction method, we are able to use the waveforms recorded at far-field stations and attain more azimuthally complete result in waveform inversion.
We apply the phase correction method to synthetic linear long waves and use those phase-corrected far-field waveforms together with near-field waveforms in the inversion. We re-examined the result of 2011 Tohoku earthquake tsunami. Both single time window and multiple time window inversion are performed. The poor azimuthal coverage of near-field stations are replenished by far-field stations. Because the previous studies used abundant near-field (< 2 hour traveltime) data of 2011 Tohoku tsunami, effects of additional far-field stations is limited.
Fig. (a) Far-field stations (red dot) used in this research, reverse triangles are for near-field stations. (b) Inversion result of simultaneous movement after adding far-field stations.

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