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Title: Time Reversal applied to Ionosphere seismology

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of the Office of Naval Research



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Time Reversal applied to ionosphere seismology

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Monitoring tsunami with ionosphere signals

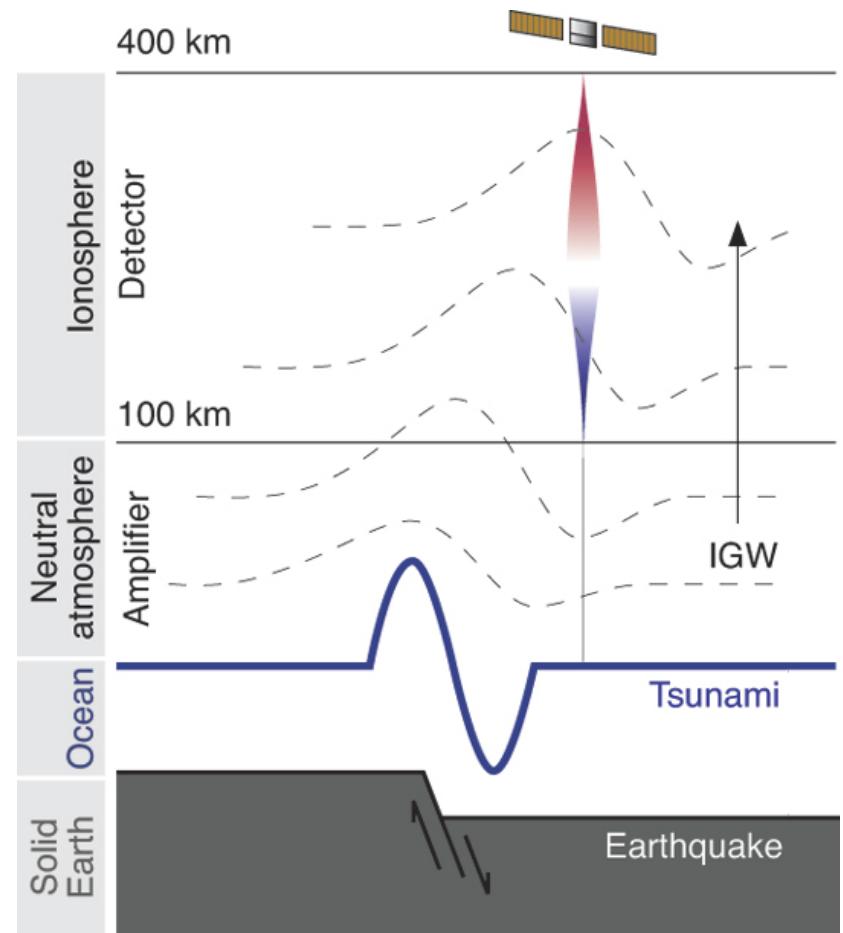
Effort in the last decades to go from observations to physics model from the ground to space.

Observations

Pioneering work by the Canadian atmospheric physicist Colin Hines (1970s), Ionospheric Doppler sounding (Artru et al., 2004); total electron content (TEC) along the satellite-receiver line-of-sight (Rolland et al., 2010); Airglow (Maleka et al., 2011)

Modeling

Rayleigh wave Lognonné et al., 1998, Artru et al., 2001, Rolland et al., 2011a; explosion-generated acoustics waves Dautermann et al., 2008, Lognonné, 2008; tsunami gravity waves Artru et al., 2005, Occhipinti et al., 2006, Occhipinti et al., 2008, Occhipinti et al., 2011; ionospheric/neutral waves coupling Kherani et al., 2009, Rolland et al., 2010



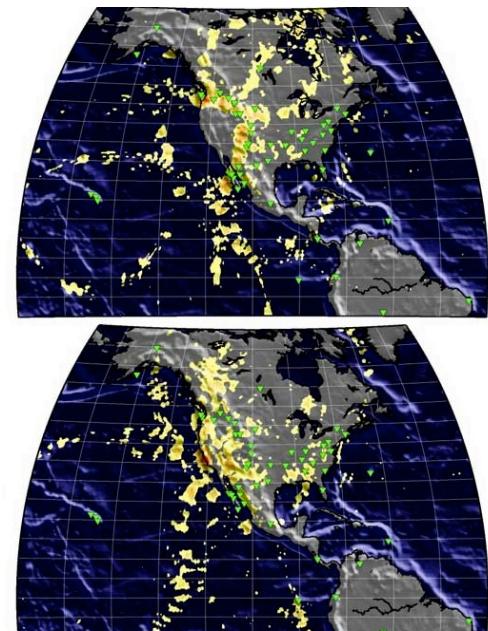
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Our project

Inversion of ionosphere signals to get detect tsunami (i.e. estimate of the wave height)

Using Time-Reversal thanks to newly developed modeling capability and High-Performance computing resources at LANL.

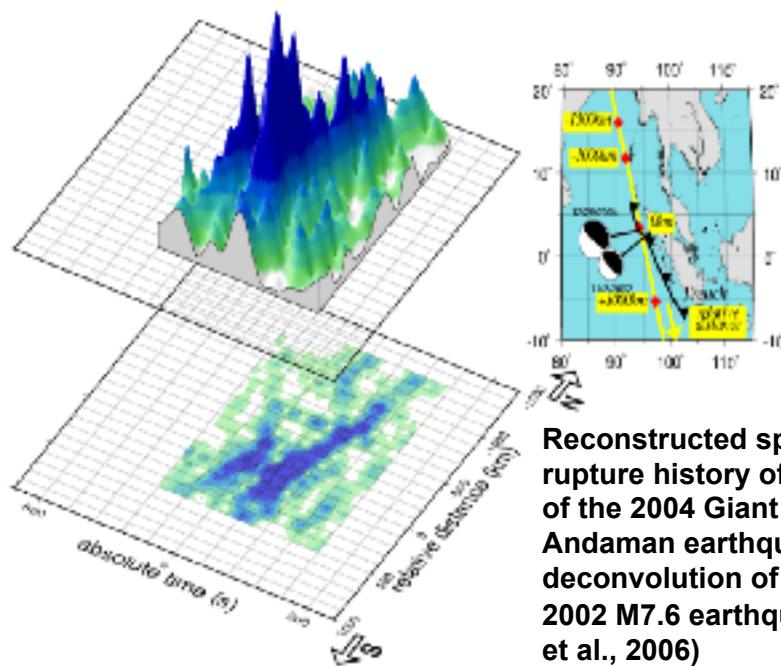
Time Reversal Reconstruction



TR reconstruction of the 2004 Parkfield earthquake (e.g. Larmat et al., 2010)

absolute value of the displacement

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Reconstructed space-time rupture history of the rupture of the 2004 Giant Sumatra-Andaman earthquake with deconvolution of the Nov. 2, 2002 M7.6 earthquake (Larmat et al., 2006)

Work done so far

- **Work of Other agreement : ongoing work**
- **Proposal to ask CPU-hrs at LANL submitted January 20th.**

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