

Remote Sensing for Tsunami Research and Early Detection

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ABSTRACT

This study discusses how tsunamis form from earthquakes and how remote-sensing technologies can be used to detect tsunami scales. According to the conventional theory, tsunamis are formed by the vertical deformation of the seafloor during undersea earthquakes. However, our recent studies contradict to the established theory. We will first show evidence—based on GPS displacement measurements, satellite-inferred gravity changes (fault movements), radar altimeter data, and seismic inversions—that the momentum transferred by the horizontal motions of continental slopes is the major force of tsunamis. The tsunami propagation patterns, in three historical cases, are shown to be controlled by the horizontal slope motions with asymmetric features with both leading elevation waves and depression waves, best explained by the horizontally-forced mechanism. We will then demonstrate how remote sensing in conjunction with the new theory can be used effectively to detect tsunami genesis and its energy scales for early warnings.