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Tsunami warning systems for the Indian Ocean: Efficient use of tide gauge stations

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The catastrophic Sumatra tsunami of December 26, 2004 killed about 300,000 people in 13 countries around the Indian Ocean. This event revealed an extremely high risk for tsunamis for the highly populated coasts of the Indian Ocean and the necessity for an Indian Ocean Tsunami Warning Service. Tsunami waves from the December 26 Earthquake arrived on the coasts of India, Sri Lanka, and the Maldives within two-three hours of the main shock, and on the coast of Somalia after about seven hours. Tens of thousands of lives might have been saved in these regions had a Tsunami Warning System been in existence. The Pacific Tsunami Warning System is based on seismological information, coastal tide gauges and a few bottom pressure stations located in the open ocean close to the potential tsunami source areas. A similar system is supposed for the Indian Ocean. Open-ocean island and bottom pressure stations may play key roles for such an early tsunami alarm. We propose an efficient approach to optimizing the emplacement of tsunami warning stations for the coasts of India and Sri Lanka. For an arbitrary tsunami source location, it is possible to estimate a *safe warning time* as the time delay between the wave arrival at a specified coastal site and the warning station. In particular, a warning station located on the Nicobar Islands would provide about a 2-hour warning for the coasts of East India and Sri Lanka for earthquakes originating off Indonesia, while a warning station on Minicoy will provide optimal warning time for earthquakes in the West Indian Ocean.