A Tsunami Local Alarm System

The tsunami early warning system covering the Pacific has saved thousands of lives in the past, and no one questions the value of establishing similar systems to protect people living along the coasts of other oceans. However, these systems have their limitations. Based upon a limited number of deep-sea buoys, reporting abnormal changes of the sea level, the wave's travel time to the nearest buoy may be considerable. Therefore seismic recordings of sub-sea earthquakes are instead used as input. The problem is that this makes it very hard to determine whether a tsunami was in fact generated. Most often a tsunami is not generated, and subsequently most tsunami warnings turn out to be false.

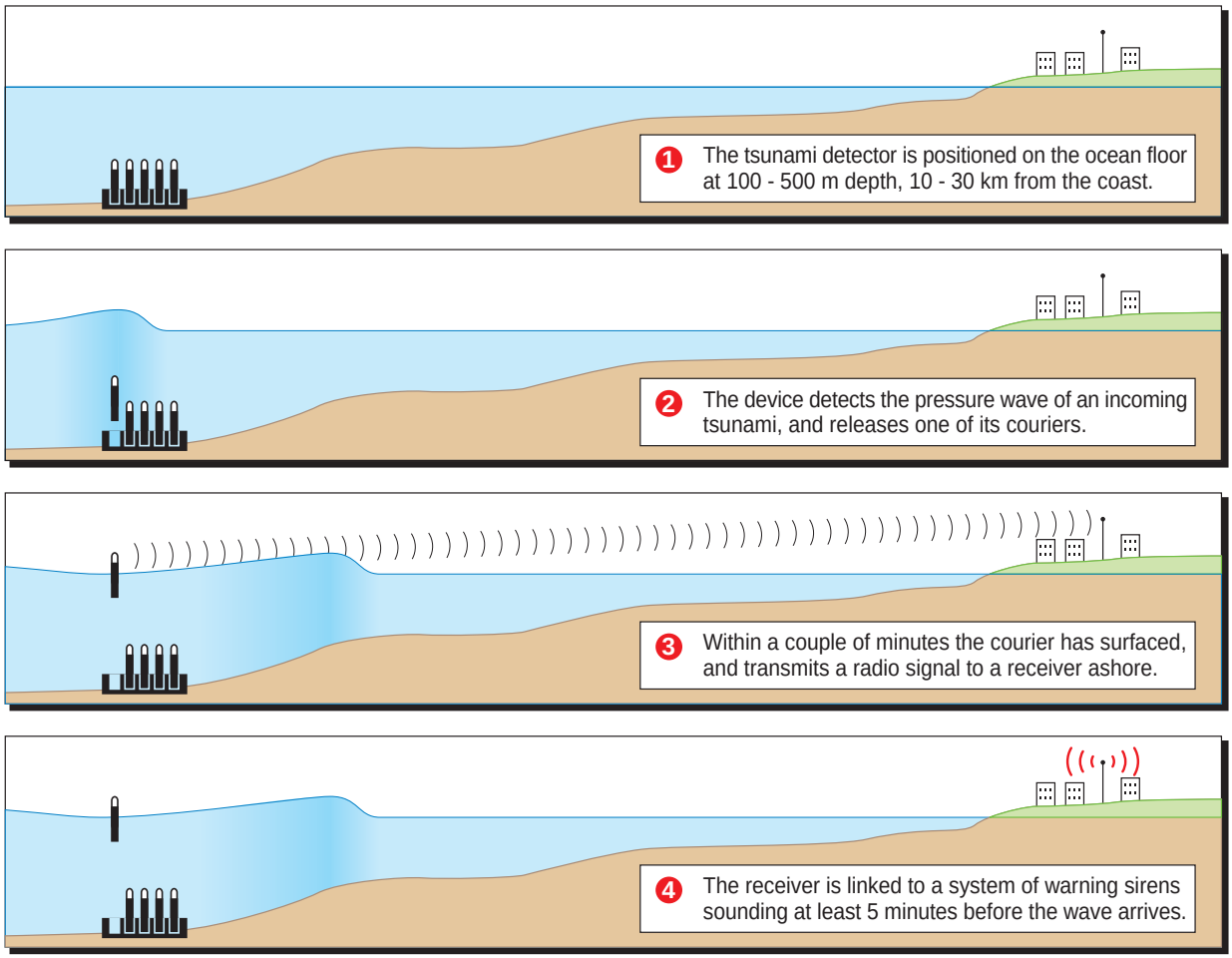
Time is another issue. As tsunamis are often generated by earthquakes close to a coast, the concept of ”early warning” is irrelevant to the nearest towns and villages. The wave will reach shore before the local people can be warned, especially in countries where communication systems are poorly developed. The city of Banda Aceh, for instance, was hit by the destructive tsunami of 2004 within 25 minutes after the earthquake occured. An early warning system in place in the Indian Ocean back then may well have saved tens of thousands of lives in Sri Lanka, India and Thailand, but for the residents of Banda Aceh and other cities close to the quake along the west coast of Sumatera the warning would have come too late.

There are many coasts with the same geological conditions, where continental plates are colliding and where tsunamis can strike shortly after an earthquake. Coastal communities in the USA, Canada, Mexico, Chile, Japan, the Solomon Islands, Puerto Rico, Italy, Greece and Turkey have all had their tsunami catastrophies in the past, and will sooner or later be struck again.

Therefore, I have developed an idea about a **Tsunami Local Alarm System**, as a complement to early warning systems. The idea is to put a detector onto the ocean floor ca 10 - 30 kilometres off the coastline, preferably in the vicinity of towns, ports, hotels, public beaches etc. Depending on local bathymetric conditions, the depth should be approx. 100 - 500 metres. When a tsunami passes over the device, it will be recognised by the detector due to the increase in water pressure. The device then releases a ”courier” that ascends to the surface. A radio signal is transmitted to a receiver ashore, which in turn triggers a system of warning sirens along the beaches. Of course, the information will also be transmitted to a warning center, enabling them to broadcast warnings to more distant places.

Positioned at a sufficient distance from the coast the device will make the sirens sound at least 5 minutes before the arrival of the wave, giving people some valuable time to react. And when the sirens sound, people know that a real tsunami is approaching, not just a possible one. In a feasibility study the Swedish Meteorological and Hydrological Institute (SMHI) made a number of calculations for different bottom profiles. One of these is shown below. In this case the device has to be positioned at a distance of at least 17 kilometres from the coast, at a depth of 250 metres, to give the desired alert time of 5 minutes (indicated by the vertical red line).

POSTAL ADDRESS	VISITING ADDRESS	TELEPHONE	FAX & E-MAIL	REG.NO.	POST GIRO	BANK GIRO
Box 98 820 64 NÄSVIKEN Sweden	**Forssåindustrial estate 820 64 NÄSVIKEN**	**+46 650 30140 +46 70 3330140**	**+46 650 305 30 sigurd@noaq.com**	**SE 520421-5619 01**	**42 29 85 - 2**	**763 - 6848**



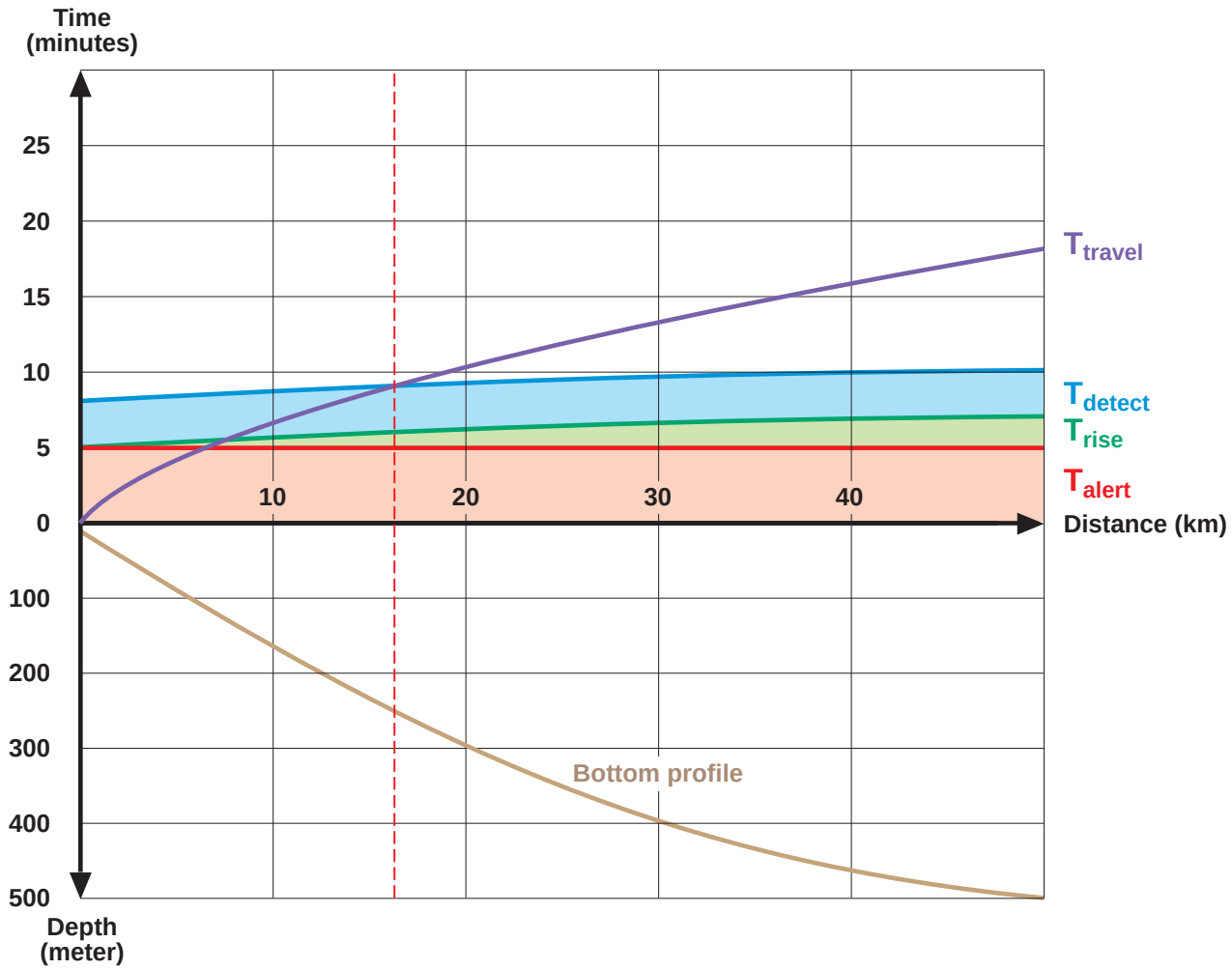
To be able to test the device and the system regularly, the detector is instructed to change its criteria for ”dangerously big tsunami” at predetermined times, for instance twice a year. Thus reacting for any change in water pressure it will almost immidiately trigger an (intentional) false alarm. Having done this it returns to its normal instructions.

The device itself consists of a pressure gauge, a signal detector, a battery and a set of couriers. The hardware will be relatively simple to manufacture, much cheaper than the existing deep-sea buoys. One reason is that it is much easier to measure water pressure at 100 - 500 metres depth than at 5,000 metres. It will also need a minimum of maintenance, as it will dwell in the calm environment of the ocean floor, unaffected by weather, storm waves, seaweeds and pirates.

A Swedish patent has been granted for the system and international patent applications have also been filed.

The idea has been presented to Dr Costas Synolakis, director of the Tsunami Research Center at University of Southern California. Dr Synolakis is one of the world´s leading tsunami experts. ***- As an idea it is great,*** he commented. ***It is one of the more promising ones I have seen in the past few years***.

In Sweden Lasse Johansson, formerly oceanographer and wave expert at the Swedish Meteorological and Hydrological Institute (SMHI), has engaged himself in the project. He has evaluated the idea and published a first report, ”Near Shore Tsunami Detection - a Feasibility Study”.



The next step will be to find suitable companies or institutions for cooperation. In order to save lives from coming tsunamis the invention need to be developed further into a commercial product. We believe there will be a huge market for the product, both public (ports and coastal cities) and private (coastal plants as well as beach hotels who want to label themselves as ”tsunami-proof”). The product will probably also generate a number of services accompanying it, like investigating the ocean bottom in the area to find an optimal distribution and positioning of the ocean-bottom units, and establishing the on-shore alarm infrastructure.

Näsviken 9 November 2007

Sigurd Melin