

## 【Grant-in-Aid for Scientific Research(S)】

### Integrated Science and Innovative Science (New multidisciplinary fields)



**Title of Project : A development of Innovative Disaster Prevention System using GPS Buoy with Sea and Submarine Observation Equipments**

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Research Area : New multidisciplinary fields, Social/Safety system science

Keyword : Urban and social disaster prevention, Tsunami, Sea floor crustal movement

#### 【Purpose and Background of the Research】

If a buoy with a sensor for detecting height change is set offshore distant enough from the coast and the data are transmitted in real-time, detection of a tsunami can be effectively used for disaster mitigation. We have developed a GPS buoy for this purpose, in which a GPS antenna is equipped at the top of a buoy floating at the sea surface (Fig. 1). Real-time kinematic (RTK) GPS technology has been used for real-time dissemination of data. The system has been adopted as a national sea-surface monitoring project and has been deployed at several locations around the Japanese coasts for monitoring wind waves as well as tsunami. However, the distance of a buoy from the base station is limited to 20km and it gives only 8 to 10 minutes of lead time of tsunami arrival to the coast. Residents may require much earlier warning, say 20 minutes or more would be necessary for effective evacuation. The purpose of this research is to conquer this subject. In addition, GPS-Acoustic system is equipped to the buoy for continues monitoring of the sea

floor movement. We try to innovate a sea and submarine disaster prevention system through these researches.

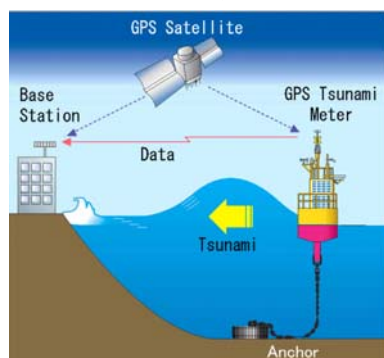


Fig.1 GPS tsunami meter

#### 【Research Methods】

The buoy and other equipments were deployed in the middle of April 2008 to the west from the tip of the Muroto Promontory, Shikoku, Southwestern Japan. The water depth of the site is about 136 m. We will carry out the next 4 researches by using this Muroto GPS buoy.

(1) Development of a new design of GPS buoy for deeper sea and a new GPS positioning method for long baselines of 50-100km. (2)

Application of a submarine crustal movement detection system using the GPS buoy with an acoustic system (3) Real-time tsunami prediction based on numerical simulation using earthquake information. (4) Research of mitigating human damage by gaining a lead time using the newly designed GPS buoy and the friendly information system for local residents.

#### 【Expected Research Achievements and Scientific Significance】

The newly designed GPS buoy system that allows farther offshore deployment as a result of the present research. This brings a big progress to tsunami early warning system. It could contribute to the safety and relief of people in general (Fig. 2).

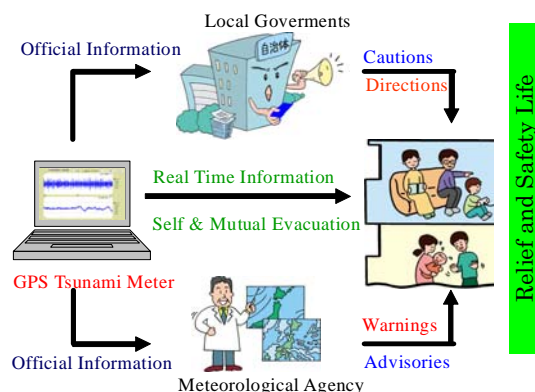


Fig. 2 Safety and relief of people

#### 【Publications Relevant to the Project】

T. Kato, Y. Terada, K. Ito, R. Hattori, T. Abe, T. Miyake S. Koshimura and T. Nagai ; Tsunami due to the 2004 September 5th Off Kii Peninsula Earthquake, Japan, Recorded by a New GPS Buoy, Earth, Planets and Space, Vol.57, pp.297-301, 2005

T. Kato, Y. Terada, M. Kinoshita, H. Kakimoto, H. Isshiki, M. Matsuishi, A. Yokoyama, and T. Tanno ; Real-time Observation of Tsunami by RTK-GPS, Earth, Planets and Space, Vol.52, pp.841-845, 2000

【Term of Project】 FY2009-2013

【Budget Allocation】 163,600 Thousand Yen

【Homepage Address and Other Contact Information】

[http:// www.tsunamigps.com/](http://www.tsunamigps.com/)