

**【Grant-in-Aid for Scientific Research (S)】**  
**Integrated Disciplines (Complex Systems)**



**Title of Project : A challenge to develop GNSS buoy system for high-functional tsunami monitoring and continuous observation of ocean-bottom crustal movements**

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Research Area : Tsunami, ocean-bottom crustal movements

Keyword : Tsunami, ocean-bottom crustal movements

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

The research team lead by the Project Leader of this proposal have developed GNSS buoy for monitoring tsunami at coastal area. Given the success of preliminary experiment of precise measurements of sea-surface heights at far offshore, this research plan is proposed, in which we try to conduct operational experiments for high accurate real-time monitoring of sea-surface height measurements at far offshore. In addition, we tackle a new experiment of continuous measurements of ocean-bottom crustal movements using GNSS-acoustic system using the same GNSS buoy. If this experiment is successful, the GNSS buoy system will open a new era of exploring continuous observation of ocean-floor, which will lead to bring us detailed information on inter-plate coupling and its temporal change, process of slow slip events, etc. Moreover, as the GNSS buoy data will be utilized to monitoring troposphere and ionosphere, deployments of GNSS buoy array in the ocean will be a powerful infrastructure for a synthetic disaster mitigation technology.

**【Research Methods】**

We will rent a fishery buoy off Kochi Prefecture for our experiments. A GNSS system and acoustic transducer, together with apparatus for satellite transmission, will be set on the buoy.

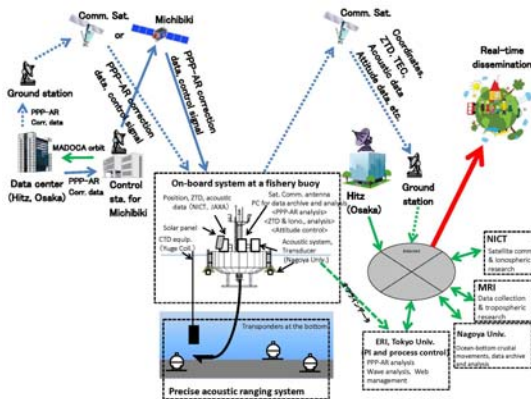


Fig. 1 Detailed design of experiment.

We conduct continuous experiments using satellite communication link. Precise orbits are transmitted from the ground and precise positioning and estimation of ZTD and TEC are conducted on-board of the buoy. Continuous acoustic ranging between buoy and ocean-bottom will also be conducted. Evaluation of data quality will be made as well. Quality of ZTD and TEC data will be examined and their impact to the atmospheric and ionospheric researches will be evaluated. Finally, the final plan of GNSS buoy array in outer ocean and the specification for necessary communication satellite will be documented.

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

A new research developments utilizing the GNSS buoy or buoy array will be expected in the following fields; tsunami including sea-waves, ocean-bottom crustal movements – in particular, related to inter-plate coupling and slow slip events -, atmospheric and ionospheric researches. Moreover, the GNSS buoy array, if it is realized in the future, will be a powerful infrastructure for a synthetic disaster mitigation technology related to the field stated above.

**【Publications Relevant to the Project】**

- Terada, Y., T. Kato, T. Nagai, S. Koshimura, N. Imada, H. Sakaue, K. Tadokoro, Recent developments of GPS tsunami meter for a far offshore observations, in Proceedings of the IAG Symposium GENAH2014, vol. 145, 2015 (in press)
- Kato, T., Global Positioning System: Toward the next dream – from the view point of the Japanese University Consortium for GPS Research (JUNCO) -, 59(3), 87-97, 2013. (in Japanese)

**【Term of Project】** FY2016-2020

**【Budget Allocation】** 141,900 Thousand Yen

**【Homepage Address and Other Contact Information】** under constructing