

Overview of GNSS-R Research Program for Ocean Observations at Japan

1. Background

GNSS-R is a new remote-sensing method which uses reflected GNSS signals.
In order to increase the Japanese involvement in future GNSS-R remote sensing applications for Marine Science, authors started basic studies

Funded by Ministry of Education, Culture, Sports, Science & Technology in Japan (MEXT)

- ▶ Purpose of the fund is to establish a core research group for space-related researches
- ▶ 3 fiscal years (actually, 2.1 years; 2015/2-2017/3)
- ▶ Approximately 280k \$ for each fiscal year



Project : GROWTH (GNSS Reflectometry for Ocean Waves, Tides and Height)

2. Objective

To launch an “ocean-space collaboration research network” for GNSS-R Targets

- ▶ Evaluation of capability to capture rapidly moving/growing phenomena
 - Growth of atmospheric low pressure systems, Tsunami, Tides
 - Diurnal modulations of air-sea interaction
- ▶ Designing best constellation of small satellites to monitor those phenomena
 - Accounting space-time scales of ocean phenomena

3. Action Plans



1. Summer school/Seminars



2. In-Situ Observations of Ocean/GNSS-R data



12 m (dia.) Ground station @Wakayama Univ.

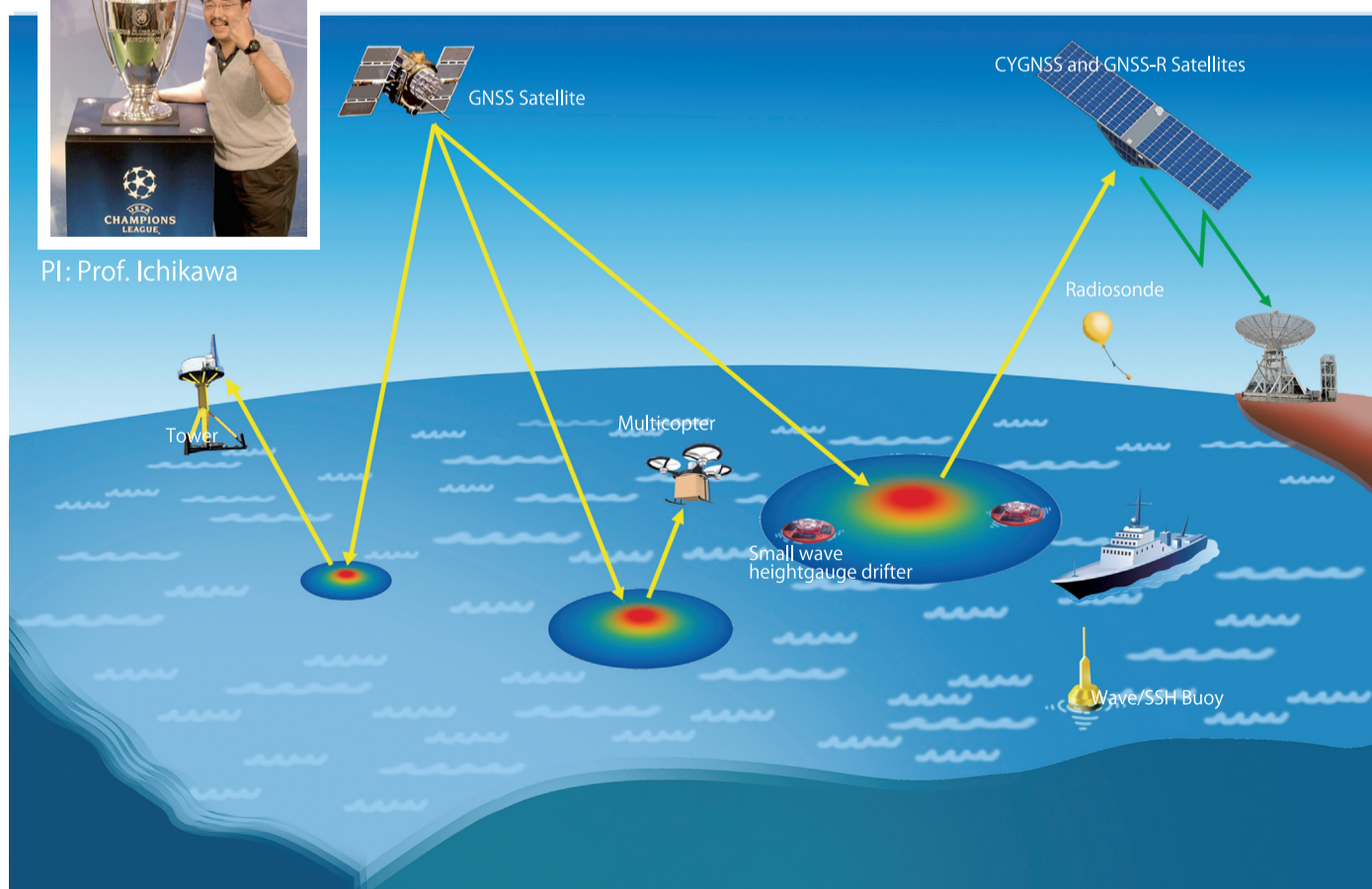


3. Building CYGNSS satellites receiving GNSS-R data usage environment

CYGNSS satellite ©NASA



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GROWTH Team members

Kyushu University

Validating SSH from GNSS-R data SSH observation from RTK GNSS drifters

Chubu University

Developing GNSS-R sensors DDM generation and analysis

Nagoya University

Relationship of GNSS-R signals to atmospheric environmental conditions

The University of Tokyo

Analysis of in situ data at Hiratsuka marine observation tower

Kyoto University

Analysis of in situ data at Lake Biwa stationary buoy

PARI

Analysis of capacitance wave height gauges data

RESTEC

SSH observation from multi-copter drones

National Inst. for Polar Research

GNSS-R ice height observation

IHI Corporation

Developing GNSS-R sensors and single processing software

meisei electric co., ltd.

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Publication list (extracts)

- T. Ebinuma, K. Ichikawa, T. Waseda, Y. Kitazawa, H. Tamura, O. Isoguchi, H. Tomita, GNSS Reflectometry and Multi-Sensor Ocean Wave and Wind Monitoring at Hiratsuka Marine Observation Tower, International Symposium on GNSS 2015, November 16-19, 2015, Kyoto, Japan.
K. Ichikawa, T. Ebinuma, H. Akiyama, Y. Kitazawa, JAPAN'S GNSS-R Research Team, Overview of GNSS-R Research Program for Ocean Observations at Japan, European Geosciences Union Assembly, EGU2015-4577, Vienna, Austria, 12-17 April, 2015.
K. Ichikawa, T. Ebinuma, H. Akiyama, Y. Kitazawa, JAPAN'S GNSS-R Research Team, Overview of GNSS-R Research Program for Ocean Observations at Japan, GNSS+R 2015 Workshop, May 11-13, 2015, GFZ, Potsdam, Germany
K. Ichikawa, T. Ebinuma, H. Akiyama, Y. Kitazawa, JAPAN'S GNSS-R Research Team, Overview of Japan's GNSS-R research program for ocean observations, 26th International Union of Geodesy and Geophysics, June 22- July 2, 2015, Prague Congress Center, Prague, Czech Republic