EGU22-2138

Impact of employing a waveglider on GNSS-Acoustic survey along the Japan trench

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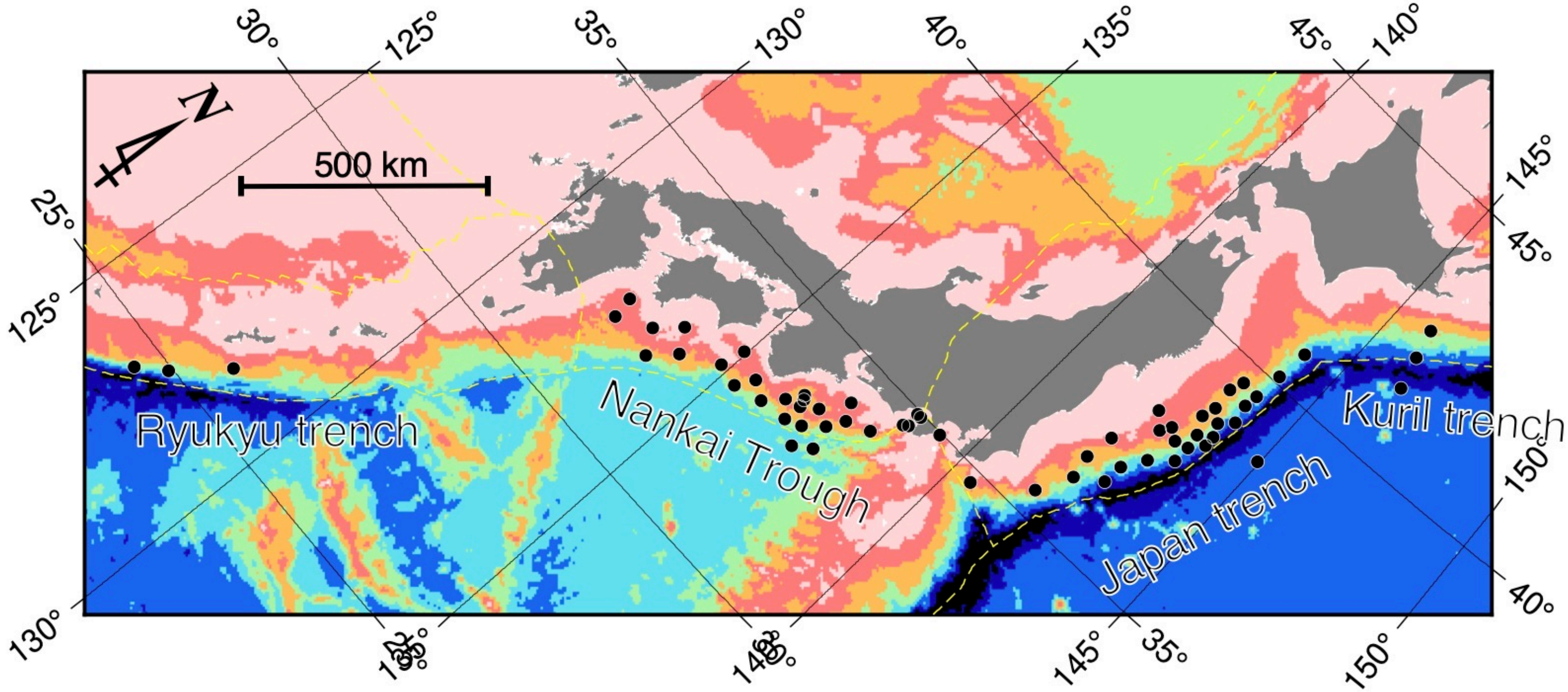
Introduction

Following the 2011 Tohoku Earthquake, we constructed seafloor geodetic benchmarks for GNSS-Acoustic measurement at 20 sites along the Japan trench in September 2012 and have started repeating surveys since then.



Current GNSS-A sites around Japan (Japan Coast Guard, Tohoku U., Nagoya U., etc.)

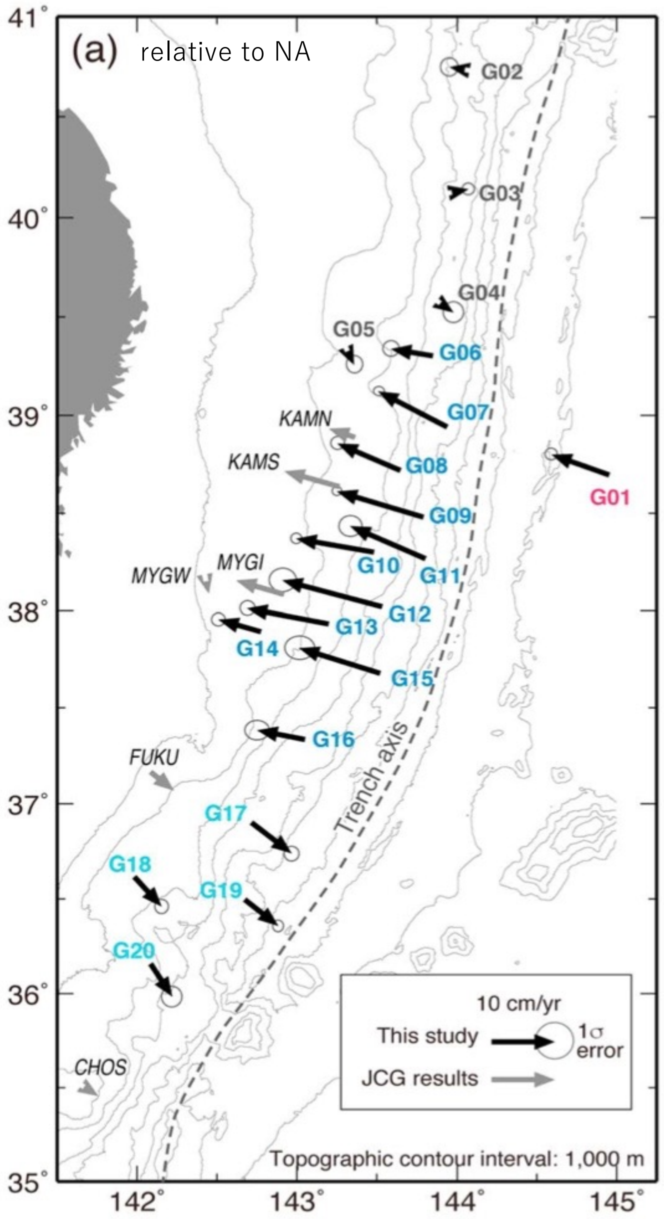
Introduction

Postseismic deformation pattern along the Trench was revealed through intensive repeated surveys using a chartered ship for the initial 4 years (2021-2016) (twice per years for all the site).

Neutral condition (relock and slow events?) in the north.

Strong westward movement due to viscoelastic relaxation in the middle.

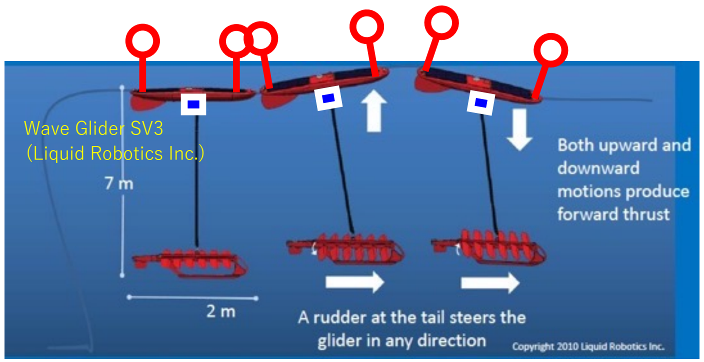
Eastward movement due to after slip in the south.



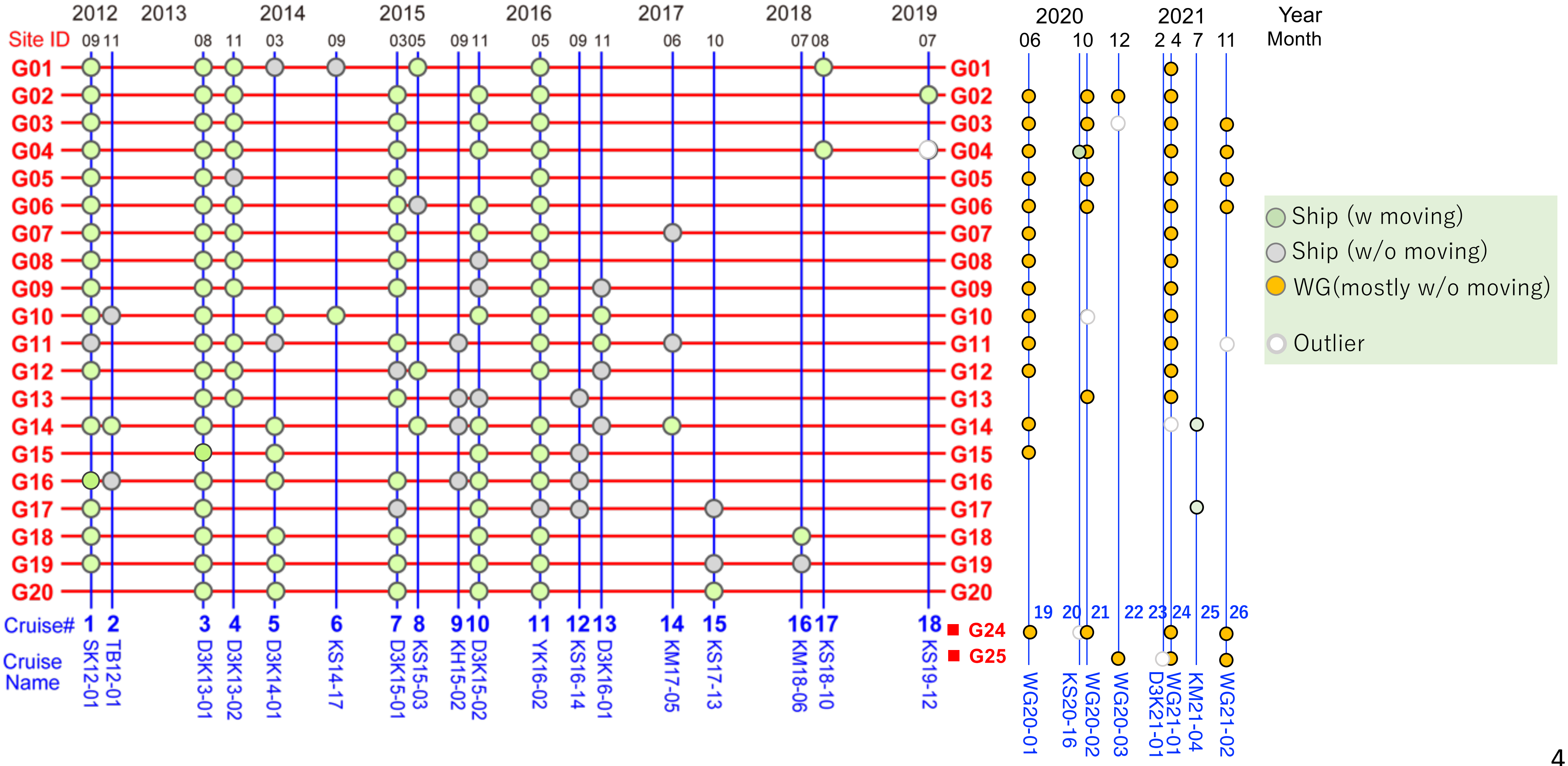
Honsho et al. (2019)

However, after 2016, governmental financial support has stopped and survey frequency becomes significantly poor (several sites per year).

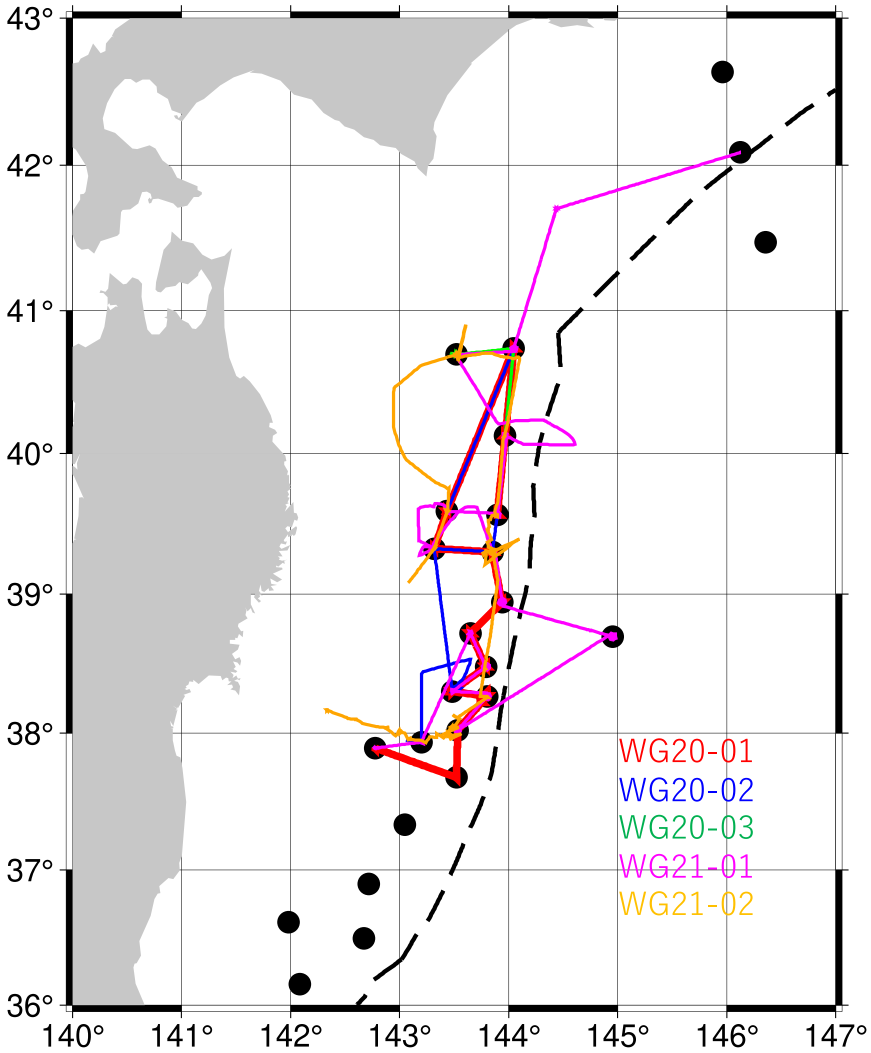
Then we decided to utilize unmanned survey platform, a waveglider, since 2020 to realize intense survey again.



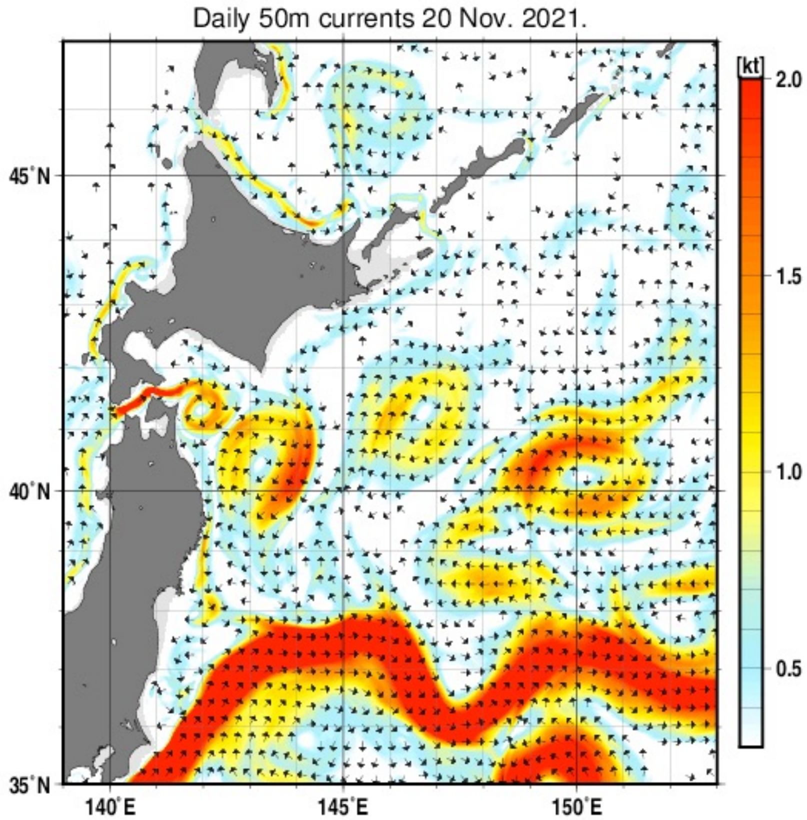
Survey frequency (ship & WG)



Survey tracks using WG

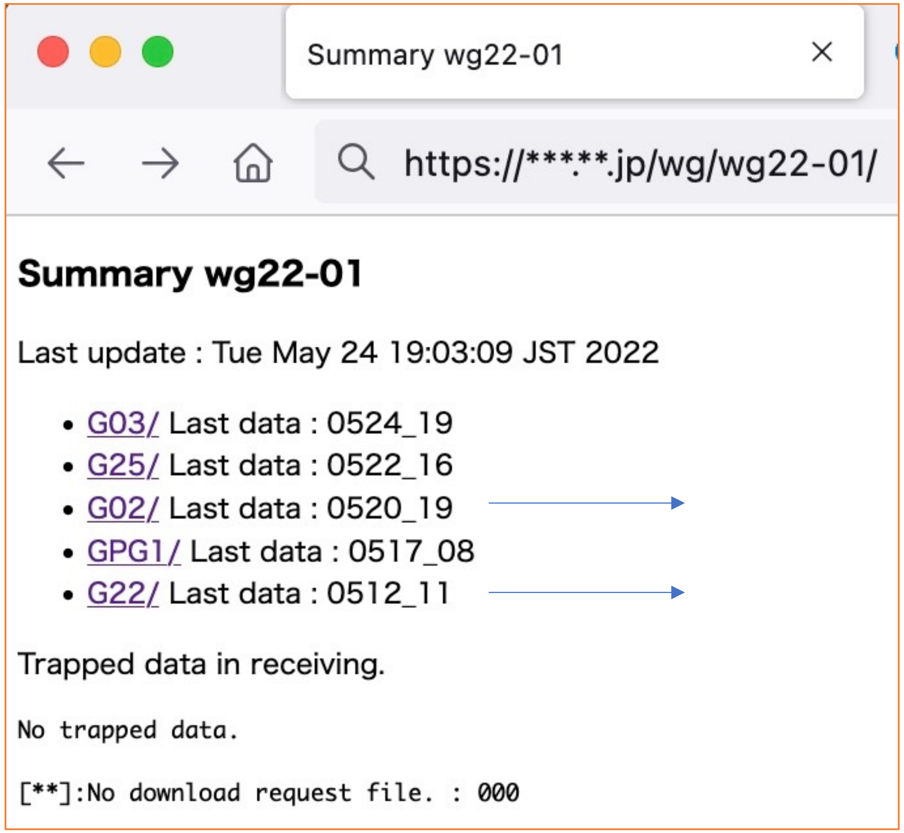


- Careful navigation course plan is needed collaborating with JCOPE2 model (JAMSTEC)
- Prefer summer season to keep sunlight



Typical current condition (JMA)

Realtime data acquisition



Realtime data acquisition

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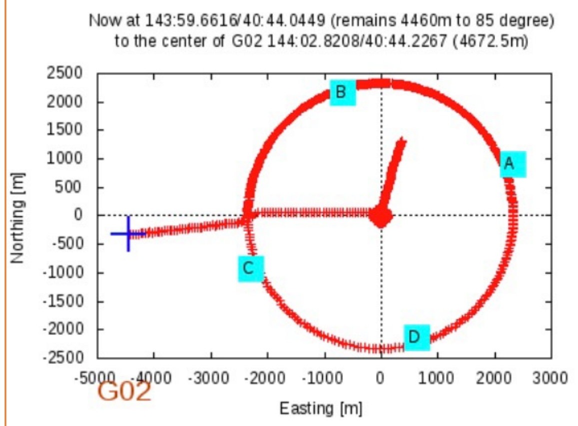
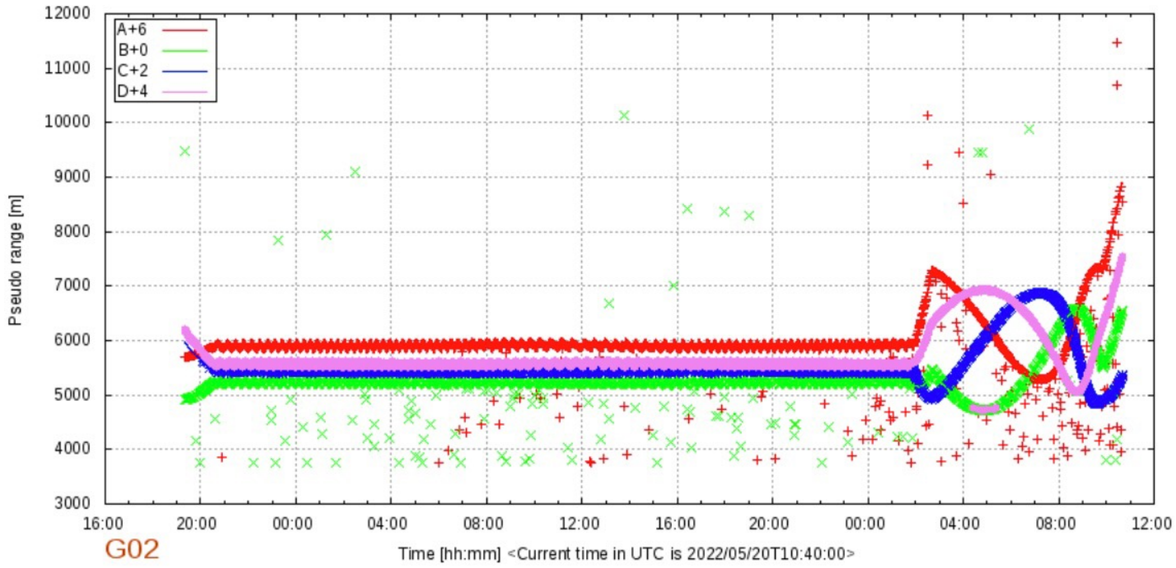
wg22-01 G02

Last update : Fri May 20 21:14:07 JST 2022

- log-G02.txt
- ini-G02.txt
- meta-G02.txt





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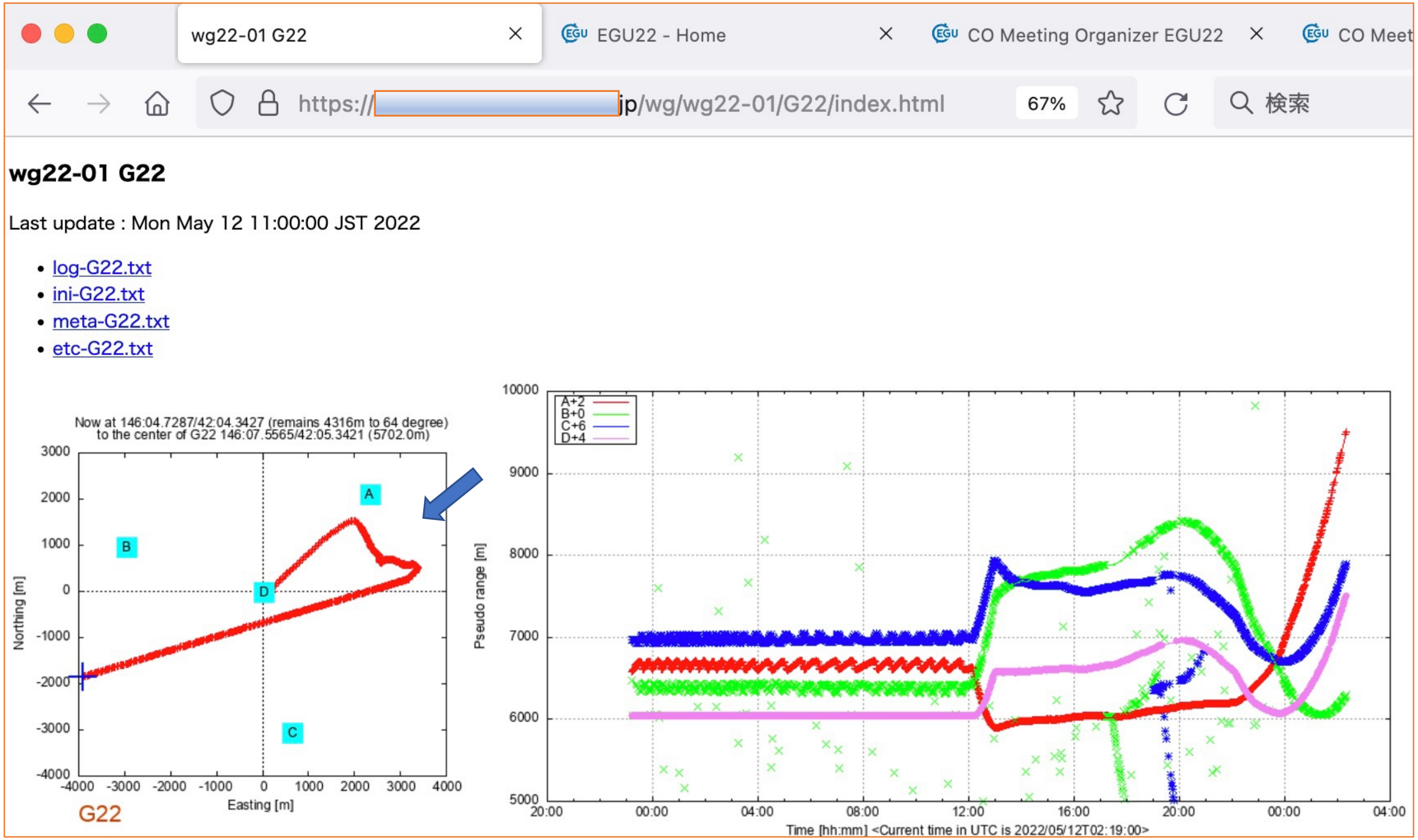
Realtime data acquisition

In the present PXP, correlogram shows ill-forms, so it must be processed on land rather than onboard.

100byte x 4 PXP x 60 shot/h =24KB/h is still acceptable for Satellite communication (e.g., Thuraya)

With RTK PPP service,
(e.g., Trimble CenterPoint RTX by Trimble MADOCA by JAXA)
MEMS attitude, and traveltimes (correlogram), realtime seafloor positioning can be achieved.

Realtime data acquisition



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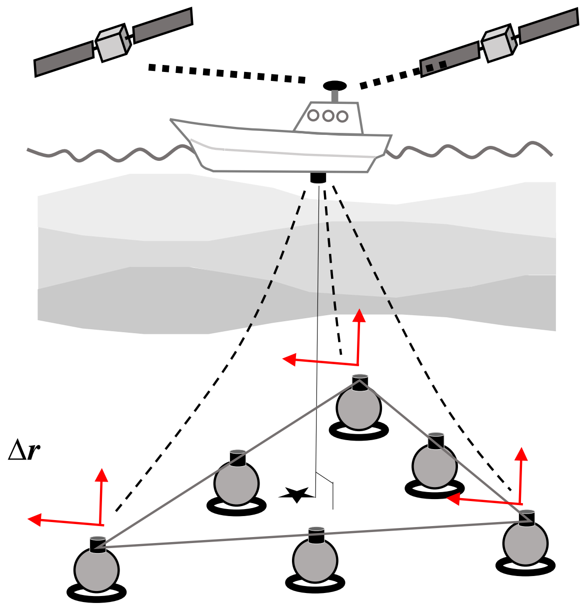
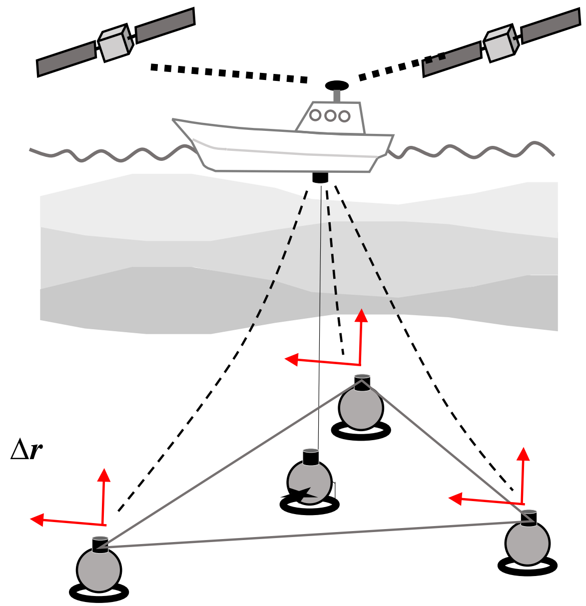
Weak point of WG in GNSS-A

- Slow to navigate against current
  - ➢ utilize JCOPE2 model to detour it
- Slow to perform moving survey
  - ➢ employ double angle array layout



Vel gradient & Vertical motion

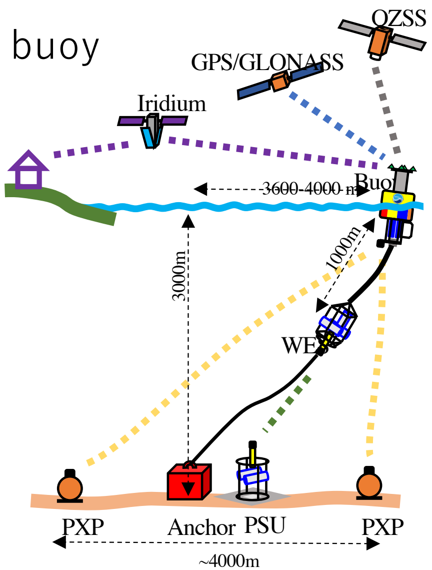


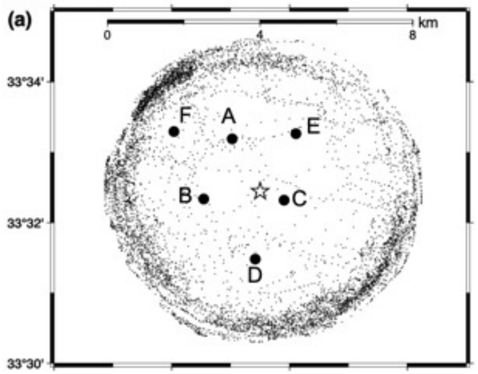
Vertical motion

Advantage of WG in GNSS-A

- Realtime
  - ➢ flexible change of plan based on result
  - ➢ Disaster mitigation
- Continuous
  - ➢ Keep a single site at arbitrary position (SSE)

c.f., moored buoy





Kido et al. (2018)

Special design of battery and sleep sequence in PXP