Application of the GNSS-A for other academic fields and fundamental marine information network

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The GNSS-A observation technology had detected coseismic deformation fields just above the megathrust earthquake [Sato et al., 2011, Science; Kido et al., 2011, GRL], postseismic deformations [Watanabe et al., 2014, GRL; Tomita et al., 2017, Sci. Adv.] and interseismic coupling condition [Yokota et al., 2016, Nature]. In addition, we recently upgraded the GNSS-A methodology in aspects of observation frequency and accuracy and detected a longer-term sequence of slow slip events (SSEs). The detected undersea SSEs led a new discussion about a diverse behavior of SEQs and provide many questions, i.e., their stress loading for coupling region and difference of geological condition in the SSE, other SEQs and coupling regions, to be solved by the future seafloor, submarine and onshore geophysical monitoring.

In the development process of this new GNSS-A system, new oceanographic information in km scale region was found to be extractable from the GNSS-A data [Yokota et al., 2018, MGR]. This data has features consistent and inconsistent with the JCOPE2 model [Miyazawa et al., 2009, JO], so the GNSS-A system has a potential to provide new observation data of very narrow marine region.

These observations have extremely high scientific potential from the viewpoint of seismology, earthquake disaster prevention engineering and submarine geology about megathrust subduction zones and unknown potential about new multidisciplinary aspects called the nano-scale GNSS-A oceanography and the marine GNSS meteorology. In order to promote the distribution of data to the earthquake science community and different academic fields, it is necessary to establish a simple data format and manage using doi. In particular, for carrying out long-term and stable observation, we must construct strong management and evaluation system to perform appropriately data collection and observation operation. The realization of such a solid fundamental marine observation network will also have a positive effect on new research and development.

Moreover, it is necessary to enhance the GNSS-A observation system to upgrade the observation density, continuity and real-time property for understanding the subduction zone and disaster prevention. Eventually, we should construct next-generation fundamental network that aggregates the marine information system that utilize total data in real time based on numerical simulation and data assimilation.

Keywords: GNSS-A, seafloor geodetic observation network, marine observation

