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Ocean tidal observation with GPS buoy around Lutzow-Holmbukka, East Antarctica

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With the objective of measuring the ocean tide around Lutzow-Holmbukka, East Antarctica, we have been developing GPS buoys. In 2005, the first GPS buoy was installed on sea surface at Nishi-no-ura, the shore of East Ongul Island, where the ocean bottom pressure has been regularly observed as tide gauge data at Syowa Station. This GPS buoy consisted of a dual frequency GPS receiver and antenna (Lexon-GGD160T & GrAnt; Javad Inc.), the buoy with a float (Zeni-light buoy Co., Ltd.) and two Pb batteries (12V24Ah). Several continuous ocean tidal observations could be conducted for 5 - 7 days without its maintenance. Aiming to perform the continuous ocean tidal observation for a few months, we modified the GPS buoy and examined its performance in 2008. We applied a hybrid power system which was combination of the electric double layer capacitor (30VA, PowerSystems Co., Ltd.) and the Pb battery (12V24Ah) to a second generation of the GPS buoy and we attached 20W solar panel on its float. The dual frequency GPS receiver and antenna (DL-V3 and GPS-702-GG; NovAtel Inc.) were incorporated into the GPS buoy. This GPS buoy was installed on the offing of Benten Jima which is located on about 20 km distance from Syowa Station, at the end of September, 2008. Due to malfunction of the charging to the Pb battery, the power supply of GPS was maintained by the electric charge and discharge to the capacitor. The 30VA capacity of the capacitor and 20W power generation of the solar panel were too short to perform the continuous GPS measurement. Therefore the ocean tidal observation by the GPS was intermittent. Polar day and fine weather in austral summer enabled the comparatively continuous observation. The instantaneous positions of the GPS buoy which were synchronized with the ocean tide were determined from GPS data obtained during Nov. - Dec., 2008 by adopting the kinematic precise point positioning analysis with GPS Tools. The ocean tidal analysis with BAYTAP-G was applied to the time series of the instantaneous GPS position data during Nov. - Dec., 2008.

We still continue to improve the GPS buoy. We plan to install the several GPS buoys around Lutzow-Holmbukka and to conduct the continuous ocean tidal observations in order to study the geoid and the ocean tide in this area.

Keywords: GPS bouy, Ocean tidal observation, Antarctica