Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

STT56-P04 Room:Convention Hall Time:May 19 18:15-19:30

Performance of quartz nano-resolution accelerometer in tidal bands

Yuichi Imanishi[1*], Theo Schaad[2], takuma oi[3]

[1]ERI, The University of Tokyo, [2]Quartz Seismic Sensors, Inc., [3]Toho Mercantile CO., LTD.

The quartz nano-resolution accelerometer developed by Quartz Seismic Sensors, Inc. detects acceleration in the range of +/-2g with high resolution through strain measurement of a quartz oscillator connected to a test mass. This makes use of the same technology of nano-counting as used in the nano-resolution barometer developed by Paroscientific, Inc. We made a parallel observation with this accelerometer and the superconducting gravimeter T011 at the Matsushiro Seismological Observatory, Japan Meteorological Agency, in order to examine the performance of the quartz accelerometer in the tidal frequency bands.

The accelerometer was installed in the vertical orientation about 2 m apart from the superconducting gravimeter. We prepared a simple platform with adjustable feet to level the accelerometer. The sensor and the counter were covered by a polystyrene foam box for reducing the effect of ambient temperature changes. The acceleration output as well as sensor temperature were logged at the rate of 20 Hz. In addition, a platinum thermometer was installed to monitor the temperature in the box. Changes in the room temperature are about 0.1 degrees p-p per day, whereas the changes in the sensor temperature are about 0.02 degrees p-p per day.

Although at first the acceleration value indicated irregular drift and steps, the drift became almost linear with respect to time after two weeks. A tidal analysis of the data with BAYTAP-G revealed that the accelerometer records the tidal gravity signals correctly, approximately consistent with those derived from the superconducting gravimeter. On the other hand, it was also found that barometric admittance is anomalously large, suggesting existence of some instrumental effect of atmospheric pressure on the accelerometer. In addition, effects of temperature changes, which are compensated internally, are still identified in the residual data. Results of a more detailed analysis will be given in the presentation.

Keywords: nano-resolution, quartz accelerometer, superconducting gravimeter, earth tides