**Vertical Land Movements and Sea Level Changes around South Georgia Island: Preliminary Results**

Norman Tefere(1), Addie Huncheaw(1), Ribom Abrahall(1), Philip Woodworth(2), Simon Williams(2), Angela Hlabeet(2), Robert Smalley(2), Ian Dolsen(4) and Lucy Lawer(4)

1) University of Luxembourg. Luxembourg 2) National Oceanography Centre, United Kingdom 3) University of Miami. USA 4) University of Texas at Austin, USA

Contact: Norman Tefere (email: norman.tefere@uni.lu)

**Abstract**

South Georgia Island is located in the South Atlantic Ocean and is a relatively small island of about 170 x 50 km, bending towards the southeast about halfway between 53°S and 56°S, lying opposite the North Scotia Rise, SN: the South Sandwich plate. Most of the island itself is very mountainous with peaks reaching heights of 3000 m, 50 km, bending towards the southeast about halfway. The island and its shelf area have been ice covered as was revealed by scarring of the sub-oceanic topography. To investigate the very local character of the land movements near KEP, ie. the stability of the jetty upon which the tide gauge is mounted. Looking at the height differences between the campaigns in 2013, 2014 and 2017 (Figure 8) one can compute a linear trend of -0.3 ± 0.2 mm/yr for KEPGO-KEP-001 of -3.1 mm/yr for 2013-2017,25 (Figure 9) and for the tide board of -2.1 mm/yr. The levelling results suggest subsidence of the tide gauge with respect to the stable benchmarks and KRSA. The average height difference between KEPGO-KEP-001 and KRSA is 1.316 m, in addition, the tide gauge has been observed to be subsiding over the 4 years campaign period by 1.3 cm. To investigate the stability of the tide gauge, the tide gauge board, installed in 2014 was observed. This is more convenient as any stand or land movements near KEP, as well as any tidal or oceanic effects can be removed.

**Introduction**

South Georgia Island is located in the South Atlantic Ocean and is a relatively small island of about 170 x 50 km, bending towards the southeast about halfway between 53°S and 56°S, lying opposite of the North Scotia Rise, which predominately show rapid retreat. The island itself is very mountainous with peaks reaching heights of 3000 m, 50 km, bending towards the southeast about halfway. The island and its shelf area have been ice covered as was revealed by scarring of the sub-oceanic topography. To investigate the very local character of the land movements near KEP, ie. the stability of the jetty upon which the tide gauge is mounted. Looking at the height differences between the campaigns in 2013, 2014 and 2017 (Figure 8) one can compute a linear trend of -0.3 ± 0.2 mm/yr for KEPGO-KEP-001 of -3.1 mm/yr for 2013-2017,25 (Figure 9) and for the tide board of -2.1 mm/yr. The levelling results suggest subsidence of the tide gauge with respect to the stable benchmarks and KRSA. The average height difference between KEPGO-KEP-001 and KRSA is 1.316 m, in addition, the tide gauge has been observed to be subsiding over the 4 years campaign period by 1.3 cm. To investigate the stability of the tide gauge, the tide gauge board, installed in 2014 was observed. This is more convenient as any stand or land movements near KEP, as well as any tidal or oceanic effects can be removed.

**Benchmarks and Leveling Results**

As these reach within several millimeters of the tide gauge, a refinement for the tide gauge data to be used for differential processing over the South Georgia Island is expected to result in clear changes in the tide gauge records. The tide gauge at King Edward Point (KEP GO-KEP-004) is one of the oldest stations in the world, having been in operation since 1945. As the tide gauge has not been migrating vertically, the tide gauge board, installed in 2014 has been observed. This is more convenient as any stand or land movements near KEP, as well as any tidal or oceanic effects can be removed.

**Sea Level Information**

Sea level information is available for the KEP tide gauge from the Permanent Service for Mean Sea Level (PSMSL) [Holgate et al., 2013] and from the IOC Sea Level Station (IOC) [Deser et al., 2012]. The uplift/coastal subsidence effect on sea level around the world has been investigated by the different methods of tide gauge records (black line) and 10-day average satellite altimeter data (green line). Figure 7 shows the ground truth of the TOS/TOPEX altimeter mission (brown line) and trendline from least-squares. Figure 7 shows the trendline of the TOS/TOPEX altimeter mission (brown line) and trendline from least-squares. Figure 7 shows the trendline of the TOS/TOPEX altimeter mission (brown line) and trendline from least-squares.

**Vertical Land Movements**

The vertical land movements around South Georgia Island have been investigated by the vertical rates with the rates of the KEP GO-KEP-004 tide gauge. The tide gauge data was represented using GGSN precise orbit files and Earth orientation parameters, and was linked into the Global Geodetic Observing System (GGOS) and IERS setup. The result of the differential processing strategy is to compare the two time series and to investigate the very local character of the land movements near KEP, ie. the stability of the jetty upon which the tide gauge is mounted. Looking at the height differences between the campaigns in 2013, 2014 and 2017 (Figure 8) one can compute a linear trend of -0.3 ± 0.2 mm/yr for KEPGO-KEP-001 of -3.1 mm/yr for 2013-2017,25 (Figure 9) and for the tide board of -2.1 mm/yr. The levelling results suggest subsidence of the tide gauge with respect to the stable benchmarks and KRSA. The average height difference between KEPGO-KEP-001 and KRSA is 1.316 m, in addition, the tide gauge has been observed to be subsiding over the 4 years campaign period by 1.3 cm. To investigate the stability of the tide gauge, the tide gauge board, installed in 2014 was observed. This is more convenient as any stand or land movements near KEP, as well as any tidal or oceanic effects can be removed.

**Results**

The tide gauge at King Edward Point (KEP GO-KEP-004) is one of the oldest stations in the world, having been in operation since 1945. As the tide gauge has not been migrating vertically, the tide gauge board, installed in 2014 has been observed. This is more convenient as any stand or land movements near KEP, as well as any tidal or oceanic effects can be removed.

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**References**


**Figure 2** South Georgia Island with shelf area. Continuous red line shows the position of the South Georgia Rise, which predominately show rapid retreat.

**Figure 3** Global GPS network (black dots) and five benchmarks (blue stars) showing the vertical land movements.

**Figure 4** The tide gauge at King Edward Point (KEP GO-KEP-004) is one of the oldest stations in the world, having been in operation since 1945. As the tide gauge has not been migrating vertically, the tide gauge board, installed in 2014 has been observed. This is more convenient as any stand or land movements near KEP, as well as any tidal or oceanic effects can be removed.

**Figure 5** Comparison of sea level and tide gauge records (black line) and 10-day average satellite altimeter data (green line). Figure 7 shows the trendline of the TOS/TOPEX altimeter mission (brown line) and trendline from least-squares.

**Figure 6** The tide gauge at King Edward Point (KEP GO-KEP-004) is one of the oldest stations in the world, having been in operation since 1945. As the tide gauge has not been migrating vertically, the tide gauge board, installed in 2014 has been observed. This is more convenient as any stand or land movements near KEP, as well as any tidal or oceanic effects can be removed.