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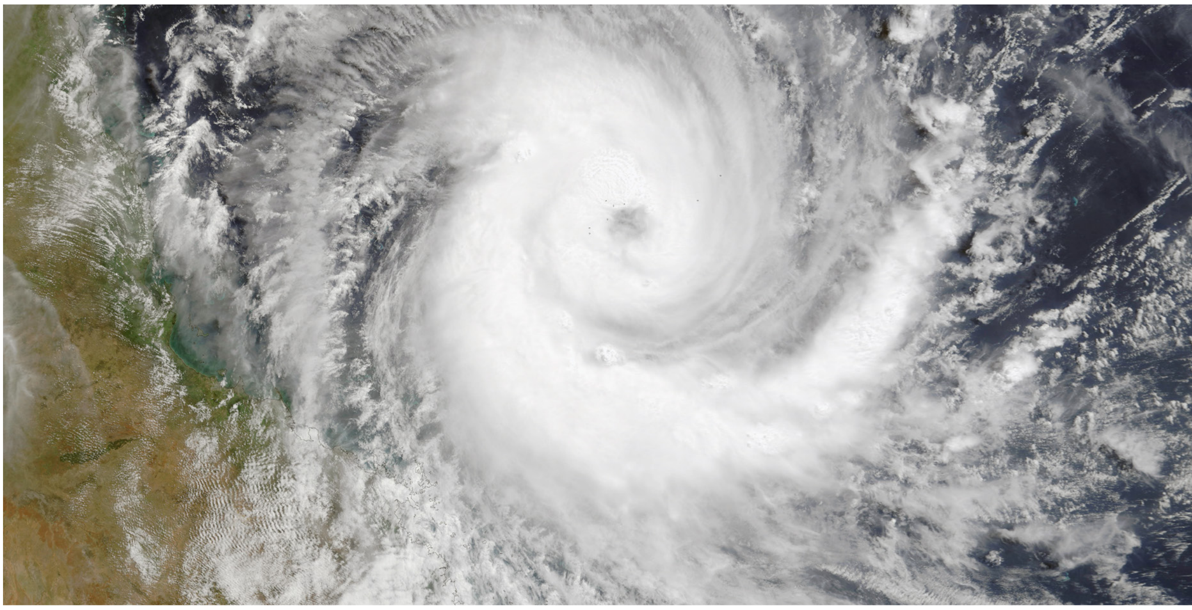

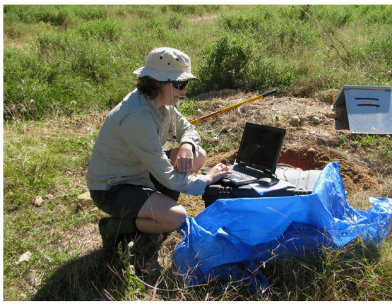

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Report on the Analysis of the Asia Pacific Regional Geodetic Project (APRGP) GPS Campaign 2012

G. Hu

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Australian Government
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Contents

Executive Summary

The annual Asia Pacific Regional Geodetic Project (APRGP) GPS campaign is an important activity of the Geodetic Reference Frame for Sustainable Development Working Group (WG) of the Regional Committee of United Nations Global Geospatial Information Management for Asia and the Pacific (UN-GGIM-AP). This document overviews the data analysis of the APRGP GPS campaign undertaken in 2012. The GPS data were processed using version 5.0 of the Bernese GPS Software in a regional network together with selected IGS (International GNSS Service) sites. The GPS solution was constrained to the ITRF2008 reference frame through adopting IGS08 coordinates on selected IGS reference sites and using the final IGS earth orientation parameters and satellite ephemerides products.

Introduction

The annual Asia Pacific Regional Geodetic Project (APRGP) GPS campaign is an important activity of the Geodetic Reference Frame for Sustainable Development Working Group (WG) of the Regional Committee of United Nations Global Geospatial Information Management for Asia and the Pacific (UN-GGIM-AP). The WG planned to continue the annual GPS campaign activity as some member countries were at this time unable to participate in the Asia Pacific Reference Frame (APREF) project but had an ongoing requirement for geodetic positioning relative to the regional/global network. One of the roles of the WG is to create and maintain a densely realized and accurate geodetic framework, coordinate regional cooperation in geodesy amongst national agencies, and to build and improve the regional geodetic infrastructure. The APRGP is where UN-GGIM-AP member agencies contribute campaign or continuous GPS data to the WG. GPS data from the APRGP are available for all participant member countries for local and global scientific research and local applications. The composite GPS data set is subsequently analysed by the WG so as to provide estimates of station coordinates in the International Terrestrial Reference Frame (ITRF). The results of the APRGP are also supplied by the WG to the official ITRF product centre to densify the ITRF in the Asia Pacific region. This document overviews the data analysis of APRGP GPS campaign undertaken in 2012.

The document is organized as follows. The data set of the campaign is described first. The data processing scheme is detailed after, followed by the results of processing including the repeatability RMS (root mean square) of the station coordinates, and the final computed station coordinates.

GPS Data Set

The 2012 GPS campaign was undertaken from the 9th to 15th September 2012 inclusive (days of year 253 to 259). The data were contributed from eleven countries and regions, i.e., Brunei, Cambodia, Hong Kong, Japan, Korea, Laos, Malaysia, Nepal, Philippines, Singapore and Vietnam. Note that Brunei, Hong Kong and Philippines also contribute CGPS data to the APREF project. Figure 1 shows the distribution of the APRGP 2012 campaign stations along with the APREF stations (as of September 2012).

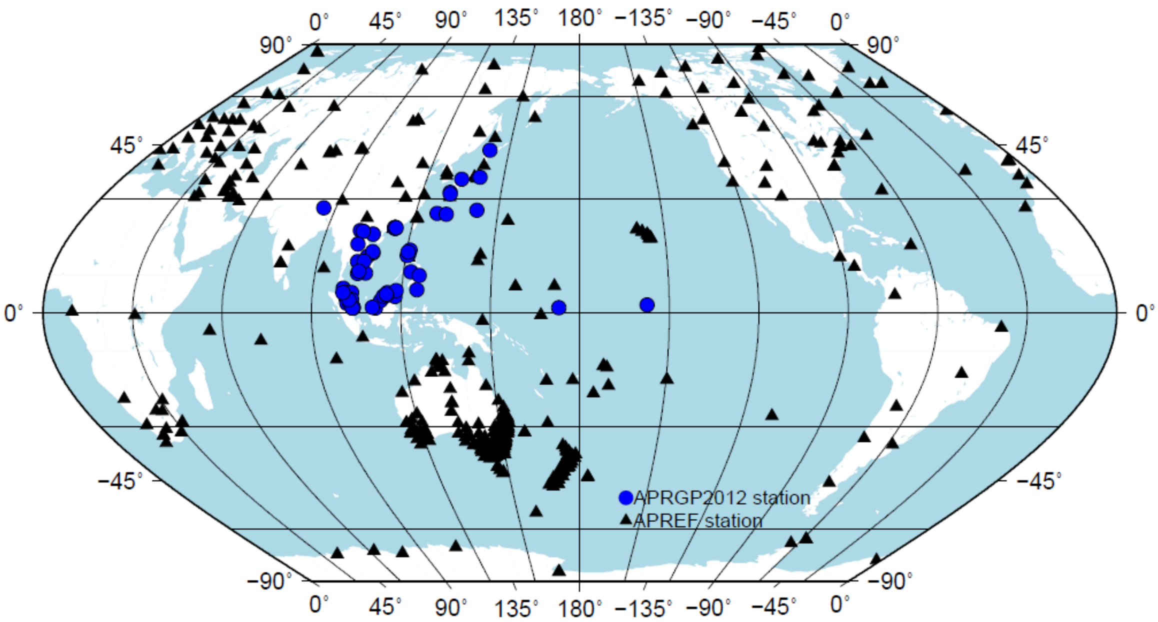

Figure 1: APRGP and APREF stations in the APRGP 2012 GPS campaign analysis.

Data Processing Scheme

Analysis of the GPS observations was undertaken with the processing engine of Bernese GPS software V5.0 (Dach et al., 2007). The Bernese GPS software conforms to the IERS2003 conventions (McCarthy and Petit, 2004). In order to tie the APRGP network to the ITRF2008 reference frame (Altamimi et al., 2011), we processed the available data from IGS sites located around the Asia Pacific region in addition to campaign sites and APREF stations as shown in Figure 1. For the details of APREF project, see http://www.ga.gov.au/earth-monitoring/geodesy/asia-pacific-reference-frame.html.

An overview of the processing strategy is as follows:

- IGS final precise GPS satellite ephemeris and the Earth rotation parameters were used for the daily data processing to generate daily normal equations.
- Site displacement due to ocean tidal loading for all stations were corrected by using the GOT00.2 model (Scherneck, 1991).
- Antenna phase centre variations were taken into consideration using consistent, absolute IGS models of both receiver and satellite antenna phase centres (Schmid et al., 2007).
- Dual frequency carrier phase and code data were used with an elevation cut off angle of 10° and elevation-dependent weighting (w = cos2 z, where z is the zenith angle). Code measurements were only used for receiver clock synchronisation. Pre-processing used the full sampling rate of 30 seconds, a sampling rate of three minutes was used for other processing.
- Carrier phase pre-processing was conducted on a baseline by baseline mode using triple differences. The observations with small pieces and the observations suspected to be corrupted by a cycle slip were marked. Subsequent processing did not use the marked observations. Using different linear combinations of L1 and L2 cycle slips were fixed if possible. New ambiguity parameters were introduced if cycle slips could not be fixed reliably, or if significant gaps in the observations where present. In addition, a data screening step in a baseline by

baseline mode was performed on the basis of weighted post-fit residuals and outliers were marked and removed for the further processing.

- An a priori dry tropospheric delay computed from a standard atmosphere was mapped with the Dry Niell mapping function (Niell, 1996). For the wet component, continuous piecewise linear troposphere parameters were estimated in 1-hour intervals without any a priori model using the wet Niell mapping function and the ionosphere-free combination observations.
- After the pre-processing, ionosphere maps were estimated using the geometry-free linear combination. The vertical electron content was modelled with a single-layer model in a solar geomagnetic reference frame. The height of the single layer was 450 km above the Earth's surface. The previously estimated ionosphere maps were introduced as a priori ionosphere information and, in addition, stochastic ionosphere parameters were set up to support the Quasi Ionospheric Free (QIF) ambiguity resolution strategy (Dach et al., 2007).
- Ambiguity resolution was attempted on all baselines within the network using the QIF strategy with ionospheric and tropospheric delay supported. The QIF strategy is based on the ionospheric free linear combination, but also incorporates the estimation of an ionospheric parameter for each epoch to account for the residual ionospheric biases, details can be found in Dach et al. (2007).
- The daily normal equations were generated and combined into a campaign solution. As part of this process the daily solutions were compared with the combined solution and the resulting differences were analysed for the presence of outliers and the daily repeatability.

Results

The repeatability RMS (root mean square) of the station coordinates, an estimate of the day-to-day scatter of coordinate components about a weighted epoch mean, was used to assess the quality of the final epoch solution and as a measure of internal precision. Table 1 lists the repeatabilities RMS of the station coordinates. The average of the repeatabilities (i.e. RMS) of the station coordinates for the campaign was 1.6 mm, 1.8 mm and 5.4 mm in north, east and up components, respectively. Note that there is no solution for the stations GETI and UMSS from Malaysia, NT04 and VUNT from Vietnam, because of the poor data quality.

Table 1. *The repeatability RMS for the APRGP 2012 GPS campaign stations.*

Station	Country	North (mm)	East (mm)	Up (mm)
LABI	Brunei	0.8	1.9	7.4
TEMB	Brunei	1.1	2.2	7.2
UKUR	Brunei	1.3	1.4	3.6
KDAL	Cambodia	2.8	2.5	6.2
SIEM	Cambodia	2.1	2.3	8.9
STUE	Cambodia	1.4	1.4	4.9
TKEO	Cambodia	2.6	2.4	6.2
HKFN	Hong Kong	3.1	1.6	9.2
HKKT	Hong Kong	1.7	4.4	11.2
HKLT	Hong Kong	1.9	3.6	6.7
HKQT	Hong Kong	2.2	3.9	4.0

Station	Country	North (mm)	East (mm)	Up (mm)
HKSC	Hong Kong	2.2	3.2	10.0
HKSL	Hong Kong	1.9	2.3	7.5
HKST	Hong Kong	2.6	4.8	8.7
T430	Hong Kong	3.2	1.3	8.4
0029	Japan	2.3	1.8	4.8
0745	Japan	2.8	2.1	6.4
0746	Japan	1.8	2.5	5.0
0837	Japan	2.3	2.2	9.0
1135	Japan	1.1	2.3	5.6
2004	Japan	2.8	2.8	6.9
2005	Japan	1.2	3.6	4.7
2007	Japan	1.7	4.0	10.1
3009	Japan	2.5	3.9	7.6
KRTM	Japan	1.9	2.8	6.0
TARW	Japan	2.5	3.6	7.2
TSKB	Japan	1.4	1.7	6.3
SUWN	Korea	1.2	3.4	6.4
ATTA	Laos	3.0	3.0	4.8
BOUN	Laos	1.5	1.2	8.4
VIEN	Laos	1.7	1.7	4.8
AMAN	Malaysia	1.1	2.5	5.2
ARAU	Malaysia	1.2	2.4	8.2
BEHR	Malaysia	1.5	2.4	5.8
BIN1	Malaysia	1.7	2.6	6.2
GMUS	Malaysia	1.3	1.5	11.4
GRIK	Malaysia	2.5	1.5	4.2
JHJY	Malaysia	0.8	2.5	4.3
KUAL	Malaysia	1.2	2.1	6.7
LAB1	Malaysia	1.7	1.5	10.6
MIRI	Malaysia	2.2	1.4	6.6
MTAW	Malaysia	1.9	0.9	11.7
PDIC	Malaysia	1.8	1.5	5.0
PEKN	Malaysia	2.1	1.2	6.4
SAND	Malaysia	1.6	3.1	7.2
SEG1	Malaysia	1.1	2.2	9.4
TLOH	Malaysia	2.4	1.4	7.1
UMAS	Malaysia	0.7	1.4	3.8
USMP	Malaysia	3.4	4.2	7.3
NAGA	Nepal	1.6	2.2	6.3

Station	Country	North (mm)	East (mm)	Up (mm)
PBAY	Philippines	1.2	2.8	10.3
PCB2	Philippines	4.5	3.4	8.2
PFLO	Philippines	1.7	3.6	9.5
PGEN	Philippines	1.9	2.2	6.7
PILC	Philippines	1.2	2.3	8.6
PSUR	Philippines	1.5	3.0	7.6
PTAG	Philippines	0.7	3.0	8.2
PURD	Philippines	0.3	2.1	11.4
SKEP	Singapore	1.6	2.7	7.5
SLOY	Singapore	2.5	2.0	3.4
SNSC	Singapore	2.0	2.4	4.5
SNTU	Singapore	2.0	1.3	5.4
SNYP	Singapore	2.6	2.0	9.2
SSEK	Singapore	1.9	1.2	5.5
SSMK	Singapore	1.9	1.4	6.3
DIEB	Vietnam	1.6	0.9	4.6
DOSN	Vietnam	1.2	4.6	13.2
NT01	Vietnam	2.6	1.3	9.0
NT03	Vietnam	3.9	3.7	3.2
NT05	Vietnam	1.4	3.6	13.6
QNAM	Vietnam	2.8	4.2	10.3
QT01	Vietnam	3.9	2.0	8.6
QT03	Vietnam	2.5	4.7	10.8

The final computed Cartesian and geodetic coordinates (ITRF2008, GRS80 ellipsoid) are listed in Tables 2 and 3, respectively, along with their formal error estimates. These estimates provide an indication of the quality of the measurements; they also characterize the internal precision of positioning performance. Note that the listed coordinates are at the mean epoch of the measurements in the ITRF2008 reference frame, and only for the campaign sites, the weekly coordinates of other CGPS stations of APREF project can be found in http://www.ga.gov.au/earth-monitoring/geodesy/asia-pacific-reference-frame.html.

Table 2. *The final computed Cartesian coordinates in ITRF2008 at the mean epoch of the measurements, i.e. @2012.70137.*

Station	X (m)	1 std (m)	Y (m)	1 std (m)	Z (m)	1 std (m)
0029	-3862398.2377	0.0004	3105008.7780	0.0004	4001961.1459	0.0004
0745	-3512919.9576	0.0005	4524558.1159	0.0005	2795882.0213	0.0004
0746	-3786805.0629	0.0004	4311846.0876	0.0004	2774485.4610	0.0003
0837	-3530185.6770	0.0006	4118797.2522	0.0005	3344036.8300	0.0005
1135	-3591930.9874	0.0004	3758797.0068	0.0004	3682342.8468	0.0004
2004	-3565271.7408	0.0004	4118973.0915	0.0005	3306293.1421	0.0004
2005	-3642161.3664	0.0004	2861487.8640	0.0004	4370351.2753	0.0004
2007	-4490605.3095	0.0005	3483894.8384	0.0004	2884928.2494	0.0004
3009	-3997616.2040	0.0004	3276761.9018	0.0003	3724230.2823	0.0003
AMAN	-2332691.8230	0.0004	5934768.2612	0.0007	135097.3801	0.0002
ARAU	-1131051.8695	0.0003	6236311.7540	0.0009	711747.9999	0.0003
ATTA	-1785584.1675	0.0003	5903570.9894	0.0007	1619746.3444	0.0003
BEHR	-1270756.6753	0.0002	6236377.9306	0.0007	416063.8878	0.0002
BIN1	-2497850.1145	0.0004	5857731.6818	0.0007	358111.9286	0.0002
BOUN	-1223197.2856	0.0002	5804402.4139	0.0007	2338344.9698	0.0003
DIEB	-1336842.3549	0.0002	5787988.4217	0.0006	2315702.2057	0.0003
DOSN	-1724757.3011	0.0004	5714523.8366	0.0008	2239792.0055	0.0004
GMUS	-1317445.1793	0.0003	6217407.6592	0.0009	537098.0181	0.0002
GRIK	-1225760.7066	0.0002	6230325.9547	0.0005	600544.0935	0.0002
HKFN	-2411013.3189	0.0003	5380268.1134	0.0006	2425128.9424	0.0003
HKKT	-2405144.3276	0.0003	5385195.0957	0.0006	2420032.3895	0.0003
HKLT	-2399063.1611	0.0003	5389237.6888	0.0006	2417326.9061	0.0003
HKQT	-2421568.3167	0.0004	5384910.4117	0.0007	2404264.2425	0.0004
HKSC	-2414267.3416	0.0003	5386768.8295	0.0006	2407459.8779	0.0003
HKSL	-2393382.8403	0.0003	5393861.0142	0.0005	2412592.2561	0.0003
HKST	-2417143.3001	0.0003	5382345.3274	0.0005	2415036.7968	0.0003
JHJY	-1520490.1693	0.0004	6191944.4432	0.0010	169912.6989	0.0002
KDAL	-1606034.0784	0.0004	6042484.3166	0.0010	1256580.0441	0.0003
KRTM	-5886688.7374	0.0006	-2444651.2787	0.0003	226251.1894	0.0002
KUAL	-1443668.4253	0.0003	6184650.0948	0.0009	587309.8702	0.0002
LAB1	-2708735.4503	0.0004	5744698.4959	0.0008	583318.7856	0.0002
LABI	-2633379.4533	0.0004	5788570.7616	0.0006	487596.3043	0.0002
MIRI	-2586925.3708	0.0003	5809853.3488	0.0006	482986.9144	0.0002
MTAW	-2974552.7449	0.0004	5622306.0221	0.0008	470932.4568	0.0002
NAGA	441480.2186	0.0002	5636225.5891	0.0007	2947375.4520	0.0004
NT01	-1726969.5478	0.0003	5714864.9039	0.0008	2237081.3677	0.0004
NT03	-1844373.5619	0.0005	5997105.5146	0.0015	1142317.0199	0.0004

Station	X (m)	1 std (m)	Y (m)	1 std (m)	Z (m)	1 std (m)
NT05	-1566020.4947	0.0006	6076071.9124	0.0016	1140472.2858	0.0003
PBAY	-3164088.3201	0.0004	5236293.5740	0.0006	1797982.0660	0.0003
PCB2	-3161494.1496	0.0008	5274361.1170	0.0012	1687745.0437	0.0005
PDIC	-1304197.8877	0.0003	6237114.3369	0.0007	279242.7348	0.0002
PEKN	-1474284.7221	0.0002	6193341.5632	0.0005	385958.6196	0.0002
PFLO	-3127778.9760	0.0004	5310051.2134	0.0006	1638298.8013	0.0002
PGEN	-3650005.7824	0.0004	5187337.1528	0.0006	669409.1359	0.0002
PILC	-3372134.9335	0.0003	5282116.0940	0.0005	1183263.5829	0.0002
PSUR	-3649683.2803	0.0004	5117857.8758	0.0006	1077577.4102	0.0002
PTAG	-3184318.7670	0.0003	5291065.4701	0.0005	1590418.2278	0.0002
PURD	-3119484.1100	0.0008	5279887.0758	0.0013	1747196.4939	0.0005
QNAM	-1939077.0753	0.0004	5824547.8579	0.0009	1724921.3583	0.0004
QT01	-1339440.8653	0.0004	5788398.0195	0.0015	2313170.2504	0.0008
QT03	-1916791.4073	0.0004	5822974.8835	0.0008	1754668.6658	0.0003
SAND	-2990750.7441	0.0005	5596337.9156	0.0009	644936.4851	0.0003
SEG1	-1404378.2018	0.0003	6215518.6974	0.0008	274837.3602	0.0002
SIEM	-1481813.7551	0.0003	6025851.5195	0.0008	1469486.4949	0.0002
SKEP	-1521817.5188	0.0004	6192367.1090	0.0011	140106.7088	0.0003
SLOY	-1539523.1951	0.0003	6187726.0440	0.0008	151765.3261	0.0002
SNSC	-1538472.9175	0.0003	6188108.0315	0.0008	145243.1683	0.0002
SNTU	-1508021.4470	0.0003	6195577.0598	0.0008	148800.7295	0.0002
SNYP	-1526242.9962	0.0004	6191001.9594	0.0009	152484.1029	0.0002
SSEK	-1522480.1196	0.0003	6191654.8620	0.0008	162569.3538	0.0002
SSMK	-1518411.1877	0.0003	6193330.5279	0.0008	133831.3206	0.0002
STUE	-1706562.5889	0.0004	5962886.3896	0.0010	1482541.0614	0.0004
SUWN	-3062023.0924	0.0005	4055447.9091	0.0005	3841818.1962	0.0005
T430	-2411015.6526	0.0003	5380265.5556	0.0006	2425132.5413	0.0003
TARW	-6327823.5408	0.0008	785587.3869	0.0003	149815.7669	0.0002
TEMB	-2693842.9861	0.0003	5757787.8650	0.0006	520314.5892	0.0002
TKEO	-1598151.3921	0.0003	6054513.1281	0.0009	1208105.0116	0.0003
TLOH	-1369260.5277	0.0003	6217732.1287	0.0007	381198.0754	0.0002
TSKB	-3957199.8054	0.0004	3310199.0560	0.0004	3737711.5571	0.0004
UKUR	-2678449.1092	0.0003	5762777.6176	0.0006	543962.4291	0.0002
UMAS	-2225109.1658	0.0003	5975252.6089	0.0006	162341.1230	0.0002
USMP	-1135919.5967	0.0004	6248058.4750	0.0012	591589.4765	0.0002
VIEN	-1314798.0137	0.0003	5923043.4940	0.0007	1961129.4250	0.0003

Table 3. *The final computed geodetic coordinates in ITRF2008 at the mean epoch of the measurements, i.e. @2012. 70137.*

Station	LONGITUDE (DMS)			1 std (m)	LATITUDE (DMS)			1 std (m)	ELLIPSOID HEIGHT (m)	1 std (m)
0029	141	12	14.24433	0.0002	39	6	38.19628	0.0002	172.1374	0.0007
0745	127	49	34.26097	0.0002	26	10	6.98433	0.0002	97.1282	0.0008
0746	131	17	26.40082	0.0002	25	57	13.42832	0.0002	72.5716	0.0006
0837	130	35	58.54127	0.0002	31	49	26.61725	0.0002	314.6362	0.0009
1135	133	41	58.46685	0.0002	35	29	25.43877	0.0002	72.4794	0.0006
2004	130	52	42.88152	0.0002	31	25	31.11123	0.0002	134.5528	0.0007
2005	141	50	41.35013	0.0002	43	31	43.11561	0.0002	118.5817	0.0007
2007	142	11	42.09748	0.0002	27	4	3.11579	0.0002	104.2099	0.0007
3009	140	39	33.29184	0.0002	35	57	19.63095	0.0002	65.7397	0.0006
AMAN	111	27	27.24755	0.0002	1	13	18.69643	0.0002	52.3795	0.0008
ARAU	100	16	47.05792	0.0003	6	27	0.56551	0.0002	18.0592	0.0009
ATTA	106	49	42.16120	0.0002	14	48	33.98403	0.0002	85.3876	0.0007
BEHR	101	31	1.96742	0.0002	3	45	55.33004	0.0002	68.7066	0.0007
BIN1	113	5	39.61584	0.0002	3	14	25.14193	0.0002	58.9908	0.0008
BOUN	101	54	0.60723	0.0002	21	38	45.31649	0.0002	891.2649	0.0007
DIEB	103	0	19.62082	0.0002	21	25	39.41412	0.0002	465.6601	0.0007
DOSN	106	47	41.50258	0.0003	20	41	40.00940	0.0002	32.6669	0.0009
GMUS	101	57	49.66499	0.0003	4	51	46.70512	0.0002	125.9465	0.0010
GRIK	101	7	48.99589	0.0002	5	26	20.44136	0.0002	149.1792	0.0005
HKFN	114	8	17.42175	0.0002	22	29	40.86534	0.0002	41.1877	0.0007
HKKT	114	3	59.65030	0.0002	22	26	41.65689	0.0002	34.5446	0.0007
HKLT	113	59	47.86024	0.0002	22	25	5.27794	0.0002	125.8943	0.0007
HKQT	114	12	47.59332	0.0002	22	17	27.72130	0.0002	5.1543	0.0008
HKSC	114	8	28.29237	0.0002	22	19	19.81452	0.0002	20.2072	0.0007
HKSL	113	55	40.74885	0.0002	22	22	19.21236	0.0002	95.2621	0.0006
HKST	114	11	3.28605	0.0002	22	23	42.96948	0.0002	258.6871	0.0006
JHJY	103	47	47.51937	0.0003	1	32	12.51476	0.0002	39.1687	0.0010
KDAL	104	53	4.31380	0.0003	11	26	18.47454	0.0002	-2.6952	0.0010
KRTM	-157	-26	-51.50364	0.0002	2	2	47.63344	0.0002	25.6474	0.0006
KUAL	103	8	20.93241	0.0003	5	19	7.99886	0.0002	54.9738	0.0009
LAB1	115	14	41.19366	0.0003	5	16	57.50716	0.0002	57.2993	0.0009
LABI	114	27	43.51987	0.0002	4	24	50.02895	0.0002	75.2308	0.0007
MIRI	114	0	6.28138	0.0002	4	22	19.56011	0.0002	62.3790	0.0006
MTAW	117	52	53.93970	0.0003	4	15	45.98341	0.0002	72.8639	0.0009
NAGA	85	31	16.39421	0.0002	27	41	33.80928	0.0002	2105.3500	0.0007
NT01	106	48	51.26984	0.0002	20	40	6.45446	0.0002	-20.8299	0.0010

Station	LONGITUDE (DMS)			1 std (m)	LATITUDE (DMS)			1 std (m)	ELLIPSOID HEIGHT (m)	1 std (m)
NT03	107	5	41.87008	0.0004	10	23	11.14678	0.0003	3.0775	0.0015
NT05	104	27	9.46045	0.0004	10	22	10.18196	0.0003	-9.2943	0.0017
PBAY	121	8	34.56417	0.0002	16	28	53.58706	0.0002	322.9024	0.0007
PCB2	120	56	19.71137	0.0004	15	26	45.80016	0.0004	76.7699	0.0015
PDIC	101	48	37.92275	0.0002	2	31	34.23210	0.0002	31.1858	0.0007
PEKN	103	23	22.89319	0.0002	3	29	33.34859	0.0002	25.9922	0.0005
PFLO	120	29	57.68635	0.0002	14	58	58.55949	0.0002	88.2145	0.0007
PGEN	125	7	53.98407	0.0002	6	3	53.68525	0.0002	118.0520	0.0007
PILC	122	33	15.86748	0.0002	10	45	46.38437	0.0002	75.3741	0.0005
PSUR	125	29	37.31252	0.0002	9	47	30.51176	0.0002	80.3043	0.0007
PTAG	121	2	26.75637	0.0002	14	32	7.58990	0.0002	86.6407	0.0006
PURD	120	34	32.21050	0.0004	16	0	15.10500	0.0004	80.4316	0.0015
QNAM	108	24	48.07480	0.0003	15	47	42.24657	0.0002	11.9238	0.0010
QT01	103	1	44.31867	0.0003	21	24	11.09494	0.0003	457.5845	0.0017
QT03	108	13	13.34539	0.0002	16	4	28.71109	0.0002	8.3318	0.0009
SAND	118	7	14.11237	0.0003	5	50	32.65040	0.0002	133.4816	0.0010
SEG1	102	43	55.27595	0.0003	2	29	10.67489	0.0002	28.5244	0.0009
SIEM	103	48	55.60791	0.0002	13	24	33.39198	0.0002	-2.2954	0.0008
SKEP	103	48	25.95600	0.0003	1	16	1.83423	0.0003	36.8106	0.0011
SLOY	103	58	17.98514	0.0002	1	22	21.49338	0.0002	50.2978	0.0008
SNSC	103	57	42.03281	0.0002	1	18	49.12068	0.0002	14.5879	0.0008
SNTU	103	40	47.79722	0.0002	1	20	44.92899	0.0002	75.4979	0.0008
SNYP	103	50	55.51553	0.0003	1	22	44.89769	0.0002	54.8322	0.0010
SSEK	103	48	52.27044	0.0002	1	28	13.35529	0.0002	40.0558	0.0008
SSMK	103	46	31.52002	0.0002	1	12	37.48721	0.0002	24.7332	0.0008
STUE	105	58	15.54249	0.0003	13	31	49.88552	0.0003	37.5669	0.0011
SUWN	127	3	15.27691	0.0002	37	16	31.84986	0.0002	82.2639	0.0008
T430	114	8	17.53285	0.0002	22	29	40.99060	0.0002	41.2898	0.0007
TARW	172	55	22.96914	0.0002	1	21	18.01468	0.0002	36.2757	0.0008
TEMB	115	4	22.97653	0.0002	4	42	38.58153	0.0002	65.1723	0.0007
TKEO	104	47	11.59341	0.0003	10	59	30.15325	0.0002	-4.7317	0.0010
TLOH	102	25	9.72096	0.0002	3	26	58.01880	0.0002	56.9851	0.0007
TSKB	140	5	15.02192	0.0002	36	6	20.44427	0.0002	67.2012	0.0007
UKUR	114	55	41.77119	0.0002	4	55	31.13248	0.0002	74.7231	0.0006
UMAS	110	25	28.91980	0.0002	1	28	5.91292	0.0002	51.3632	0.0006
USMP	100	18	14.53814	0.0003	5	21	28.03211	0.0003	19.8509	0.0012
VIEN	102	30	56.12172	0.0002	18	1	31.84738	0.0002	192.4192	0.0008

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