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The Victorian Seismic Zone 2011 GNSS Campaign Data Analysis

G. Hu

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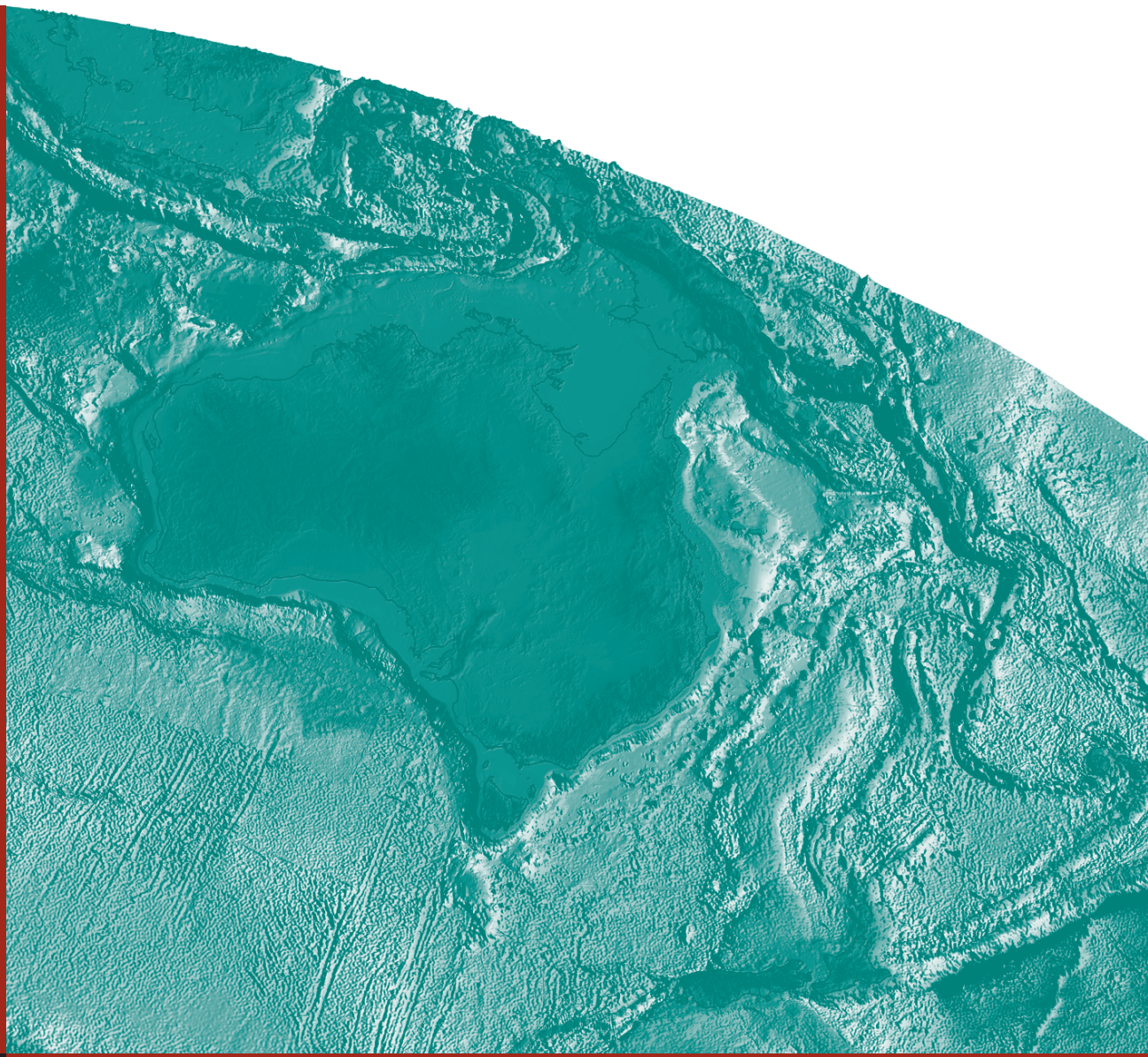

The Victorian Seismic Zone 2011 GNSS Campaign Data Analysis

GEOSCIENCE AUSTRALIA
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by

G. Hu[1].

1. National Geospatial Reference Systems Section, c/- Geoscience Australia GPO Box 378 Canberra ACT 2601

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Minister for Resources and Energy: The Hon. Martin Ferguson, AM MP
Secretary: Mr Drew Clarke

Geoscience Australia
Chief Executive Officer: Dr Chris Pigram

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Executive Summary

The Victorian Seismic Zone (VICSZ) GNSS network covers the Otway and Gippsland regions and consists of 52 custom designed survey marks built directly into rock outcrops or competent features 1-3 m below the surface. Survey mark locations are approximately 30 – 40 km apart. The first GNSS observations of the VICSZ were conducted at the sampling rate of 30s by the Office of Surveyor-General Victoria survey staff between 14 and 23 November 2011.

This document overviews the data analysis of the VICSZ GNSS 2011 campaign, and presents the results including the repeatability RMS (root mean square) of the station coordinates, and the final computed station coordinates. The average of the repeatability RMS of the station coordinates are 1.4 mm, 1.8 mm and 4.3 mm for the northing, easting and height components, respectively.

Introduction

This document overviews the data analysis of the Victorian Seismic Zone (VICSZ) GNSS campaign conducted in November 2011. The VICSZ GNSS network covers the Otway and Gippsland regions and consists of 52 custom designed survey marks built directly into rock outcrops or competent features 1-3 m below the surface. Survey mark locations are approximately 30 – 40 km apart. (details see Woods, 2011).

The document is organized as follows. The data set of the campaign is described next. 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.

GNSS Data Set

Between 14 and 23 November 2011 the first GNSS observations of the VICSZ were conducted at the sampling rate of 30s by the Office of Surveyor-General Victoria survey staff. Figure 1 shows the positions of the VICSZ stations. The GNSS data set summaries, receivers, antennae and station eccentricities for the campaign are listed in Tables 1-3, respectively.

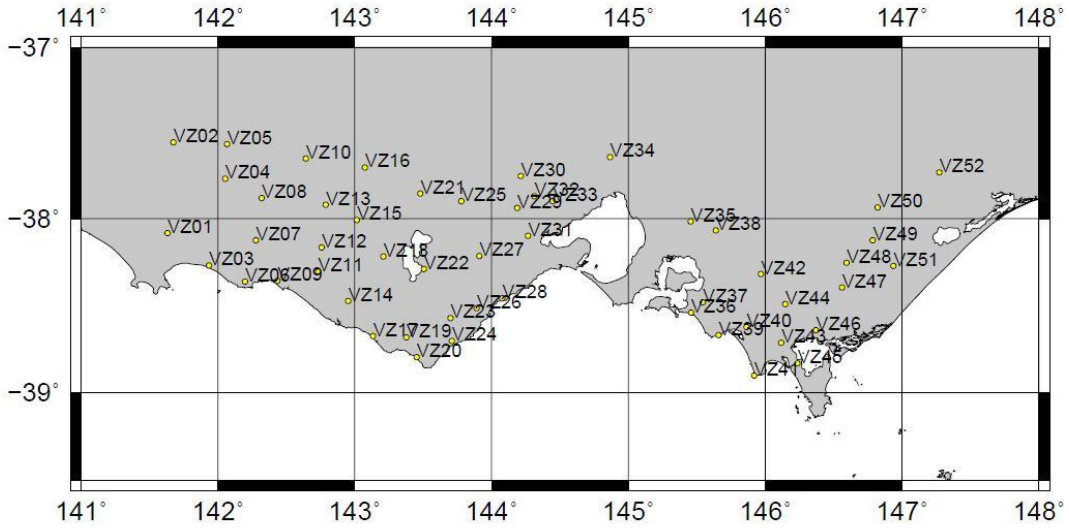

Figure 1: *The positions of the VICSZ stations.*

Table 1: Day-of-year occupations for the VICSZ GNSS 2011 campaign.

SITE	DAY-OF-YEAR	DAYS		SITE	DAY-OF-YEAR	DAYS
VZ01	319-326	8		VZ27	318-328	11
VZ02	319-327	9		VZ28	318-327	10
VZ03	319-326	8		VZ29	318-328	11
VZ04	319-327	9		VZ30	318-326	9
VZ05	319-327	9		VZ31	318-328	11
VZ06	319-326	8		VZ32	320-327	8
VZ07	319-326	8		VZ33	320-327	8
VZ08	318-327	10		VZ34	317-328	12
VZ09	319-326	8		VZ35	318-327	10
VZ10	318-327	10		VZ36	318-327	10
VZ11	319-326	8		VZ37	318-327	10
VZ12	318-327	10		VZ38	318-327	10
VZ13	318-326	9		VZ39	318-327	10
VZ14	319-326	8		VZ40	320-327	8
VZ15	318-327	10		VZ41	318-326	9
VZ16	318-326	9		VZ42	318-327	10
VZ17	319-326	8		VZ43	319-326	8
VZ18	318-327	10		VZ44	319-326	8
VZ19	319-326	8		VZ45	319-326	8
VZ20	319-326	8		VZ46	319-326	8
VZ21	318-326	9		VZ47	318-326	9
VZ22	318-327	10		VZ48	318-327	10
VZ23	318-327	10		VZ49	319-326	8
VZ24	318-327	10		VZ50	319-326	8
VZ25	318-326	9		VZ51	319-326	8
VZ26	318-327	10		VZ52	319-326	8

Table 2: GNSS receivers and antennae used for the VICSZ GNSS 2011 campaign.

SITE	RECEIVER TYPE	ANTENNA TYPE		SITE	RECEIVER TYPE	ANTENNA TYPE	
VZ01	TRIMBLE NETRS	TRM55971.00	NONE	VZ27	TRIMBLE NETR9	TRM55971.00	NONE
VZ02	TRIMBLE NETR9	TRM55971.00	NONE	VZ28	TPS NET-G3A	TPSG3_A1	NONE
VZ03	TRIMBLE NETR9	TRM55971.00	NONE	VZ29	TPS NET-G3A	TPSG3_A1	NONE
VZ04	TRIMBLE NETR9	TRM55971.00	NONE	VZ30	LEICA GR10	LEIAR10	NONE
VZ05	TRIMBLE NETR9	TRM55971.00	NONE	VZ31	TRIMBLE NETR9	TRM55971.00	NONE
VZ06	TRIMBLE NETR9	TRM55971.00	NONE	VZ32	LEICA GR10	LEIAR10	NONE
VZ07	TRIMBLE NETR9	TRM55971.00	NONE	VZ33	LEICA GR10	LEIAR10	NONE
VZ08	TRIMBLE NETR9	TRM55971.00	NONE	VZ34	LEICA GR10	LEIAR10	NONE
VZ09	TRIMBLE NETR9	TRM55971.00	NONE	VZ35	TPS NET-G3A	TPSG3_A1	NONE
VZ10	TRIMBLE NETR9	TRM55971.00	NONE	VZ36	LEICA GR10	LEIAR10	NONE
VZ11	TRIMBLE NETR9	TPSG3_A1	NONE	VZ37	LEICA GR10	LEIAR10	NONE
VZ12	TPS NET-G3A	TRM55971.00	NONE	VZ38	TPS NET-G3A	TPSG3_A1	NONE
VZ13	TRIMBLE NETR9	TRM55971.00	NONE	VZ39	LEICA GR10	LEIAR10	NONE
VZ14	TRIMBLE NETR9	TPSG3_A1	NONE	VZ40	LEICA GR10	LEIAR10	NONE
VZ15	TPS NET-G3A	TRM55971.00	NONE	VZ41	LEICA GR10	LEIAR10	NONE
VZ16	TRIMBLE NETR9	TRM55971.00	NONE	VZ42	TPS NET-G3A	TPSG3_A1	NONE
VZ17	TRIMBLE NETR9	TPSG3_A1	NONE	VZ43	LEICA GR10	LEIAR10	NONE
VZ18	TPS NET-G3A	TRM55971.00	NONE	VZ44	LEICA GR10	LEIAR10	NONE
VZ19	TRIMBLE NETR9	TPSG3_A1	NONE	VZ45	LEICA GR10	LEIAR10	NONE
VZ20	TPS NET-G3A	TPSG3_A1	NONE	VZ46	LEICA GR10	LEIAR10	NONE
VZ21	TPS NET-G3A	TRM55971.00	NONE	VZ47	TPS NET-G3A	TPSG3_A1	NONE
VZ22	TRIMBLE NETR9	TRM55971.00	NONE	VZ48	TPS NET-G3A	TPSG3_A1	NONE
VZ23	TRIMBLE NETR9	TPSG3_A1	NONE	VZ49	TPS NET-G3A	TPSG3_A1	NONE
VZ24	TPS NET-G3A	TPSG3_A1	NONE	VZ50	TPS NET-G3A	TPSG3_A1	NONE
VZ25	TPS NET-G3A	TRM55971.00	NONE	VZ51	TPS NET-G3A	TPSG3_A1	NONE
VZ26	TRIMBLE NETR9	TPSG3_A1	NONE	VZ52	TPS NET-G3A	TPSG3_A1	NONE

Table 3: Station eccentricities for the VICSZ GNSS 2011 campaign.

SITE	ECCENTRICITIES (M)			SITE	ECCENTRICITIES (M)		
	NORTH	EAST	UP		NORTH	EAST	UP
VZ01	0.0000	0.0000	0.0505	VZ27	0.0000	0.0000	0.0505
VZ02	0.0000	0.0000	0.0505	VZ28	0.0000	0.0000	0.0505
VZ03	0.0000	0.0000	0.0505	VZ29	0.0000	0.0000	0.0505
VZ04	0.0000	0.0000	0.0505	VZ30	0.0000	0.0000	0.0505
VZ05	0.0000	0.0000	0.0505	VZ31	0.0000	0.0000	0.0505
VZ06	0.0000	0.0000	0.0505	VZ32	0.0000	0.0000	0.0505
VZ07	0.0000	0.0000	0.0505	VZ33	0.0000	0.0000	0.0505
VZ08	0.0000	0.0000	0.0505	VZ34	0.0000	0.0000	0.0505
VZ09	0.0000	0.0000	0.0505	VZ35	0.0000	0.0000	0.0505
VZ10	0.0000	0.0000	0.0505	VZ36	0.0000	0.0000	0.0505
VZ11	0.0000	0.0000	0.0505	VZ37	0.0000	0.0000	0.0505
VZ12	0.0000	0.0000	0.0505	VZ38	0.0000	0.0000	0.0505
VZ13	0.0000	0.0000	0.0505	VZ39	0.0000	0.0000	0.0505
VZ14	0.0000	0.0000	0.0505	VZ40	0.0000	0.0000	0.1638
VZ15	0.0000	0.0000	0.0505	VZ41	0.0000	0.0000	0.0505
VZ16	0.0000	0.0000	0.0505	VZ42	0.0000	0.0000	0.0505
VZ17	0.0000	0.0000	0.0505	VZ43	0.0000	0.0000	0.0505
VZ18	0.0000	0.0000	0.0505	VZ44	0.0000	0.0000	0.0505
VZ19	0.0000	0.0000	0.0505	VZ45	0.0000	0.0000	0.0505
VZ20	0.0000	0.0000	0.0505	VZ46	0.0000	0.0000	0.0505
VZ21	0.0000	0.0000	0.0505	VZ47	0.0000	0.0000	0.0505
VZ22	0.0000	0.0000	0.0505	VZ48	0.0000	0.0000	0.0505
VZ23	0.0000	0.0000	0.0505	VZ49	0.0000	0.0000	0.0505
VZ24	0.0000	0.0000	0.0505	VZ50	0.0000	0.0000	0.0505
VZ25	0.0000	0.0000	0.0505	VZ51	0.0000	0.0000	0.0505
VZ26	0.0000	0.0000	0.1638	VZ52	0.0000	0.0000	0.0505

Data Processing Scheme

The data analysis was conducted using the processing engine of Bernese GPS software (Version 5.0) which is capable of providing mm-level horizontal and 1-cm level vertical positioning accuracies over distances up to thousands of km (Dach et al., 2007). The data of ARGN(Australian Regional GPS Network) /IGS stations around the area at the time of the campaign, where available, were included in the analysis to serve as ties with the global reference frame ITRF2008 as illustrated in Figure 2 (Altamimi et al., 2011). The positions and velocities of these IGS stations, which are well determined in ITRF2008 (Altamimi et al., 2011), were constrained to 1.0 mm standard deviation of their a priori values at the actual epoch.

The models applied and processing strategy adopted adhered closely to the procedures typically used by IGS Analysis Centres and Regional Network Associate Analysis Centres in the routine generation of final IGS products, with the following particular points highlighted in this study (e.g., Steigenberger et al., 2006):

(1) IGS final precise GPS satellite ephemeris and the Earth rotation parameters which are in ITRF2008 were used for the daily solutions.
(2) In order to achieve the highest accuracy positions, corrections from IGS absolute antenna phase centre variation (PCV) models are accounted for in both receiver and satellite antenna phase centre offsets (Ge et al., 2005).
(3) During data processing, baseline selection was driven by the desire to keep baseline length as short as possible, and if possible, the same receiver and antenna types should be connected.
(4) Site displacements due to ocean tidal loading for all stations were corrected by using GOT00.2 model (e.g., Scherneck, 1991).

Final combined daily solutions were generated using the minimum constraints approach with the above IGS stations as constraints (Altamimi et al., 2011). As part of this process the daily solutions are compared with the combined solution and the resulting differences are analysed to detect the presence of outliers and check the daily repeatability.

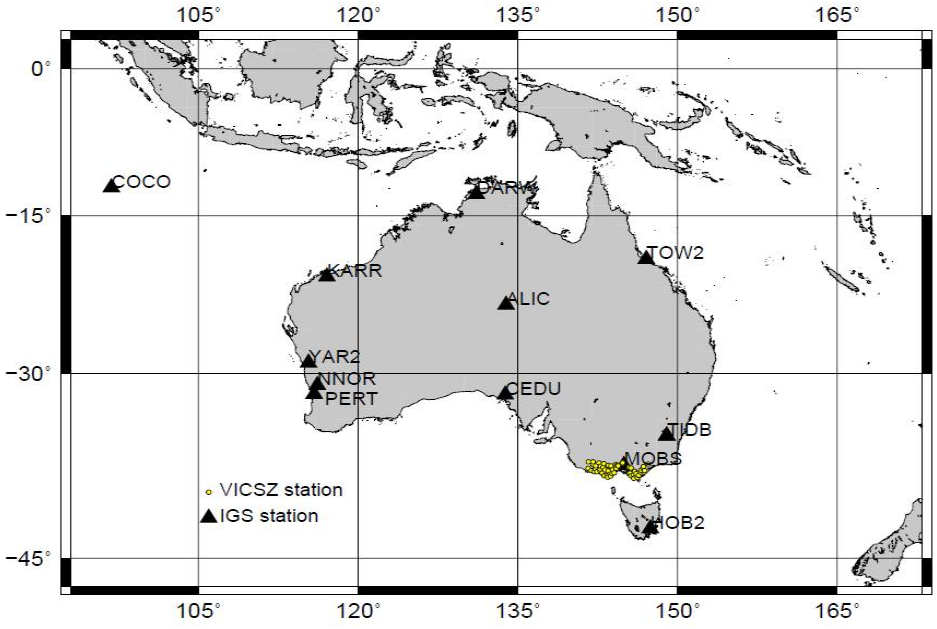

Figure 2: *The positions of the VICSZ stations and ARGN/IGS stations.*

Results

The repeatability RMS (root mean square) of the station coordinates

The repeatability RMS (root mean square) of the station coordinates, an estimate of the day-to-day scatters of coordinates components about a weighted epoch mean, can be used to assess the quality of the final solution and as a measure of internal precision. Table 4 shows the repeatability RMS of the station coordinates. The agreement between the whole campaign and daily solutions for the VICSZ stations is at the millimetre to sub-millimetre level for the horizontal components and at the millimetre level for the vertical component. The average of the repeatability RMS of the station coordinates are 1.4 mm, 1.8 mm and 4.3 mm for the northing, easting and height components, respectively.

Table 4: The repeatability RMS (root mean square) of the station coordinates for each station, unit: mm.

SITE	NORTH	EAST	UP		SITE	NORTH	EAST	UP
ALIC	1.2	1.2	4.5		VZ21	0.7	0.7	3.9
CEDU	0.7	1.0	3.6		VZ22	0.8	0.6	2.9
COCO	1.3	2.5	5.1		VZ23	1.4	0.8	3.7
DARW	2.4	2.1	10.1		VZ24	0.9	1.8	5.6
HOB2	1.4	3.0	3.9		VZ25	1.1	0.5	2.7
KARR	1.1	1.1	5.3		VZ26	1.8	1.1	2.8
MOBS	0.9	0.8	3.3		VZ27	0.9	0.6	3.2
NNOR	1.1	0.9	3.5		VZ28	1.4	1.6	3.5
PERT	1.2	1.4	3.9		VZ29	1.3	0.9	2.6
TIDB	1.1	0.7	3.6		VZ30	1.1	0.5	3.0
TOW2	1.4	2.3	2.9		VZ31	1.0	0.5	4.3
YAR2	1.0	0.8	3.0		VZ32	1.1	0.8	3.0
VZ01	1.2	0.7	4.1		VZ33	1.1	1.0	3.1
VZ02	1.0	0.9	2.6		VZ34	1.0	0.5	2.1
VZ03	1.2	0.5	1.8		VZ35	1.7	1.0	1.8
VZ04	0.7	0.9	2.8		VZ36	1.4	0.6	1.8
VZ05	1.0	0.9	3.0		VZ37	1.2	0.8	4.6
VZ06	1.0	0.8	3.2		VZ38	1.4	0.8	2.2
VZ07	1.3	1.0	2.3		VZ39	0.9	0.5	4.4
VZ08	1.1	0.6	3.2		VZ40	1.0	0.3	3.0
VZ09	1.0	0.9	2.2		VZ41	1.1	1.3	5.1
VZ10	0.9	0.6	3.6		VZ42	1.1	1.2	2.9
VZ11	1.2	1.0	2.1		VZ43	0.8	0.5	2.8
VZ12	0.9	0.6	2.1		VZ44	1.0	1.0	4.1
VZ13	0.9	0.6	2.4		VZ45	0.7	0.8	3.5
VZ14	1.3	0.9	2.8		VZ46	0.5	0.2	4.7
VZ15	1.1	0.7	4.9		VZ47	1.0	1.3	3.9
VZ16	1.1	1.1	1.8		VZ48	1.1	1.0	4.5
VZ17	1.5	0.6	3.4		VZ49	1.4	1.6	5.9
VZ18	1.2	0.9	3.0		VZ50	1.2	0.7	4.0
VZ19	1.7	1.2	2.6		VZ51	1.3	1.0	3.2
VZ20	2.1	1.2	2.3		VZ52	1.2	0.9	3.3

Estimated coordinates in ITRF2008

The final computed Cartesian and geodetic coordinates (ITRF2008, GRS80 ellipsoid) are listed in Tables 5 and 6, respectively, along with their formal error estimates, which can be the first indication of the quality of the measurements and characterizes the internal precision of positioning performance. Note that the listed coordinates are at the mean epoch of the measurements in the ITRF2008 reference frame, i.e., @2011.8822.

Table 5: The final computed Cartesian coordinates in ITRF2008 at the mean epoch of the measurements, i.e. @2011.8822.

SITE 4-char. ID	X (m)	1 σ (m)	Y (m)	1 σ (m)	Z (m)	1 σ (m)
ALIC	-4052052.4229	0.0003	4212836.0303	0.0003	-2545105.0288	0.0003
CEDU	-3753472.8574	0.0003	3912741.0141	0.0003	-3347960.1082	0.0003
COCO	-741950.7136	0.0003	6190961.6605	0.0006	-1337767.8181	0.0002
DARW	-4091359.3187	0.0004	4684606.5369	0.0004	-1408579.6030	0.0002
HOB2	-3950071.9418	0.0003	2522415.3033	0.0002	-4311637.7426	0.0003
KARR	-2713832.9139	0.0003	5303935.1044	0.0004	-2269514.1966	0.0002
MOBS	-4130636.4457	0.0003	2894953.1093	0.0002	-3890530.6178	0.0003
NNOR	-2414152.0034	0.0003	4907778.5726	0.0004	-3270644.6181	0.0003
PERT	-2368687.6682	0.0002	4881316.6248	0.0004	-3341795.3918	0.0003
TIDB	-4460996.6685	0.0003	2682557.0841	0.0002	-3674443.0105	0.0003
TOW2	-5054583.1472	0.0004	3275504.2318	0.0003	-2091538.9036	0.0002
YAR2	-2389026.2354	0.0003	5043316.9933	0.0004	-3078529.9706	0.0003
VZ01	-3941333.1253	0.0004	3120186.7444	0.0003	-3912760.1860	0.0003
VZ02	-3971818.4482	0.0003	3139703.0054	0.0003	-3866484.6654	0.0003
VZ03	-3947449.3890	0.0003	3091378.4385	0.0003	-3929102.1351	0.0003
VZ04	-3981177.0567	0.0003	3104453.0969	0.0003	-3885172.3487	0.0003
VZ05	-3992606.6176	0.0003	3112014.4462	0.0003	-3867530.6144	0.0003
VZ06	-3956586.2752	0.0004	3069385.4545	0.0003	-3937080.9932	0.0003
VZ07	-3973892.4267	0.0004	3073948.5501	0.0003	-3916293.3489	0.0003
VZ08	-3989550.1934	0.0003	3081235.0502	0.0003	-3895007.6619	0.0003
VZ09	-3969502.3383	0.0003	3053129.6803	0.0003	-3936745.3404	0.0003
VZ10	-4019252.0716	0.0003	3068205.5055	0.0003	-3874869.1699	0.0003
VZ11	-3988253.1727	0.0004	3034633.7869	0.0003	-3932385.2231	0.0003
VZ12	-3997252.2980	0.0003	3038851.1860	0.0003	-3919949.9810	0.0003
VZ13	-4012399.8392	0.0003	3046947.0210	0.0003	-3898441.5037	0.0003
VZ14	-3990538.0006	0.0004	3012329.3741	0.0003	-3946908.2340	0.0003
VZ15	-4019459.2837	0.0003	3027367.3788	0.0003	-3906236.7954	0.0003
VZ16	-4039374.3064	0.0003	3035648.3420	0.0003	-3879512.1634	0.0003
VZ17	-3988842.5197	0.0003	2991258.3915	0.0003	-3964468.9119	0.0003
VZ18	-4018206.1391	0.0003	3005105.5005	0.0003	-3924567.2034	0.0003
VZ19	-4001353.1191	0.0004	2974167.3768	0.0003	-3965316.9845	0.0004
VZ20	-3998830.3884	0.0004	2963972.2138	0.0003	-3974856.0075	0.0003
VZ21	-4052460.6449	0.0003	3000813.6352	0.0003	-3892871.3317	0.0003
VZ22	-4029692.3341	0.0003	2981269.6227	0.0002	-3930882.7566	0.0003
VZ23	-4024266.0898	0.0003	2956019.5739	0.0003	-3955751.0631	0.0003
VZ24	-4017465.2379	0.0003	2949938.7021	0.0003	-3966897.2368	0.0003
VZ25	-4065567.2339	0.0003	2977948.2652	0.0003	-3896667.8816	0.0003
VZ26	-4037277.2559	0.0003	2945124.1322	0.0003	-3950869.4846	0.0003
VZ27	-4054854.5219	0.0003	2955650.9794	0.0002	-3924377.8073	0.0003
VZ28	-4049933.2361	0.0003	2933994.1192	0.0003	-3945475.1622	0.0003
VZ29	-4084632.2626	0.0003	2947218.8685	0.0003	-3900050.6959	0.0003
VZ30	-4096423.4207	0.0003	2952924.9960	0.0003	-3883902.9484	0.0003
VZ31	-4079689.3419	0.0003	2935158.0011	0.0002	-3914033.3489	0.0003
VZ32	-4094849.6723	0.0003	2941018.7195	0.0003	-3894085.8412	0.0003
VZ33	-4100192.5750	0.0003	2930166.9566	0.0002	-3896499.5333	0.0003
VZ34	-4135575.3665	0.0003	2910169.7721	0.0002	-3874216.5711	0.0003
VZ35	-4144416.7770	0.0003	2853141.2642	0.0003	-3906884.3186	0.0003
VZ36	-4114707.9451	0.0003	2832315.2748	0.0003	-3952644.1880	0.0003
VZ37	-4122447.7725	0.0004	2828490.7356	0.0003	-3947700.5588	0.0003
VZ38	-4150498.1962	0.0003	2837747.2470	0.0002	-3911509.8794	0.0003
VZ39	-4117251.7277	0.0003	2812744.0629	0.0003	-3963833.6909	0.0003
VZ40	-4129905.3046	0.0003	2799906.4056	0.0003	-3959800.7732	0.0003
VZ41	-4116569.8816	0.0003	2784950.7162	0.0003	-3984062.1516	0.0003
VZ42	-4152611.5567	0.0003	2804405.6727	0.0003	-3933602.5038	0.0003
VZ43	-4137161.1860	0.0003	2778159.5745	0.0003	-3967736.5700	0.0003
VZ44	-4151218.9947	0.0003	2784713.0149	0.0003	-3948624.3226	0.0003
VZ45	-4135789.6172	0.0003	2764939.2530	0.0002	-3978041.9319	0.0003
VZ46	-4153407.0409	0.0004	2762595.4558	0.0003	-3961601.9630	0.0003
VZ47	-4177287.5641	0.0004	2758347.4288	0.0003	-3940456.9297	0.0003
VZ48	-4186547.2662	0.0003	2761276.3718	0.0003	-3927623.2849	0.0003
VZ49	-4203029.3735	0.0004	2752082.7390	0.0003	-3916455.7507	0.0003
VZ50	-4215776.8342	0.0003	2756553.3432	0.0002	-3899780.7488	0.0003
VZ51	-4201929.6433	0.0004	2735340.4474	0.0003	-3929332.9912	0.0003
VZ52	-4249134.3542	0.0004	2730762.2726	0.0003	-3881994.7156	0.0003

Table 6: The final computed Cartesian coordinates in ITRF2008 at the mean epoch of the measurements, i.e. @2011.8822.

SITE 4-char. ID	LONGITUDE (DMS)			1 σ (m)	LATITUDE (DMS)			1 σ (m)	ELLIPSOID HEIGHT (m)	1 σ (m)
ALIC	133	53	7.86879	0.0002	-23	-40	-12.41203	0.0002	603.2519	0.0005
CEDU	133	48	35.39604	0.0001	-31	-51	-59.98285	0.0002	144.7291	0.0005
COCO	96	50	2.29944	0.0002	-12	-11	-18.03883	0.0002	-35.3152	0.0006
DARW	131	7	57.86943	0.0002	-12	-50	-37.32438	0.0002	125.1087	0.0005
HOB2	147	26	19.44813	0.0001	-42	-48	-16.95338	0.0002	41.0509	0.0004
KARR	117	5	49.89724	0.0002	-20	-58	-53.13651	0.0002	109.1427	0.0005
MOBS	144	58	31.22174	0.0001	-37	-49	-45.86644	0.0002	40.5884	0.0004
NNOR	116	11	33.79462	0.0002	-31	-2	-55.43413	0.0002	234.8252	0.0005
PERT	115	53	6.91333	0.0002	-31	-48	-7.06392	0.0002	12.6949	0.0005
TIDB	148	58	47.99853	0.0002	-35	-23	-57.12436	0.0002	665.3329	0.0005
TOW2	147	3	20.48393	0.0002	-19	-16	-9.39552	0.0002	88.1062	0.0005
YAR2	115	20	49.12636	0.0002	-29	-2	-47.58391	0.0002	241.2849	0.0005
VZ01	141	37	58.18868	0.0002	-38	-4	-57.49022	0.0002	149.7278	0.0005
VZ02	141	40	25.68866	0.0002	-37	-33	-15.58484	0.0002	227.2326	0.0005
VZ03	141	56	3.57796	0.0002	-38	-16	-15.05575	0.0002	18.2126	0.0005
VZ04	142	3	12.63552	0.0002	-37	-46	-0.91844	0.0002	239.7439	0.0005
VZ05	142	3	56.05304	0.0002	-37	-33	-57.19218	0.0002	274.8868	0.0005
VZ06	142	11	48.85112	0.0002	-38	-21	-45.04446	0.0002	11.2322	0.0005
VZ07	142	16	36.33868	0.0002	-38	-7	-24.79009	0.0002	83.6753	0.0005
VZ08	142	19	12.51305	0.0002	-37	-52	-44.44171	0.0002	252.0034	0.0005
VZ09	142	26	3.96154	0.0002	-38	-21	-30.7861	0.0002	25.8691	0.0005
VZ10	142	38	33.75668	0.0002	-37	-38	-57.77774	0.0002	269.5364	0.0005
VZ11	142	43	57.89616	0.0002	-38	-18	-26.35685	0.0002	188.2725	0.0005
VZ12	142	45	23.87306	0.0002	-38	-9	-54.56802	0.0002	123.5356	0.0005
VZ13	142	47	15.33122	0.0002	-37	-55	-6.24796	0.0002	225.405	0.0005
VZ14	142	57	7.24864	0.0002	-38	-28	-30.17172	0.0002	75.4143	0.0005
VZ15	143	0	49.51223	0.0002	-38	0	-28.87038	0.0002	148.4701	0.0005
VZ16	143	4	28.58608	0.0002	-37	-42	-8.67041	0.0002	244.4504	0.0005
VZ17	143	8	0.72984	0.0002	-38	-40	-38.9619	0.0002	62.5018	0.0005
VZ18	143	12	29.51775	0.0002	-38	-13	-4.17366	0.0002	159.6401	0.0005
VZ19	143	22	36.95502	0.0002	-38	-41	-4.48163	0.0002	436.5041	0.0006
VZ20	143	27	13.6645	0.0002	-38	-47	-50.17512	0.0002	86.5092	0.0005
VZ21	143	28	49.28802	0.0002	-37	-51	-16.57526	0.0002	255.9153	0.0005
VZ22	143	30	18.05557	0.0001	-38	-17	-25.6129	0.0002	135.7684	0.0004
VZ23	143	42	3.2544	0.0002	-38	-34	-27.42285	0.0002	435.5621	0.0005
VZ24	143	42	39.45264	0.0002	-38	-42	-13.62214	0.0002	302.3451	0.0005
VZ25	143	46	40.63772	0.0002	-37	-53	-53.62636	0.0002	214.0867	0.0005
VZ26	143	53	23.61808	0.0002	-38	-31	-1.50855	0.0002	571.5913	0.0005
VZ27	143	54	39.85015	0.0001	-38	-12	-57.192	0.0002	126.8899	0.0004
VZ28	144	4	42.10925	0.0002	-38	-27	-30.06316	0.0002	104.5647	0.0005
VZ29	144	11	17.18189	0.0002	-37	-56	-12.97744	0.0002	203.0926	0.0005
VZ30	144	12	49.98326	0.0002	-37	-45	-2.70223	0.0002	484.2086	0.0005
VZ31	144	15	59.88965	0.0001	-38	-5	-51.19364	0.0002	100.9863	0.0004
VZ32	144	18	47.48687	0.0002	-37	-52	-7.28486	0.0002	223.5235	0.0005
VZ33	144	26	55.8018	0.0001	-37	-53	-48.4387	0.0002	145.4981	0.0004
VZ34	144	51	58.57054	0.0001	-37	-38	-33.57558	0.0002	168.4104	0.0004
VZ35	145	27	19.10084	0.0002	-38	0	-54.15043	0.0002	202.6935	0.0005
VZ36	145	27	31.80534	0.0002	-38	-32	-28.03779	0.0002	69.6474	0.0005
VZ37	145	32	42.83536	0.0002	-38	-28	-57.52393	0.0002	287.6505	0.0005
VZ38	145	38	20.75323	0.0001	-38	-4	-6.12938	0.0002	143.7718	0.0004
VZ39	145	39	38.34242	0.0002	-38	-40	-13.12595	0.0002	41.3146	0.0005
VZ40	145	51	51.6215	0.0002	-38	-37	-25.39993	0.0002	51.6509	0.0005
VZ41	145	55	14.80041	0.0002	-38	-54	-13.33689	0.0002	93.3259	0.0005
VZ42	145	58	2.81768	0.0002	-38	-19	-9.95283	0.0002	450.3783	0.0005
VZ43	146	7	5.18322	0.0002	-38	-42	-50.91786	0.0002	209.395	0.0005
VZ44	146	8	44.06686	0.0002	-38	-29	-36.49506	0.0002	260.5423	0.0005
VZ45	146	14	8.53156	0.0001	-38	-50	-4.04454	0.0002	37.748	0.0004
VZ46	146	22	13.97522	0.0002	-38	-38	-37.14403	0.0002	168.6228	0.0005
VZ47	146	33	44.6783	0.0002	-38	-23	-46.0356	0.0002	737.9859	0.0005
VZ48	146	35	34.00523	0.0002	-38	-15	-11.66844	0.0002	108.2992	0.0005
VZ49	146	47	1.6865	0.0002	-38	-7	-32.05296	0.0002	61.3805	0.0005
VZ50	146	49	14.48332	0.0001	-37	-56	-4.01203	0.0002	118.6268	0.0004
VZ51	146	56	13.13218	0.0002	-38	-16	-22.29036	0.0002	108.1814	0.0005
VZ52	147	16	21.494	0.0002	-37	-43	-50.65833	0.0002	236.4573	0.0005

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