

AUSPOS GPS Processing Report

August 17, 2012

This document is a report of the GPS data processing undertaken by the AUSPOS Online GPS Processing Service (version: AUSPOS 2.0) . The AUSPOS Online GPS Processing Service uses International GNSS Service (IGS) products (final, rapid, ultra-rapid depending on availability) to compute precise coordinates in ITRF anywhere on Earth and GDA94 within Australia. The Service is designed to process only dual frequency GPS phase data.

An overview of the GPS processing strategy is included in this report.

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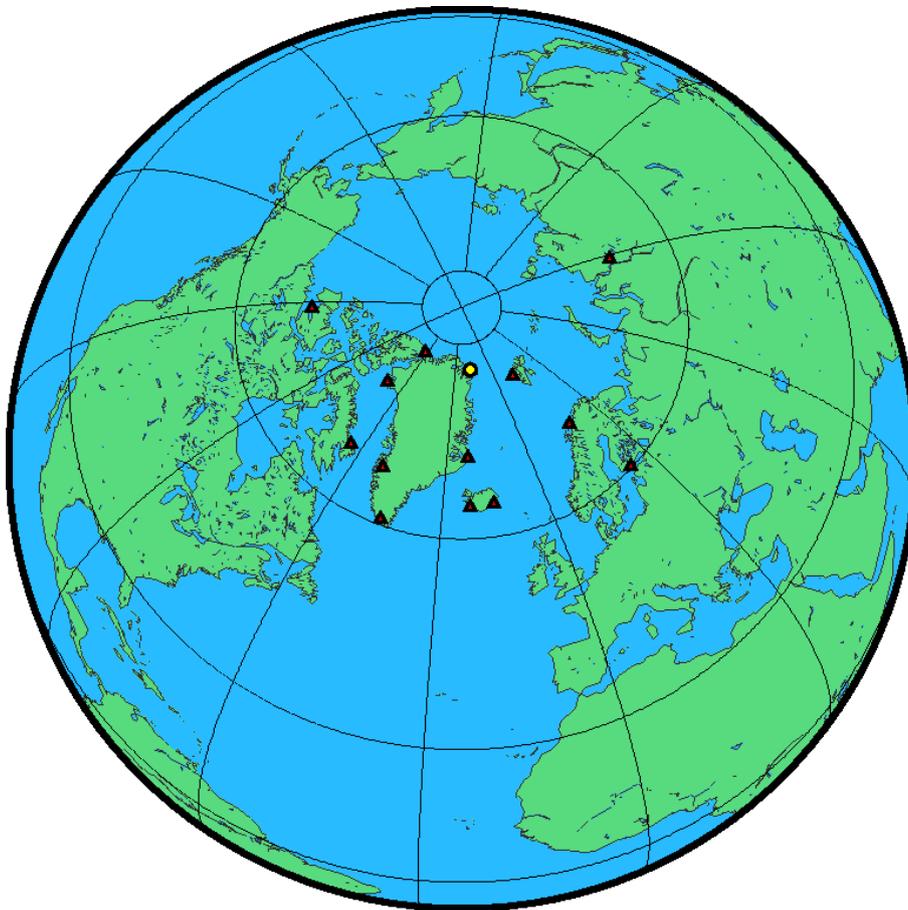


1 User Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP).

Station (s)	Submitted File	Antenna Type	Antenna Height (m)	Start Time	End Time
NRDO	nrd01320.05o	NONE NONE	0.000	2005/05/12 13:56:00	2005/05/13 03:04:30

2 Processing Summary



Date	User Stations	Reference Stations	Orbit Type
2005/05/12 13:56:00	NRDO	ALRT HOFN HOLM KELY METS NRIL NYA1 QAQ1 QIKI REYK SCOR THU3 TRO1	IGS final

3 Computed Coordinates, ITRF2008

All computed coordinates are based on the IGS realisation of the ITRF2008 reference frame. All the given ITRF2008 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

3.1 Cartesian, ITRF2008

Station	X (m)	Y (m)	Z (m)	ITRF2008 @
NRDO	895414.408	-267991.646	6288199.410	12/05/2005
ALRT	388042.692	-740382.387	6302001.878	12/05/2005
HOFN	2679689.976	-727951.220	5722789.315	12/05/2005
HOLM	-983071.990	-1867623.644	5998639.556	12/05/2005
KELY	1575559.089	-1941827.938	5848076.501	12/05/2005
METS	2892570.778	1311843.448	5512634.133	12/05/2005
NRIL	64537.184	2253782.861	5946363.492	12/05/2005
NYA1	1202433.840	252632.291	6237772.592	12/05/2005
QAQ1	2170942.089	-2251829.975	5539988.355	12/05/2005
QIKI	1069081.269	-2195214.191	5872519.021	12/05/2005
REYK	2587384.297	-1043033.521	5716564.031	12/05/2005
SCOR	1982096.073	-798820.968	5989464.532	12/05/2005
THU3	538093.540	-1389088.041	6180979.238	12/05/2005
TRO1	2102928.474	721619.456	5958196.250	12/05/2005

3.2 Geodetic, GRS80 Ellipsoid, ITRF2008

Geoid-ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM2008 geoid. More information on the EGM2008 geoid can be found at <http://earth-info.nga.mil/GandG/wgs84/gravitymod/egm2008/>

Station	Latitude (DMS)	Longitude (DMS)	Ellipsoidal Height(m)	Derived Above Geoid Height(m)
NRDO	81 36 05.10124	-16 39 43.54566	70.024	41.071
ALRT	82 29 39.45803	-62 20 25.66876	78.129	59.233
HOFN	64 16 02.25134	-15 11 52.51396	82.711	17.382
HOLM	70 44 10.69526	-117 45 40.44761	0.424	16.757
KELY	66 59 14.70673	-50 56 41.41878	229.827	198.495
METS	60 13 02.89997	24 23 43.15355	94.608	75.764
NRIL	69 21 42.59997	88 21 35.21057	47.906	62.000
NYA1	78 55 46.39731	11 51 55.11436	84.238	48.644
QAQ1	60 42 54.94867	-46 02 51.94755	110.427	73.180
QIKI	67 33 33.62128	-64 02 01.19614	13.264	5.569
REYK	64 08 19.62327	-21 57 19.74900	93.024	26.553
SCOR	70 29 07.20131	-21 57 01.21044	128.505	71.505
THU3	76 32 13.37143	-68 49 30.13306	36.112	19.763
TRO1	69 39 45.78545	18 56 22.72778	138.079	106.633

4 Solution Information

4.1 Coordinate Precision - Geodetic, One Sigma

Station	σ East (m)	σ North (m)	σ Up (m)
NRDO	0.001	0.001	0.004
ALRT	0.001	0.001	0.002
HOFN	0.001	0.001	0.002
HOLM	0.001	0.001	0.002
KELY	0.001	0.001	0.002
METS	0.001	0.001	0.002
NRIL	0.001	0.001	0.002
NYA1	0.001	0.001	0.002
QAQ1	0.001	0.001	0.002
QIKI	0.001	0.001	0.002
REYK	0.001	0.001	0.002
SCOR	0.001	0.001	0.002
THU3	0.001	0.001	0.002
TRO1	0.001	0.001	0.002

4.2 Ambiguity Resolution - per baseline

Baseline	Ambiguities Resolved	Baseline Length (km)
HOFN - REYK	82.4 %	328.4
NRIL - NYA1	87.5 %	2320.4
METS - TRO1	92.7 %	1081.9
KELY - QAQ1	46.9 %	738.6
NYA1 - TRO1	93.2 %	1053.1
HOLM - THU3	80.4 %	1605.1
KELY - QIKI	56.8 %	566.9
ALRT - THU3	97.5 %	676.7
HOFN - TRO1	82.7 %	1577.8
REYK - SCOR	69.4 %	707.5
NYA1 - THU3	94.6 %	1772.0
QIKI - THU3	94.4 %	1013.4
NRDO - NYA1	92.1 %	606.5
AVERAGE	81.1%	1080.6

Please note for a regional solution, such as used by AUSPOS, an average ambiguity resolution of 50% or better for the network indicates a reliable solution.

5 Computation Standards

5.1 Computation System

Software	Bernese GPS Software Version 5.0.
GNSS system(s)	GPS only.

5.2 Data Preprocessing and Measurement Modelling

Data preprocessing	Phase preprocessing is undertaken in a baseline by baseline mode using triple-differences. In most cases, cycle slips are fixed by the simultaneous analysis of different linear combinations of L1 and L2. If a cycle slip cannot be fixed reliably, bad data points are removed or new ambiguities are set up. A data screening step on the basis of weighted postfit residuals is also performed, and outliers are removed.
Basic observable	Carrier phase with an elevation angle cutoff of 10° and a sampling rate of 3 minutes. However, data cleaning is performed at a sampling rate of 30 seconds. Elevation dependent weighting is applied according to $1/\sin(e)^2$ where e is the satellite elevation. The code observable is only used for the receiver clock synchronisation.
Modelled observable	Double differences of the ionosphere-free linear combination.
Ground antenna phase centre calibrations	IGS08 absolute phase-centre variation model is applied.
Tropospheric Model	A priori model is the Saastamoinen-based hydrostatic mapped with the dry-Niell.
Tropospheric Estimation	Zenith delay corrections are estimated relying on the wet-Niell mapping function in intervals of 2 hour. N-S and E-W horizontal delay parameters are solved for every 24 hours.
Tropospheric Mapping Function	Niell
Ionosphere	First-order effect eliminated by forming the ionosphere-free linear combination of L1 and L2.
Tidal displacements	Solid earth tidal displacements are derived from the complete model from the IERS Conventions 2003, but ocean tide loading is not applied.
Atmospheric loading	Not applied
Satellite centre of mass correction	IGS08 phase-centre variation model applied
Satellite phase centre calibration	IGS08 phase-centre variation model applied
Satellite trajectories	Best available IGS products.
Earth Orientation	Best available IGS products.

5.3 Estimation Process

Adjustment	Weighted least-squares algorithm.
Station coordinates	Coordinate constraints are applied at the Reference sites with standard deviation of 1mm and 2mm for horizontal and vertical components respectively.
Troposphere	Zenith delay parameters and pairs of horizontal delay gradient parameters are estimated for each station in intervals of 2 hour and 24 hours.
Ionospheric correction	An ionospheric map derived from the contributing reference stations is used to aid ambiguity resolution using the QIF strategy
Ambiguity	Ambiguities are resolved in a baseline-by-baseline mode using Quasi-Ionosphere-Free (QIF) approach.

5.4 Reference Frame

Terrestrial reference frame	IGS08 station coordinates and velocities mapped to the mean epoch of observation.
Australian datum	GDA94 coordinates determined via Helmert transformation from ITRF using the Dawson and Woods (2010) parameters.
Derived AHD	For stations within Australia, AUSGeoid09 is used to compute AHD. AUSGeoid09 is the Australia-wide gravimetric quasigeoid model that has been a posteriori fitted to the Australian Height Datum
Above-geoid heights	Earth Gravitational Model EGM2008 released by the National Geospatial-Intelligence Agency (NGA) EGM Development Team is used to compute above-geoid heights. This gravitational model is complete to spherical harmonic degree and order 2159, and contains additional coefficients extending to degree 2190 and order 2159.