Routine GNSS Processing for EUREF Densification
Dionysos Satellite Observatory, NTUA

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December 7, 2015

First Revision: December 4, 2015
Library Uri: http://dionysos.survey.ntua.gr
Version: v1.0-0

Abstract

This document describes the routine processing of GNSS data as performed by Dionysos Satellite Observatory (DSO), of National Technical University of Athens (NTUA) for EUREF Densification Project.

Contents

1 General

This document describes the routine processing of GNSS performed at DSO for the EUREF Densification Project.

2 Data and Products

2.1 RINEX files

The required RINEX files are downloaded on a daily basis from the respective data centers.

2.2 Products

We use the `final` products from Center for Orbit Determination in Europee (CODE). The required products are downloaded from CODE's ftp site, namely `ftp://ftp.unibe.ch/aiub/CODE/YYYY/`, where `YYYY` is the year.

Product	Type	Directory	Notes
Satellite orbits	sp3	`YYYY/`	
Earth rotation parameters	erp	`YYYY/`	
Ionospheric corrections	ion	`YYYY/`	Bernese - specific
Code differential Bias	dcb	`YYYY/`	P1C1
VMF1 grid files		`DELAY/GRID/VMFG/YYYY` [1]	six-hour grid files

2.3 A-priori Coordinates

For `igs` stations we use their published coordinates in `IGb08`. For EPN class A stations, we use their published coordinates, as extrapolated from `ftp://ftp.epncb.oma.be/pub/station/coord/EPN/EPN_A_IGb08.SSC`.

2.4 Ocean Loading

Ocean loading corrections applied according to the model `FES2004`. For EPN sites, displacements are extracted from `ftp://epncb.oma.be/pub/station/general/EPN_FES2004.BLQ`.

2.5 Receiver & Satellite Antennae Calibration

Corrections are extracted from the most recent EPN ANTEX file, i.e. `ftp://ftp.epncb.oma.be/pub/station/general/epn_08.atx`.

2.6 Excluded Stations

We use the EUREF produced exlusion list (`ftp://ftp.epncb.oma.be/pub/station/general/excluded/excluded.wwww`, where 'wwww' is the gps week). All stations mentioned therein are exluded from the processing.

2.7 Metadata

Station information are not extracted from the RINEX files; they are read from the most recent version of the file `ftp://ftp.epncb.oma.be/pub/station/general/EUREF52.STA`.

2.8 Reference Frame

The network is aligned to the frame `IGb08` via the 'minimum-constraint-conditions' approach. The sites used to that end are: `MISSING TEXT`.
Any site (out of the reference list) with offsets larger than 10mm in the North, East or Up component, with respect to its published `IGb08` coordinates, is not used as reference site.

2.9 Elevation Angle & Observation Weighting

We use an elevation cut-off angle of 3°. Elevation dependent weighting of observations applied, according to the function $1/cos^2(z)$.

2.10 Tropospheric Refraction

We use the VMF1 model; a priori ZHD extracted from the VMF grid files. ZWD estimated for each station in intervals of 1 hour. Relative constraints of 5 m are applied.
Additionaly, horizontal delay gradient parameters are estimated for each station in intervals of 24 hours, according to Chen and Herring (1997); relative constraints of 5 m are applied.

2.11 Ambiguity Fixing

Ambiguity resolution is performed, using a baseline-length dependent scenario, as proposed by CODE, i.e.

Code-Based Widelane (WL) For baselines shorter than 6000km, a Melbourne-Wuebbena wide-lane (after checking the residuals of the code observations for outliers) and a narrow-lane ambiguity resolution is performed. This approach only used for GPS observations.

Phase-Based Widelane (L5) For baselines shorter than 200km the code-based wide-lane ambiguity resolution is replaced by a phase-only wide-lane with a subsequent narrow-lane ambiguity resolution.

Quasi-Ionosphere-Free (QIF) The QIF-strategy is applied on the remaining real-valued ambiguities for baselines shorter tahn 2000 km.

Direct L1/L2 A direct L1/L2 ambiguity resolution is applied instead of the above mentioned sequence of strategies on very short baselines, i.e. 20km.

2.12 Satellite Systems

When available, GLONASS observations are included in the processing (a pure GPS-only solution shall also be available).