Routine GNSS Processing for EUREF Densification
Dionysos Satellite Observatory, NTUA

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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.

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 2000km.

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.