SWEPOS post-processing service

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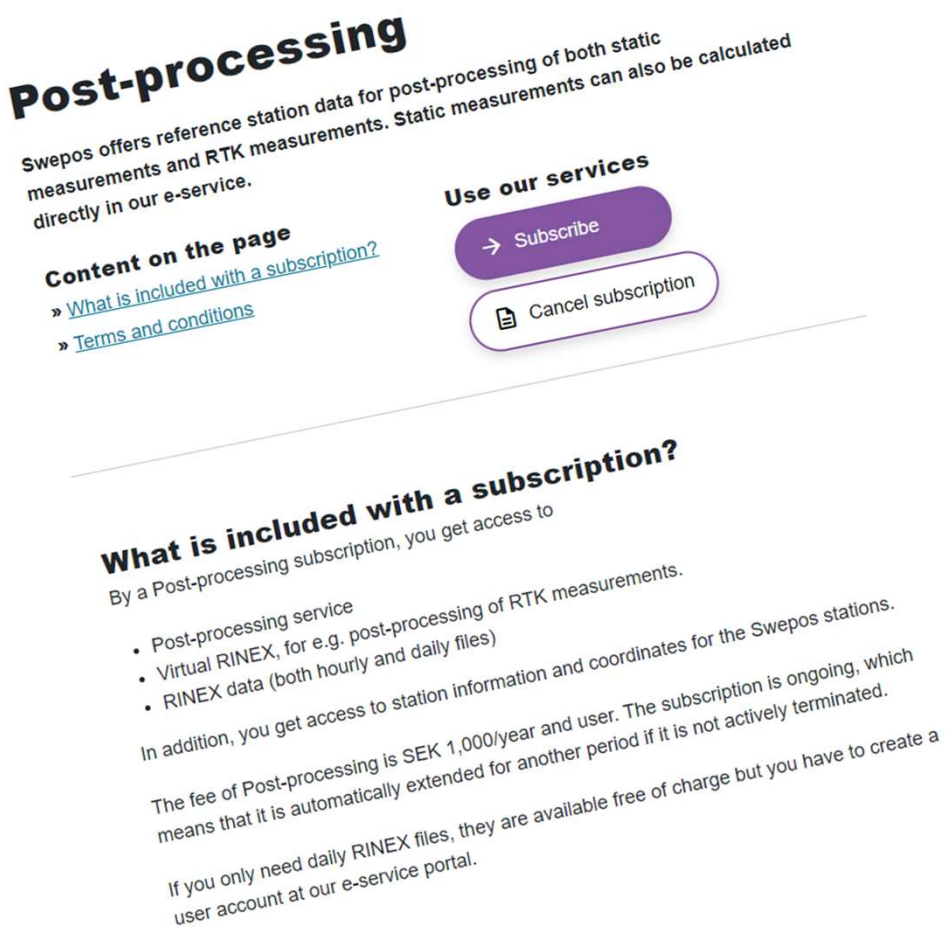
WHAT IS THE SWEPOS POST-PROCESSING SERVICE?

- An online service for the estimation of high precision SWEREF 99 coordinates
- Based on Bernese GNSS software
- Used single static point and SWEPOS reference stations nearby
- Developed in 2000s (renewed in 2015
- Fully modernized in 2023-2024 (not renewed but rewritten from scratch). Why?
  - RINEX2
  - Old tools such as TEQC
  - More limitations
    - Error handling, configurability
    - Troubleshooting
    - Difficult to upgrade
- The new service will be released in April 9-10, 2024



Post-processing

Swepos offers reference station data for post-processing of both static measurements and RTK measurements. Static measurements can also be calculated directly in our e-service.

Content on the page

» What is included with a subscription?

» Terms and conditions

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What is included with a subscription?

By a Post-processing subscription, you get access to

- Post-processing service
- Virtual RINEX, for e.g. post-processing of RTK measurements.
- RINEX data (both hourly and daily files)

In addition, you get access to station information and coordinates for the Swepos stations.

The fee of Post-processing is SEK 1,000/year and user. The subscription is ongoing, which means that it is automatically extended for another period if it is not actively terminated.

If you only need daily RINEX files, they are available free of charge but you have to create a user account at our e-service portal.

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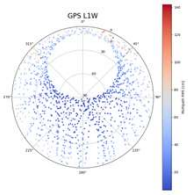
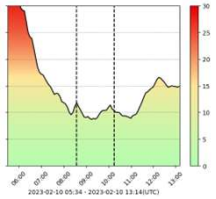
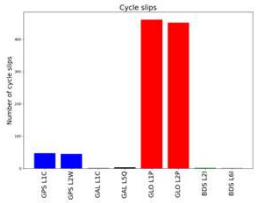
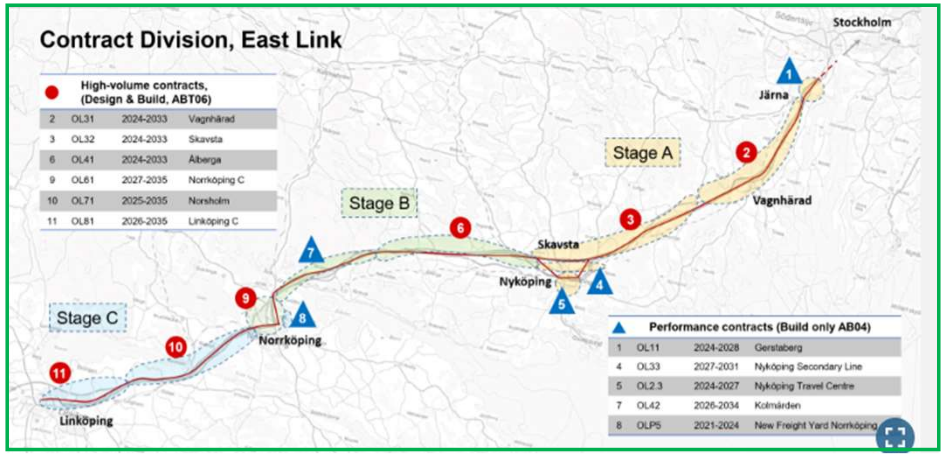
SERVICE TYPES

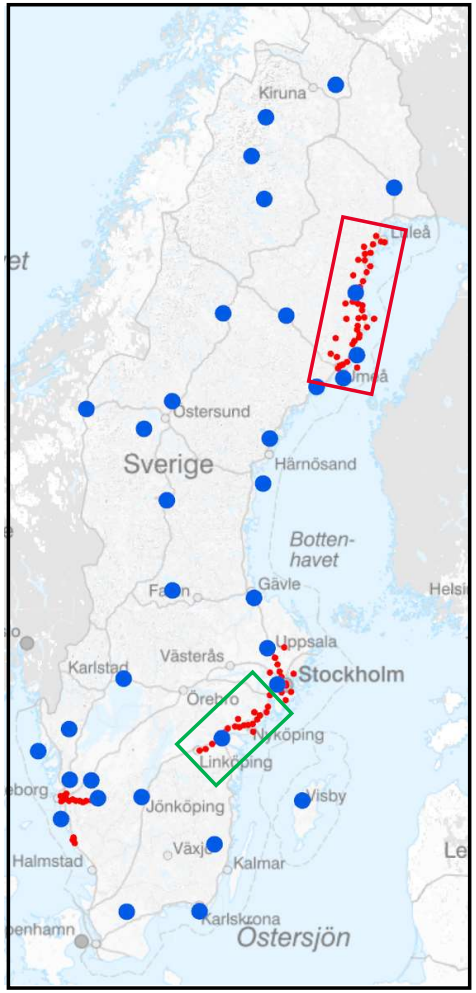
- SWEREF 99 coordinates calculation
  - Ordinary Post Processing Service
  - Project adapted Post Processing Service
- RINEX quality report – NEW!
  - SweposQC

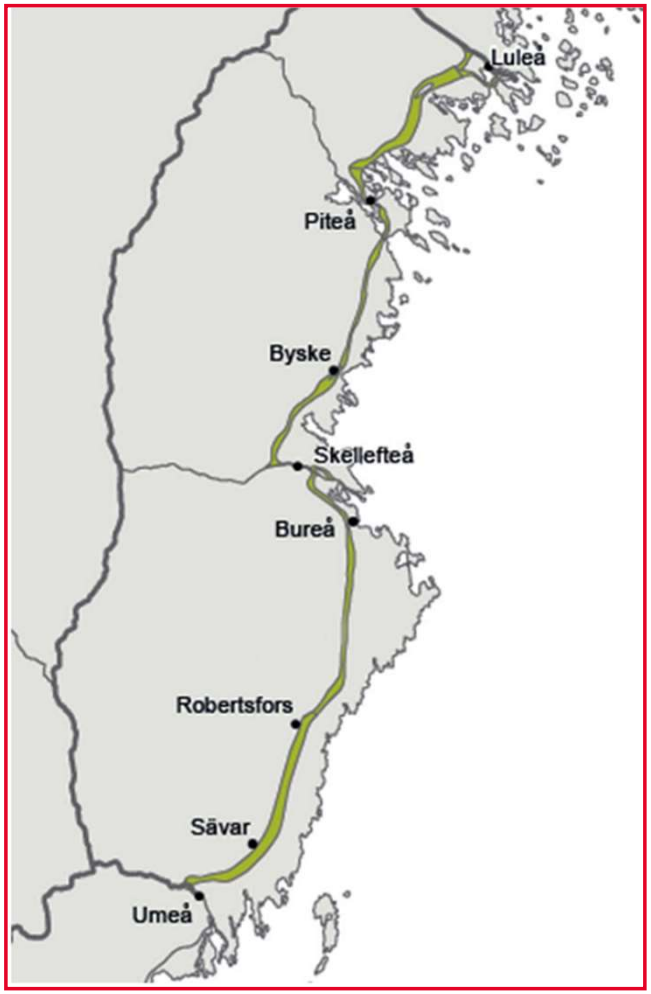












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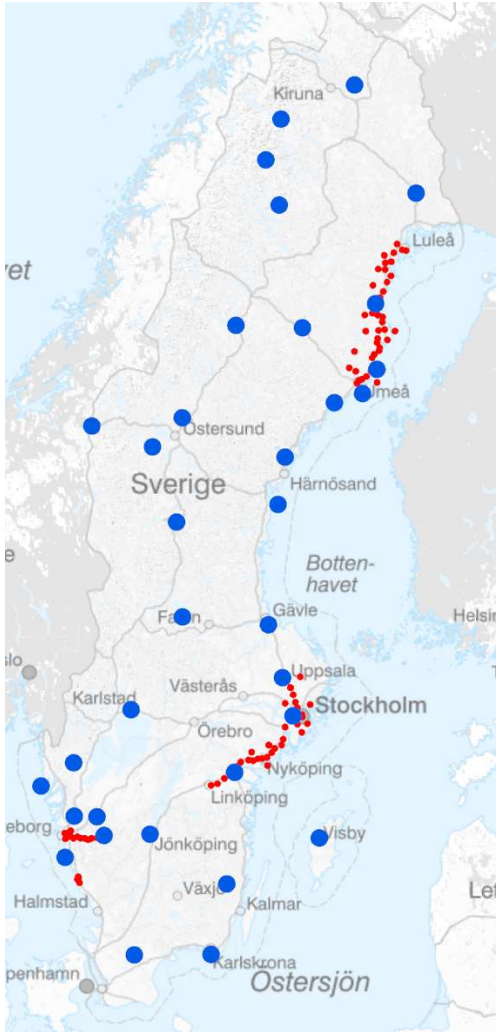
PROCESSING SETTINGS

- SWEREF 99 coordinates calculation
  - Bernese GNSS software, CODE products
  - Coordinates of a new point relative to 6-8 stations, considering station geometry, up to few hundreds of KMS, stations within 10-20 kms
  - Two-frequency observation is a requirement
  - Bernese Processing Settings
    - STAR-based baseline from the new point
    - Multi-GNSS (GPS+GLO+GAL)
    - L3, L1
    - Hourly troposphere parameters - VMF3, Troposphere parameters not always estimated
    - Ionosphere model
    - 3 degrees cut-off
    - 30s observation sampling
    - IGS20.atx antenna models
    - ITRF20 solution fitted to SWEREF99 of SWEPOS stations with Helmert-transformation
- RINEX Quality report
  - Anubis and Inhouse QC tool



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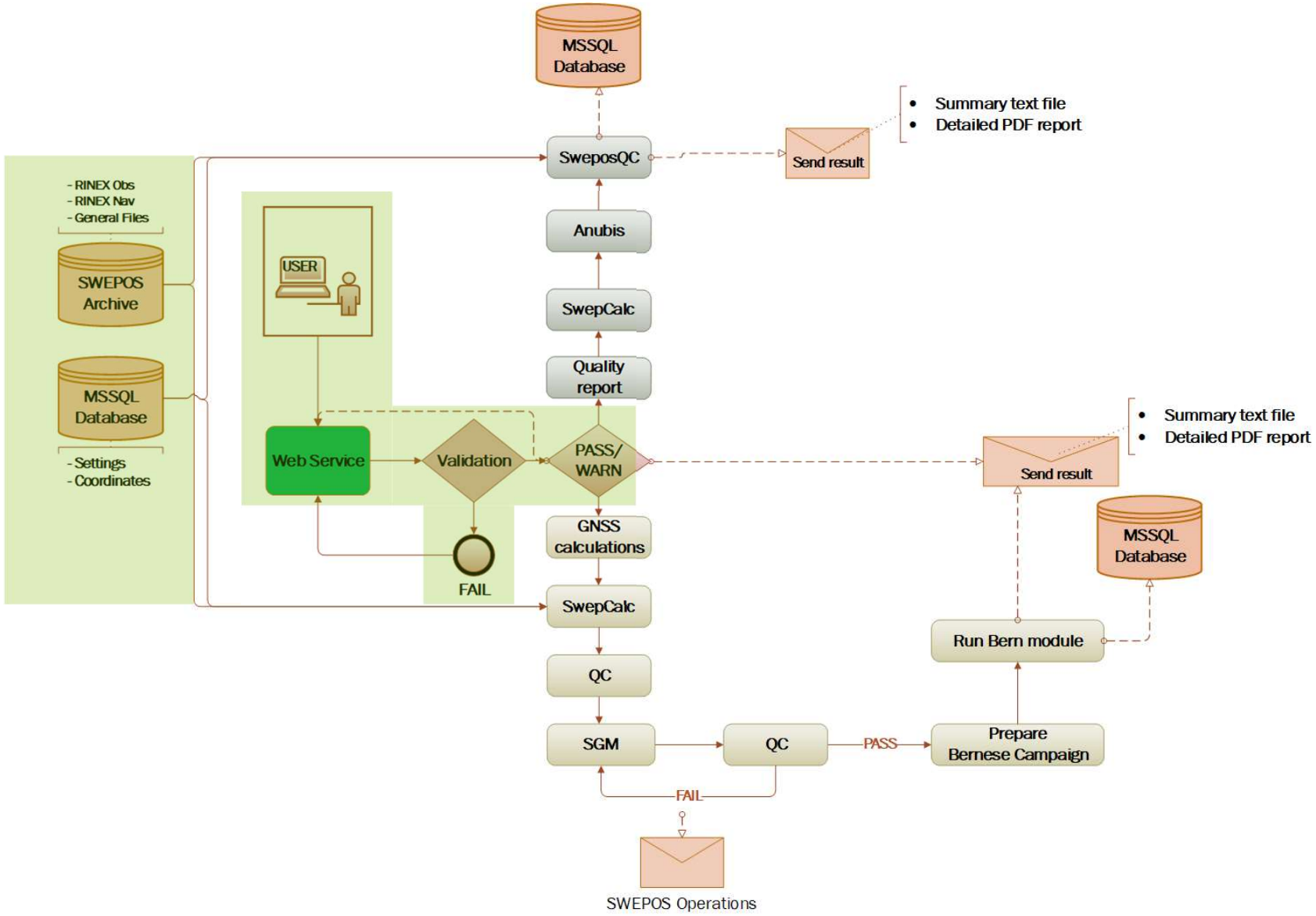
OVERVIEW


MSSQL Database
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Send result
Summary text file
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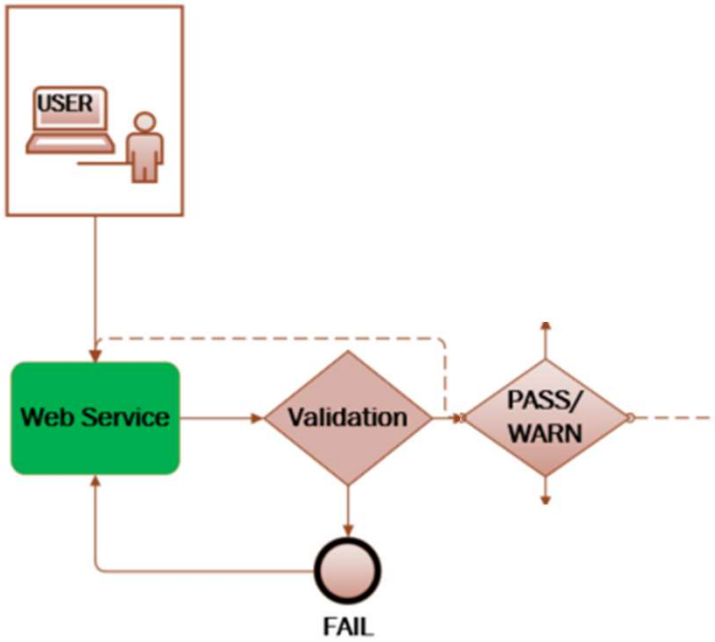
SWEPOS Operations




```
     3.05           OBSERVATION DATA    M (MIXED)           RINEX VERSION / TYPE
TPP 4.3.2                              20210916 235931 UTC PGM / RUN BY / DATE
gfzrnx-2.1.0        FILE PROCESSING    20240312 153120 UTC COMMENT
KUNG.0                                                     MARKER NAME
KUNG.0                                                     MARKER NUMBER
SWEPOS              LMV                                    OBSERVER / AGENCY
5737R50908          TRIMBLE NETR9      5.43                REC # / TYPE / VERS
A0090829            JAVRINGANT_DM  OSOP                    ANT # / TYPE
        0.0710          0.0000          0.0000             ANTENNA: DELTA H/E/N
  3434083.6281   958104.6747  5270952.7988                  APPROX POSITION XYZ
E   12 C1X C5X C7X C8X L1X L5X L7X L8X S1X S5X S7X S8X     SYS / # / OBS TYPES
G   12 C1C C2W C2X C5X L1C L2W L2X L5X S1C S2W S2X S5X     SYS / # / OBS TYPES
R   12 C1C C1P C2C C2P L1C L1P L2C L2P S1C S1P S2C S2P     SYS / # / OBS TYPES
INITIAL_RINEX_VERSION: 3.04                                COMMENT
                                                           COMMENT
                                                           COMMENT
                                                           COMMENT
THE COORDINATES ARE GIVEN IN SWEREF 99 (ETRS 89)           COMMENT
    0                                                      RCV CLOCK OFFS APPL
   18  2175     5                                         LEAP SECONDS
 24 R01  1 R02 -4 R03  5 R04  6 R05  1 R06 -4 R07  5 R08  6 GLONASS SLOT / FRQ #
    R09 -2 R10 -7 R11  0 R12 -1 R13 -2 R14 -7 R15  0 R16 -1 GLONASS SLOT / FRQ #
    R17  4 R18 -3 R19  3 R20  2 R21  4 R22 -3 R23  3 R24  2 GLONASS SLOT / FRQ #
 C1C   19.070 C1P   19.070 C2C   19.070 C2P   19.070       GLONASS COD/PHS/BIS
E                                                          SYS / PHASE SHIFT
G                                                          SYS / PHASE SHIFT
R                                                          SYS / PHASE SHIFT
   30.000                                                  INTERVAL
  2021    9   17    0    0    0.0000000     GPS           TIME OF FIRST OBS
  2021    9   17   23   59   30.0000000     GPS           TIME OF LAST OBS
                                                           END OF HEADER
> 2021 09 17 00 00 00.0000000  0 28      0.000000000000
E02  23218399.445    23218401.629    23218399.824    23218400.902    122013557.595 8
E07  26445707.664    26445711.234    26445709.594    26445710.645    138973135.431 7
E08  25058210.172    25058212.801    25058211.566    25058212.262    131681797.819 6
E11  23241874.750    23241874.316    23241872.883    23241873.828    122136897.172 7
```

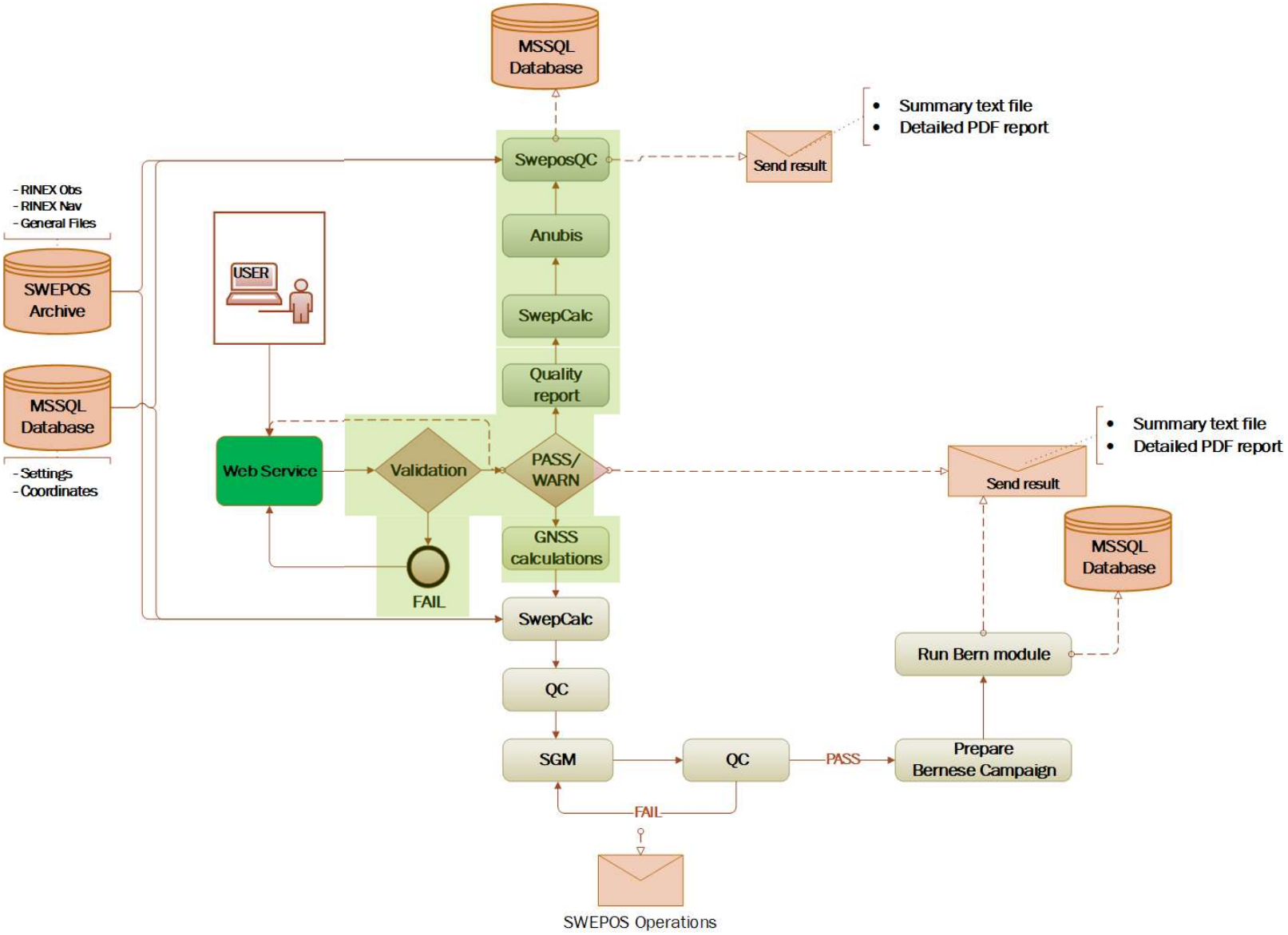
PASS

PASSWithWARNING

FAIL

Ex. Unknown Antenna type, downsampling, time span

Ex. Invalid data format, single frequency, Kinematic data, far from project area e.t.c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Anubis
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QC
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Prepare Bernese Campaign
FAIL
SWEPOS Operations

Swepos Kvalitetsra

Jobbnamn: SQC240304_23
Beställare: Kibrom Ebuy Ab
E-post: None

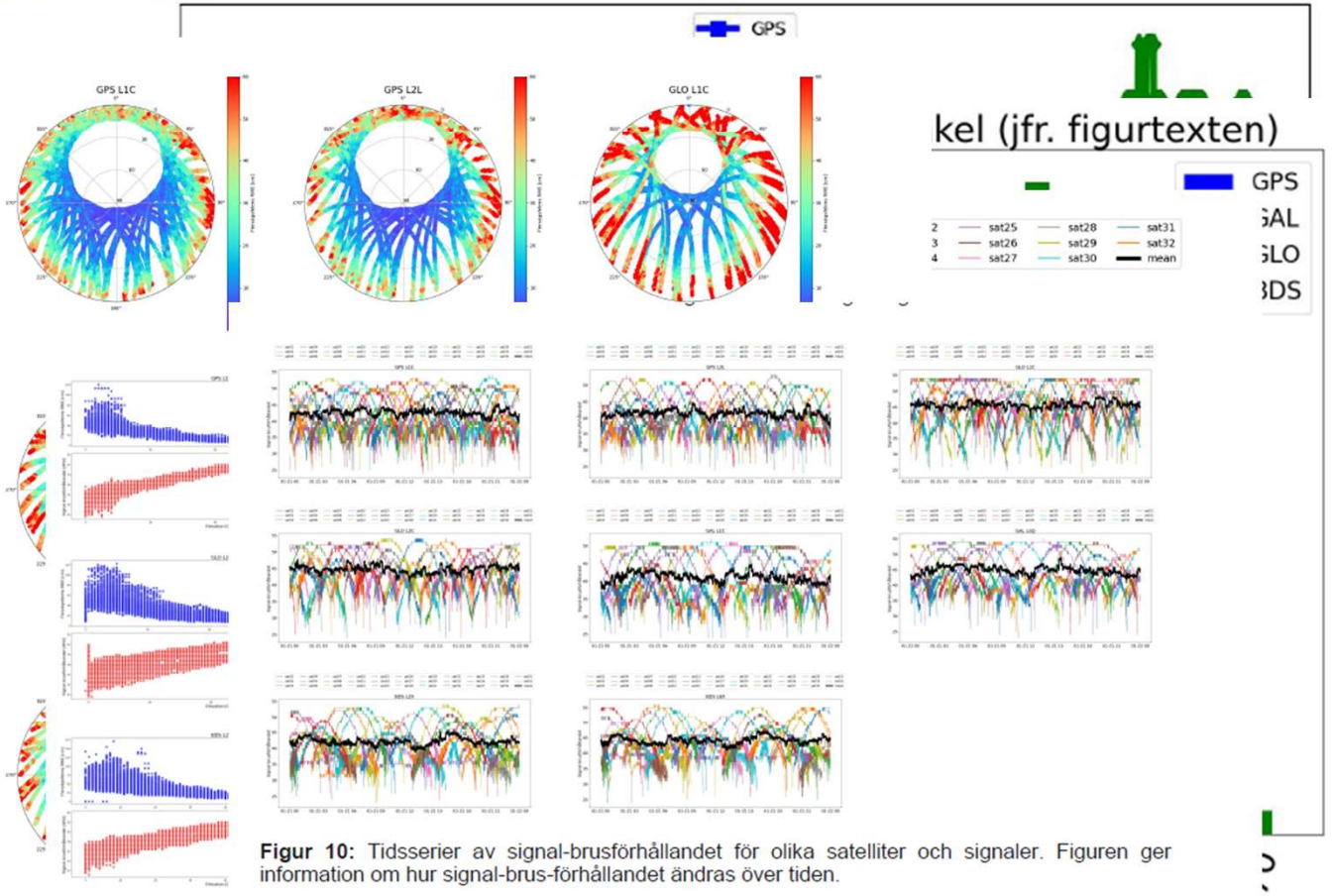
Indatafil: 0SOD00SWE_S_2
Punktnamn: SODE.0

Start mättid (UTC): 2024-01
Stopp mättid (UTC): 2024-0
Fil uppladdad: 2024-03-04 (

Antenntyp (Rinex-header): JNS
Excentricitet Norr/Öst/Upp (m):
Mottagare: SEPT POLARX5

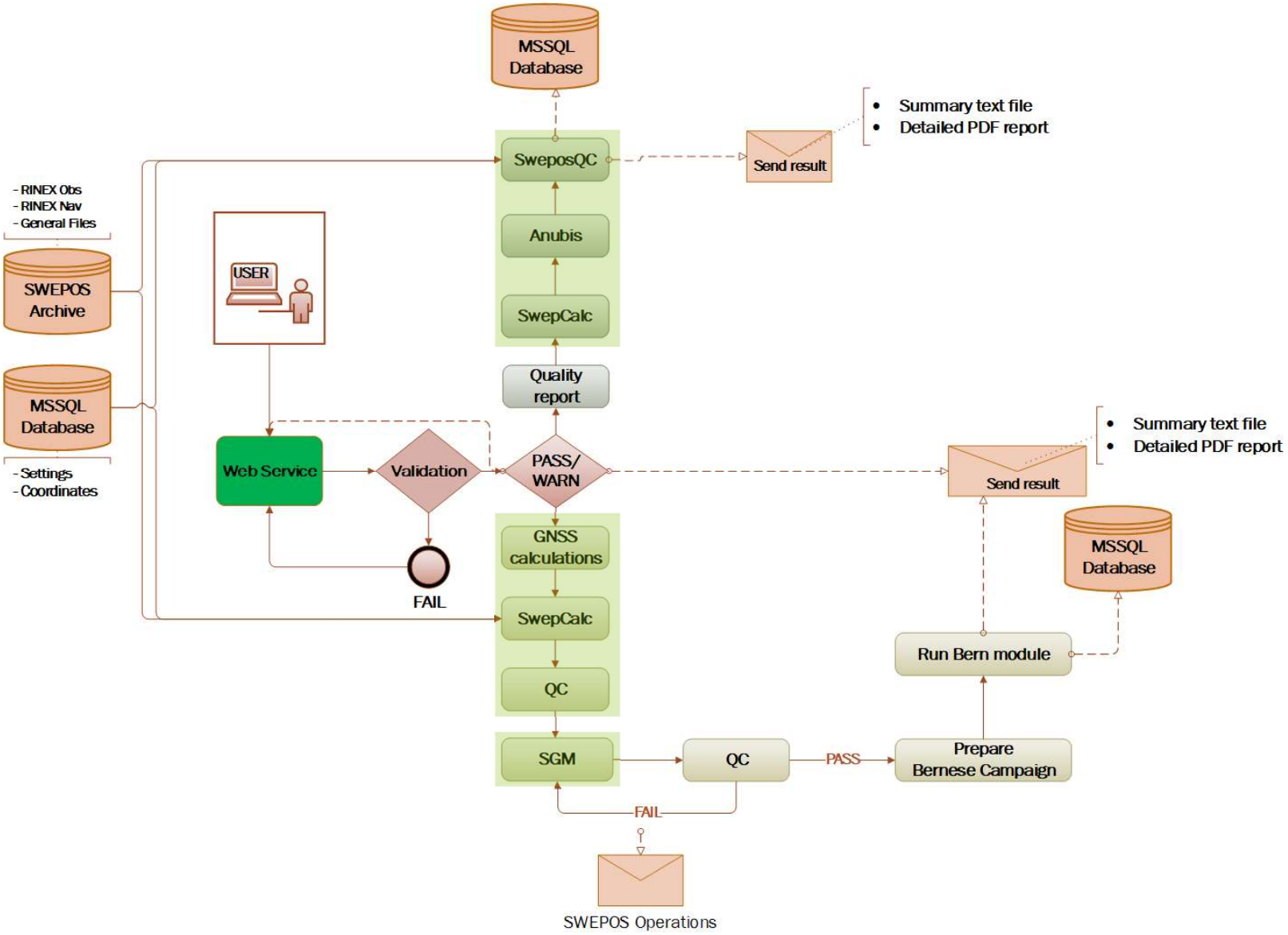
Resultat från kvalitetskontrollen av rinex-filen

Observationsstatistik:



Figur 10: Tidsserier av signal-brusförhållandet för olika satelliter och signaler. Figuren ger information om hur signal-brus-förhållandet ändras över tiden.

Figur 11: De övr
på GPS L1 som
(SNR) som funktion av elevationsvinkeln. Normalt är flervägsfelet högre och
Signal-brusförhållandet lägre för låga elevationsvinklar.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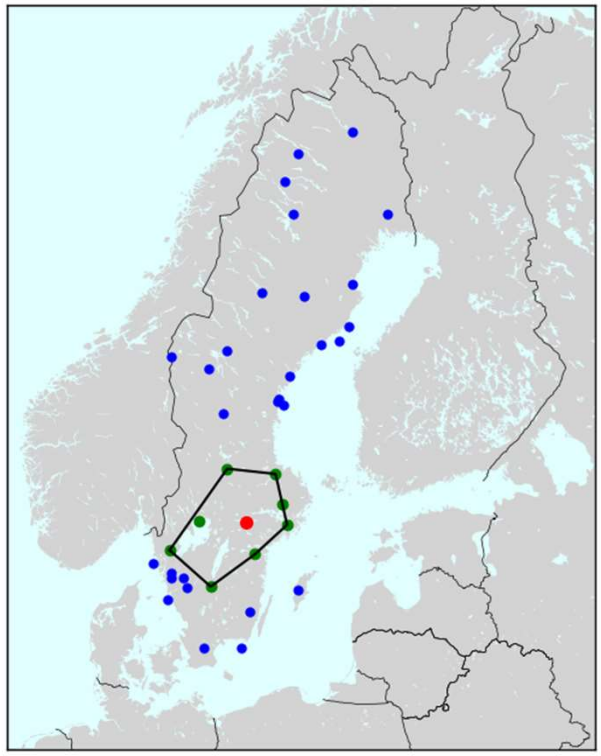
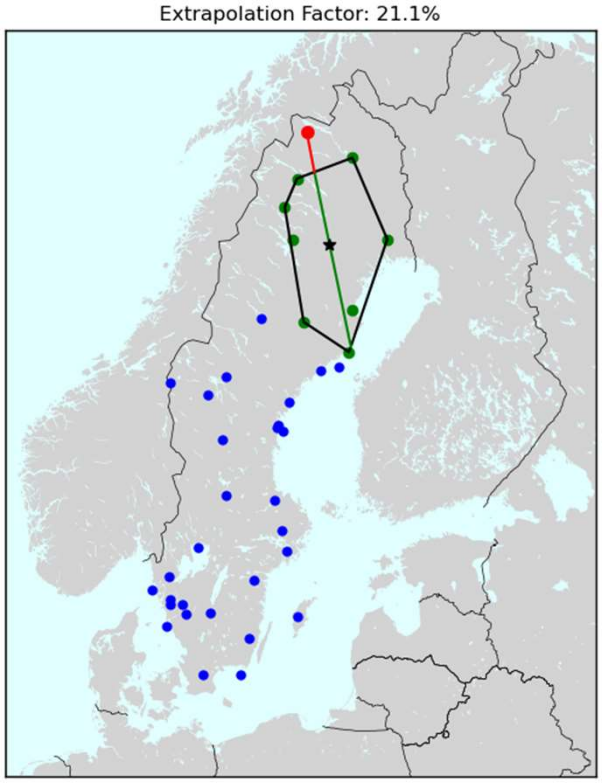
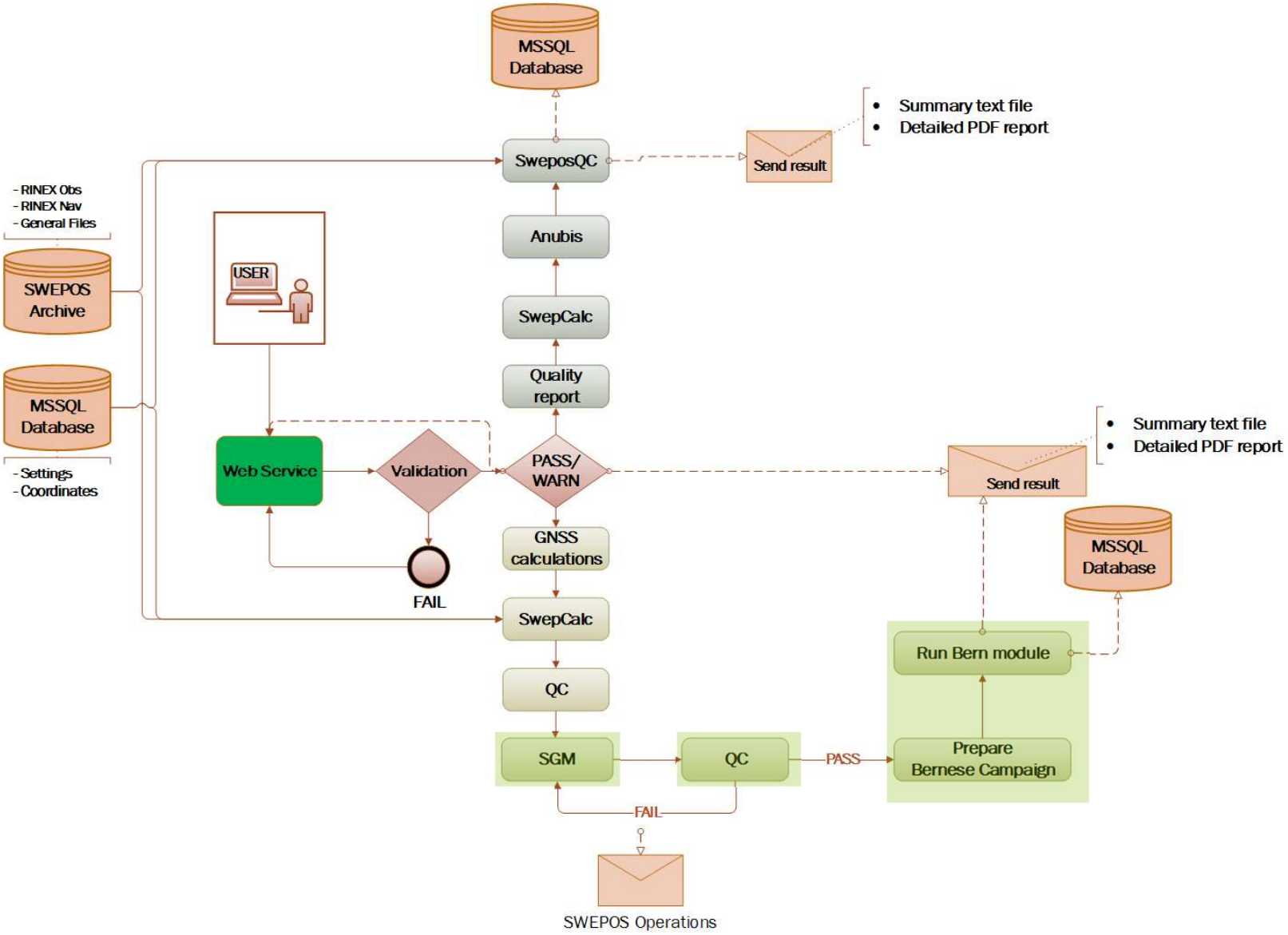
SGM – Station Geometry Matrix



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Resultat från Swepos Beräkningstjänst

Koordinater för nypunkt

SWEREF 99 geocentriska kartesiska koordinater:

Punkt	X (m)	Y (m)	Z (
LEKS.0	3022573.1880	802945.6390	55

SWEREF 99 geodetiska koordinater:

Punkt	Latitud
LEKS.0	60 43 19.71366

SWEREF 99 TM, RH 2000

Punkt	Norr (m)
LEKS.0	6731845.2670

ITRF2020 geocentriska kartesiska koordinater

Punkt	X (m)
LEKS.0	3022572.6487

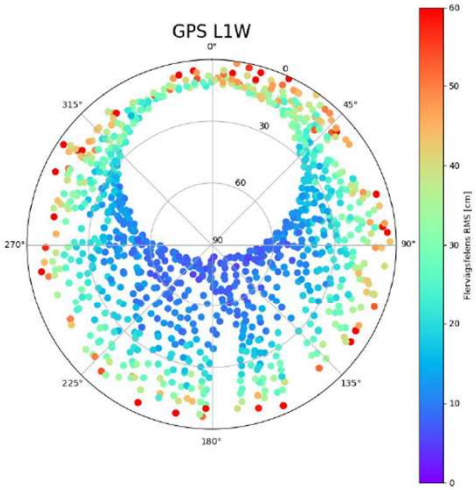
Resultat från Swepos Beräkningstjänst

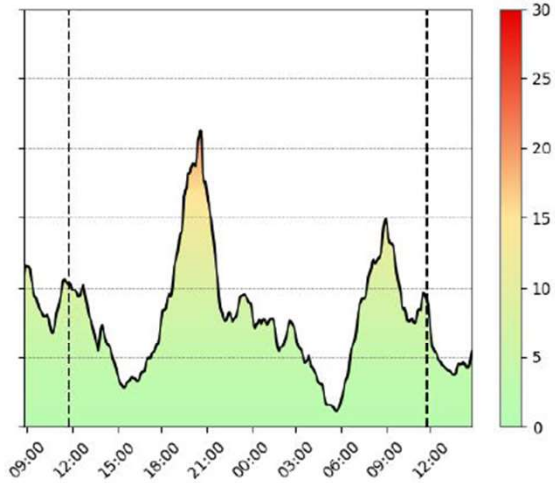
Resultat från Swepos Beräkningstjänst

Jonosfärsaktivitet:

Resultat från Swepos Beräkningstjänst

Flervägsfel (multipath):





5 mm

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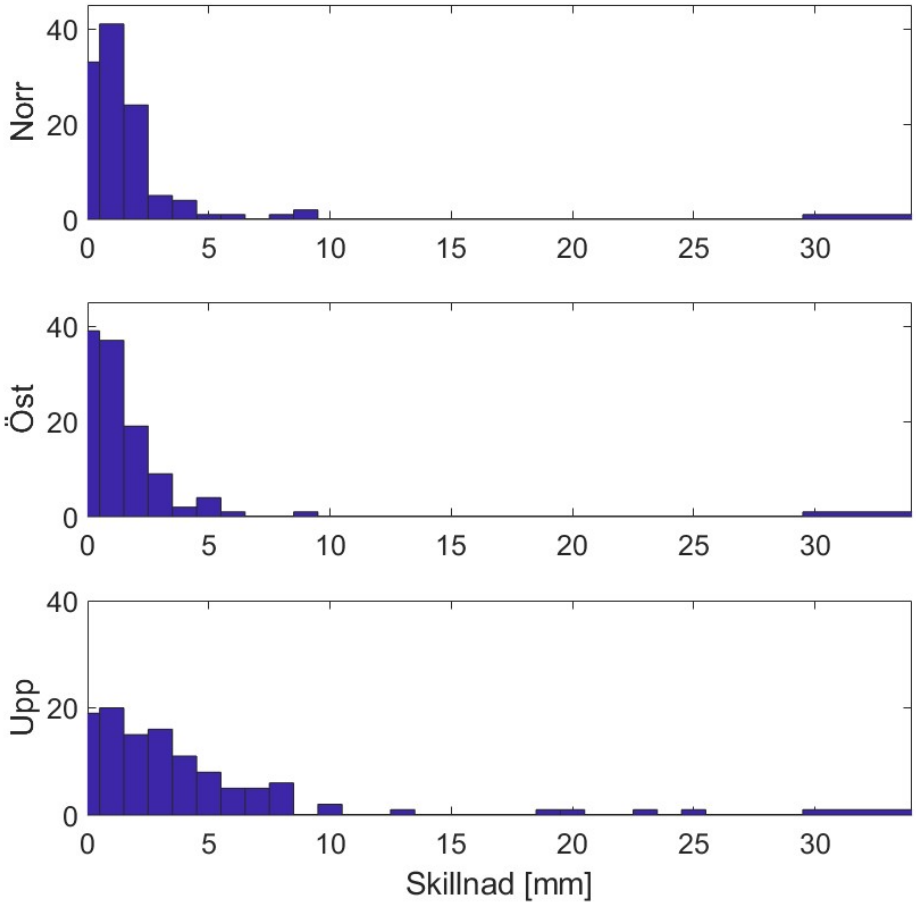
SERVICE ACCURACY

Expected coordinate differences from switching to the new calculations service

- RMS differences
  - Horizontal 2mm
  - Vertical 6mm
- Coordinate differences
  - Horizontal
    - 92% < 5mm
    - 66% <2mm
  - Vertical
    - 78% < 5mm
    - 43% < 2mm



- **Conclusion**
  - No significant coordinate differences are expected from switching to NSB (differences are smaller than the accuracy we expect from the service)

- **Service accuracy**
  - 2-3 hours of data
    - Horizontal 1-2cm
    - Vertical 2-3cm
  - 24-hour data, with chock ring antenna
    - Horizontal 6mm
    - Vertical 12mm

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IMPROVEMENTS IN THE NEW CALCULATION SERVICE?

- Transition from IGS14 to IGS20.ATX for antenna modeling
  - No support anymore from Bern for IGS14.atx
- Handles ALL RINEX version
  - RINEX 2.X, 3.X, 4.X
- Multi-GNSS capability
  - GPS
  - GLONASS
  - Galileo
  - BeiDou
- GNSS support based on Antenna calibration
- Improved user RINEX validation
- Improved reference network selection

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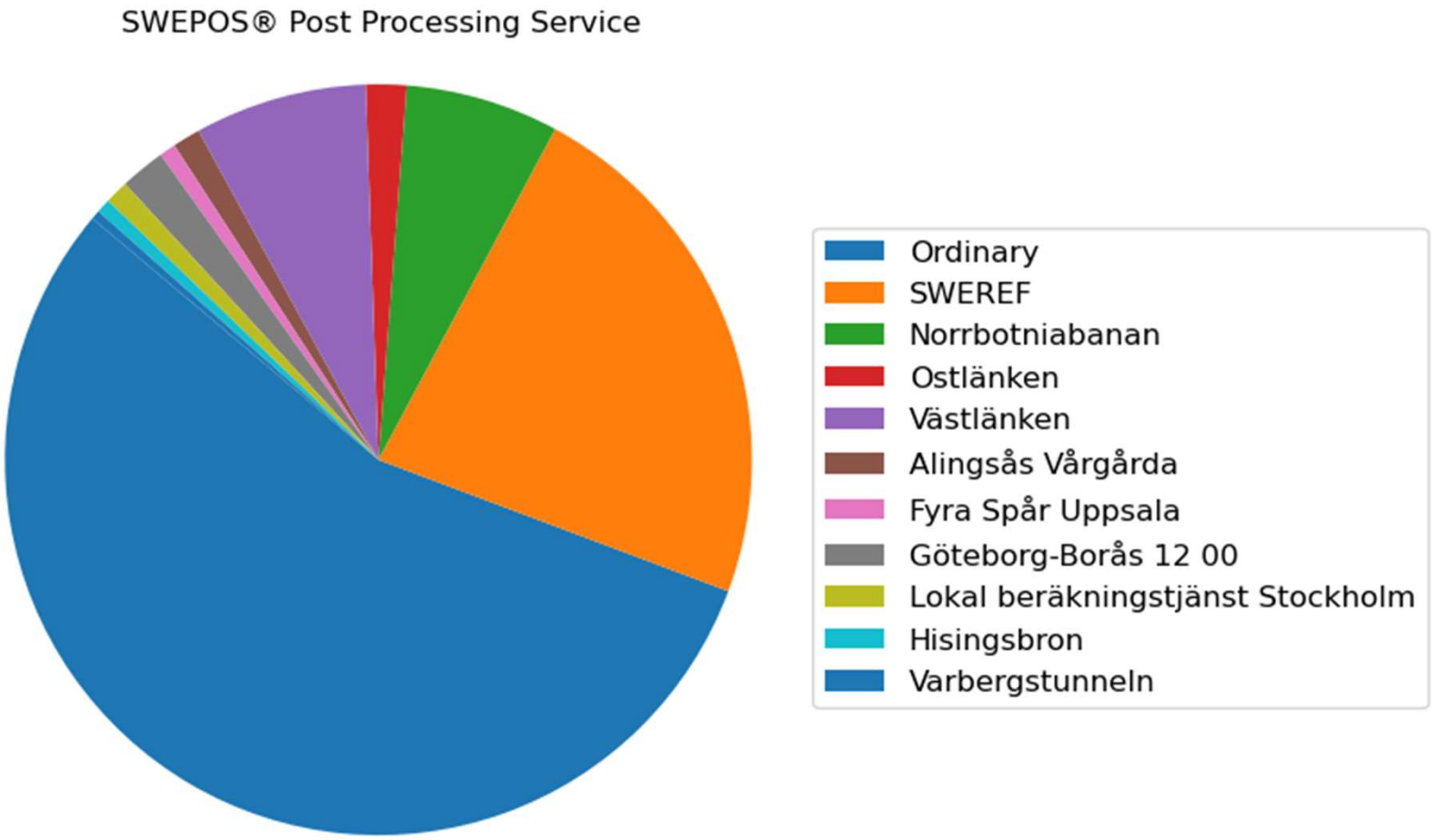
JOB STATISTICS


SWEPOS® Post Processing Service
Ordinary
SWEREF
Norrbotniabanan
Ostlänken
Västlänken
Alingsås Vårgårda
Fyra Spår Uppsala
Göteborg-Borås 12 00
Lokal beräkningstjänst Stockholm
Hisingsbron
Varbergstunneln

TACK! VI FINNS PÅ…

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