



Maintenance and Densification of the Italian GNSS Network



DIPARTIMENTO DI GEOSCIENZE

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1. Maintenance of the original RDN (100 sites) from time of validation (2008.0) to present

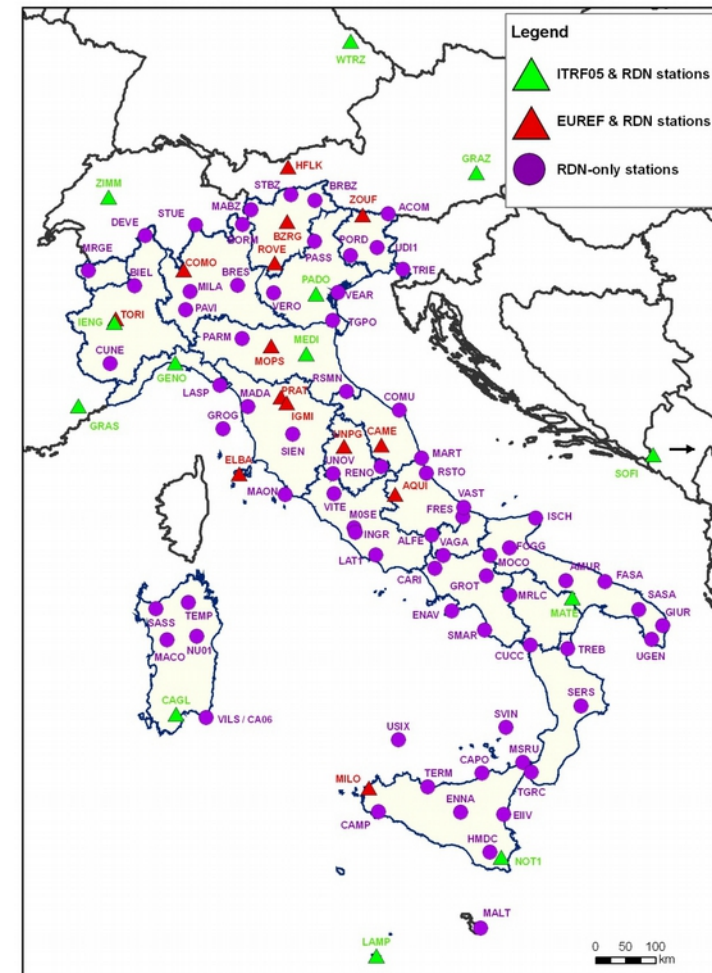
2. Densification of RDN:

- I. Processing includes additional 300 permanent sites
- II. Stacking, reference frame alignment to ETRF2000 and time series
- III. Repository: traceability of Rinex data, monitoring of stations, archive
- IV. Applications: cadastre, RTK/ETRF2000 georeferencing, geophysics

3. Conclusions

Rete Dinamica Nazionale RDN of Istituto Geografico Militare IGMI

- **100** Permanent Stations
- Computed in **ETRF2000** at epoch **2008.0**, **Class B** campaign
- Includes **28 EPN** stations, among them **10** are **IGS**
- **Periodic re-adjustment** necessary because of tectonic deformation of up to some mm/yr
- Project **CISIS – NSPR**: Università di Bologna, Politecnico di Milano and Università di Padova, with IGMI and CISIS, independently recompute the network every 6 months since 2008.0
- **Velocities** implied by the time series



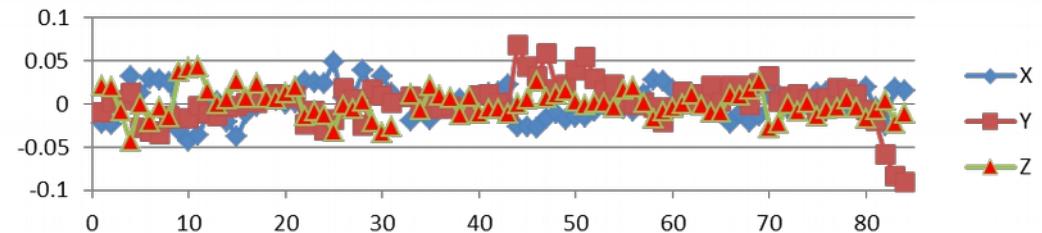
Method

- Setup of **workflow**:
 - RINEX Files are downloaded from the server at IGM
 - Repro2 CODE orbits, IGB08.atx, BSW50, EPN guidelines for densification
 - EPN solution numbers are implemented for the Class A sites
- **Daily free network** adjustments, then stacking of seven daily Neq's with **Minimum Constraints** on class A EPN sites: CAGL, GENO, GRAS, GRAZ, IENG, MATE, NOT1, SOFI, WTZR, ZIMM
- Stack 83 weekly normal equations from 2007-12-23 to 2013-01-05
- Monitor Helmert parameters of the weekly campaigns relative to the long term solution
- **Estimate velocities** in IGB08 and ETRF2000

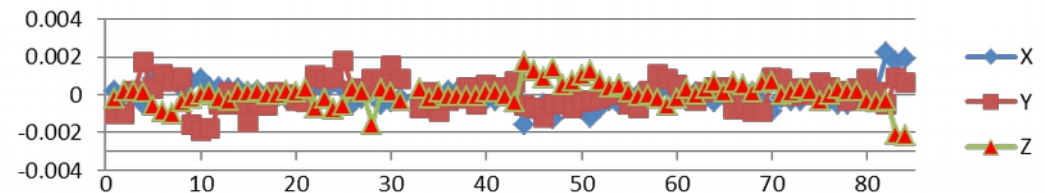
Datum stability: weekly MC solutions vs. combined solution: 2008 - 2013

Helmert Transformation
for the individual weekly
solutions with respect
the combined one.

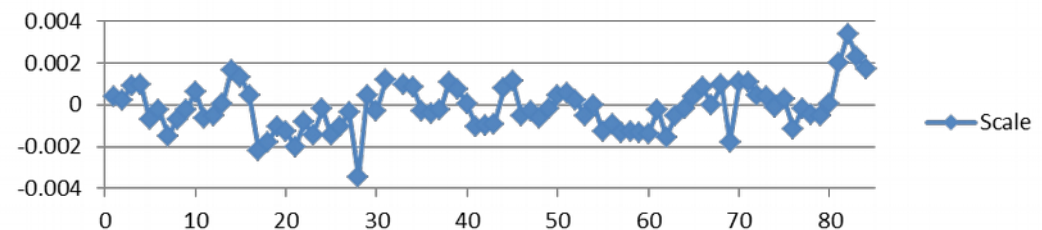
Translations (m)



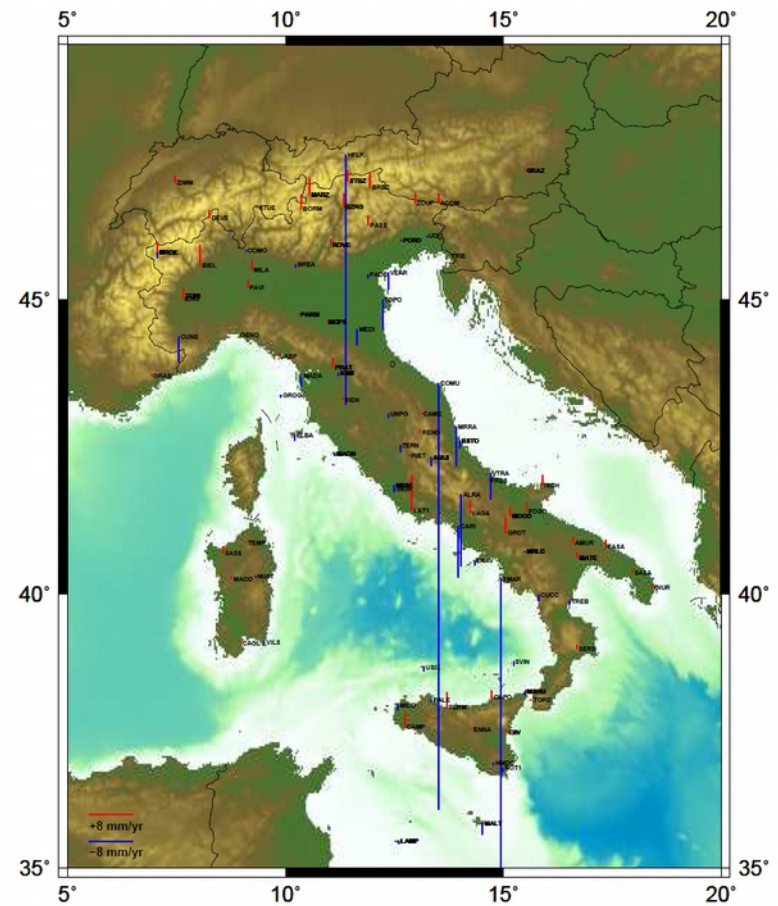
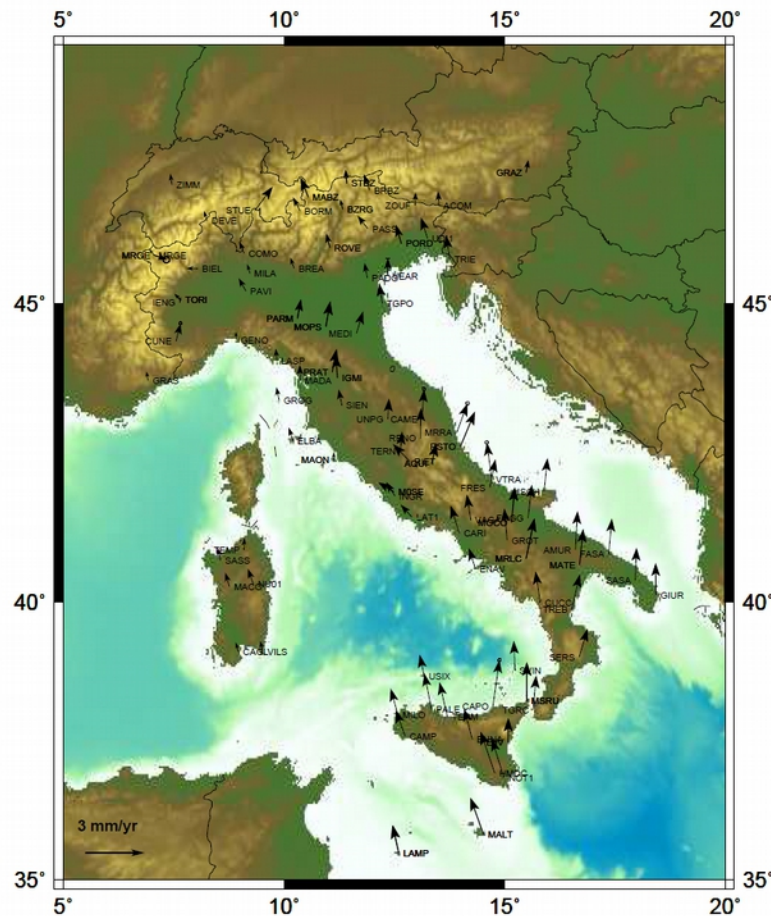
Rotations (")



Scale (ppm)



Computed Horizontal (w/r ETRF2000) and Vertical velocities (original RDN)



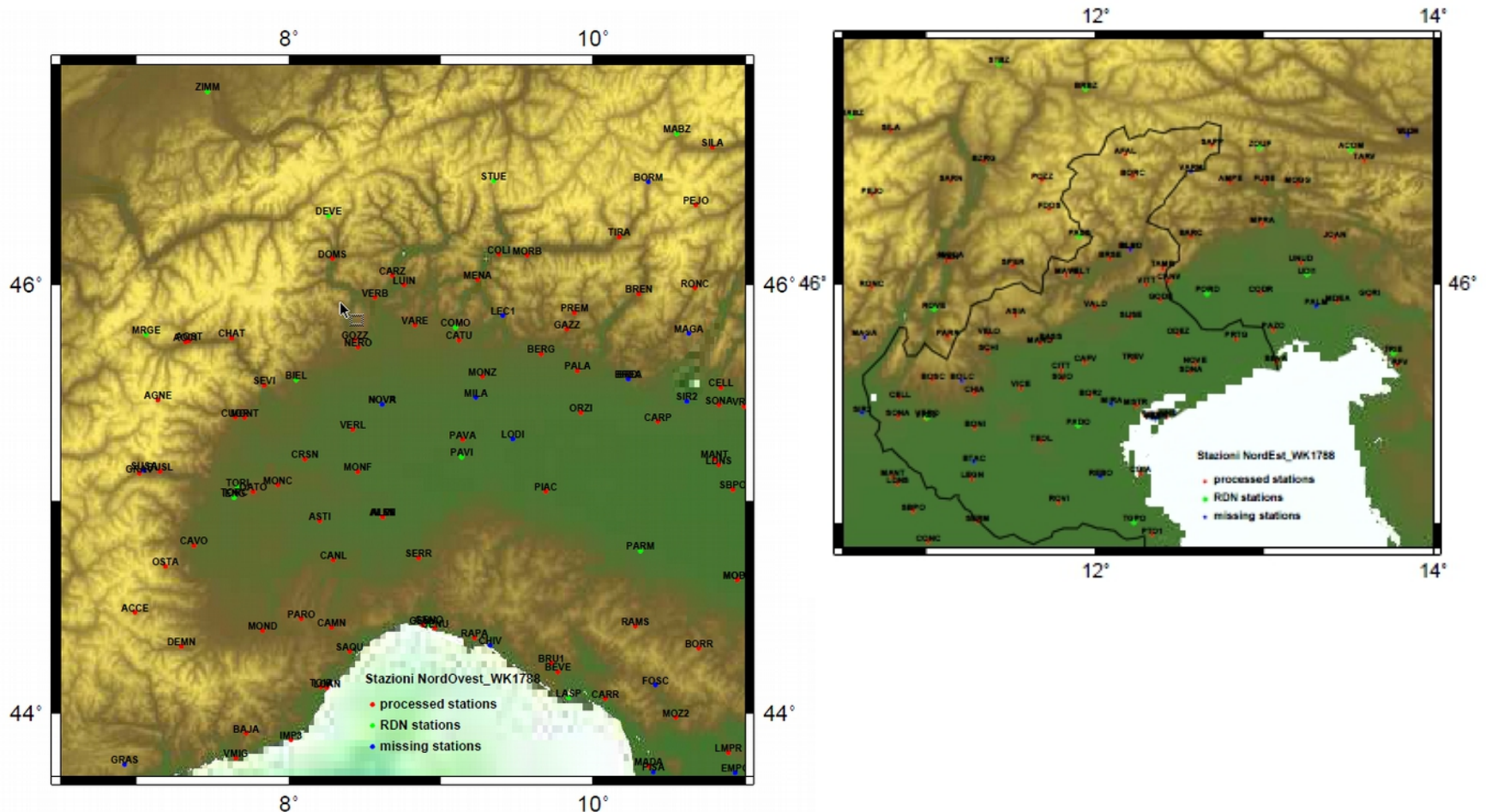
Need to densify the RDN

- In order to maintain a **unique accurate reference frame** for all GNSS users, the **RDN must be densified**
- The densification involves the inclusion of **RTK GNSS** networks
- Eventually, all RTK mountpoints have coordinates in a **ETRF2000 consistent** frame (→ Inspire) nationwide.

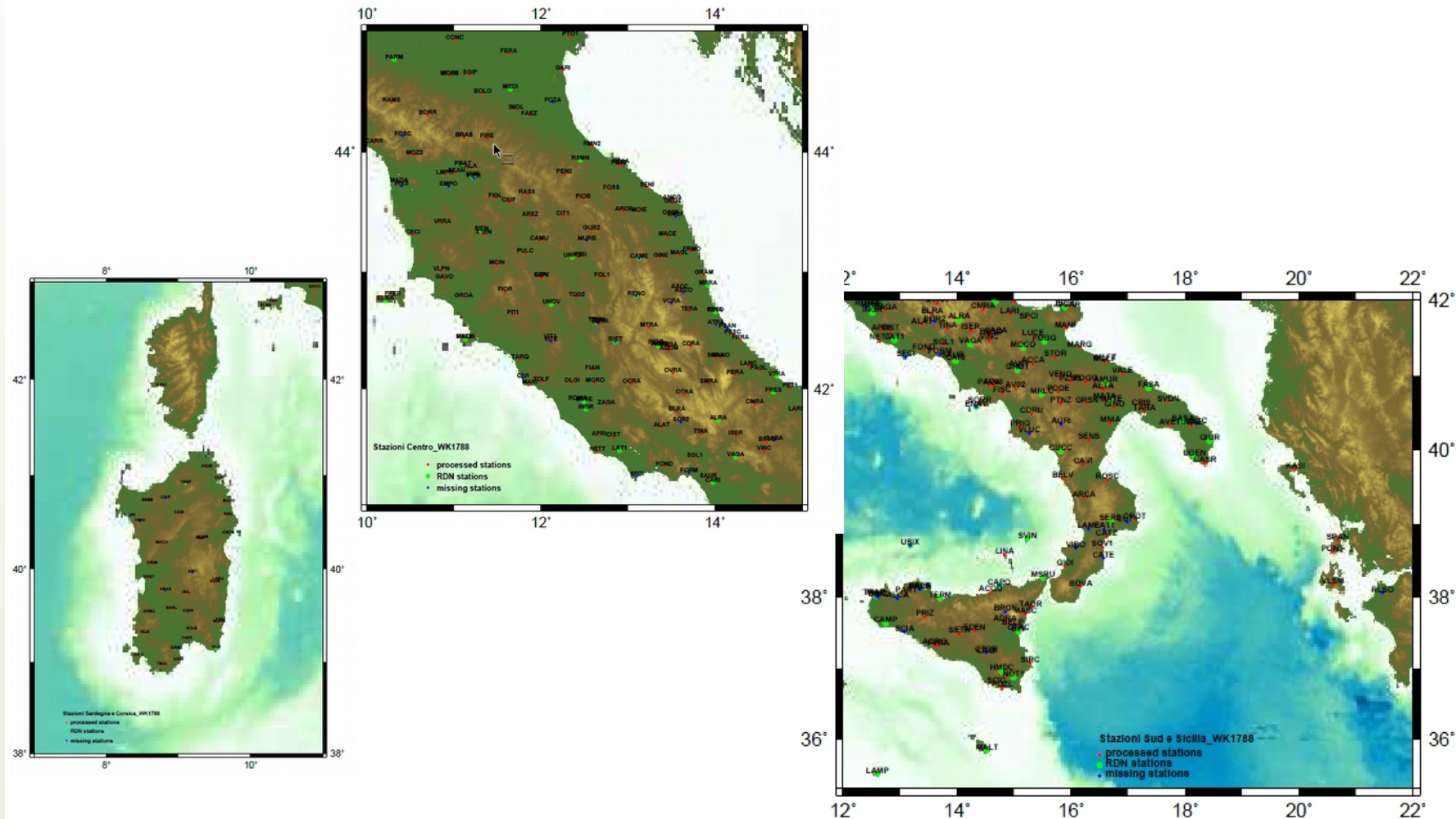
This means:

- Include stations from **regional networks**
- **create a repository**
- Maintain **files traceability**
- **updated STA file**

Densification of RDN: 100 → ca. 400 permanent GNSS sites



Densification of RDN: 100 → ca. 400 permanent GNSS sites



Definition of the 13 clusters

1. Valle d'Aosta-Piemonte-Liguria;
2. Lombardia;
3. Trentino Alto Adige-Veneto;
4. Friuli Venezia Giulia - **Austria**;
5. Emilia Romagna;
6. Toscana;
7. Marche-Umbria;
8. Abruzzo;
9. Lazio;
10. Molise- Campania;
11. Puglia-Basilicata-**Greece**;
12. Calabria-Sicilia;
13. Sardegna.



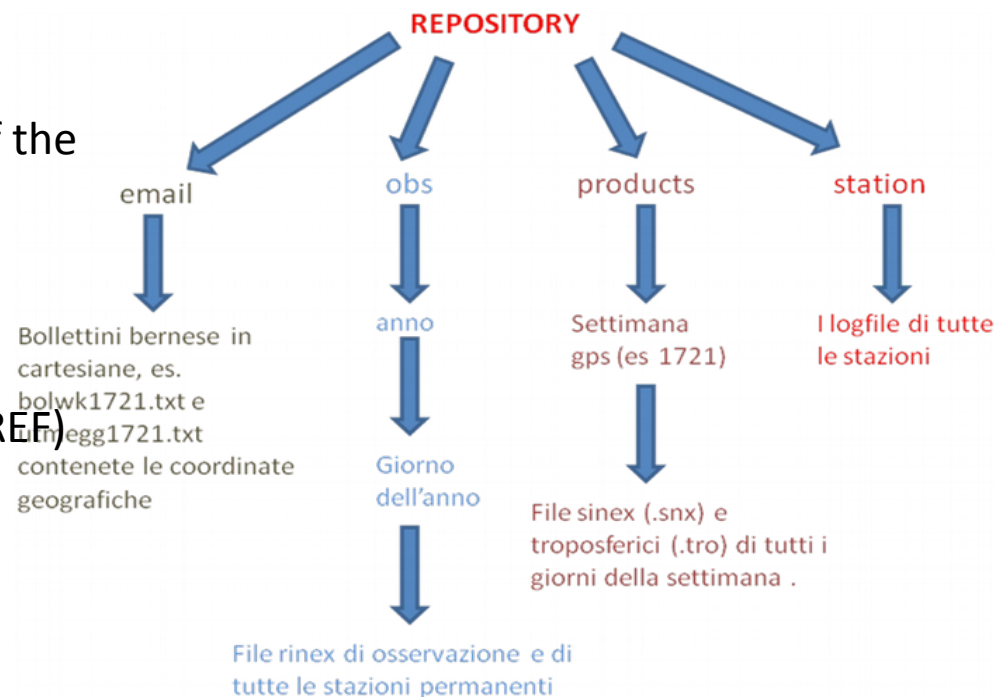
Testings must be performed in order to set most optimal clustering strategy
(thanks to Lotti Jivall for his excellent report on clustering)

RDN Repository

Structure of the repository for data and results is patterned after [ftp://igs.bkg.bund.de/EUREF/](http://igs.bkg.bund.de/EUREF/)

We archive:

1. Weekly Bulletins with results of the processing
2. Rinex data
3. SINEX files (Network, tropos, discontinuities)
4. Sites' logfiles (logsheet IGS/EUREF)



RDN Repository

Example: RINEX files per station

Color code allows to identify which regional network a station belongs to.

Most, if not all daily Rinex files, are available for each site (last column gives the percentage of archived/number of days)

| ID | SP | EPOCA PRIMO DATO ARCHIVIATO a partire dal 21 ottobre 2012 DOY= 295 (settimana gps 1711) | N° GIORNI ARCHIVIATI al 31 gennaio 2013 | % file presenti |
|----|------|---|--|-----------------|
| 1 | ACCA | 2012-10-21 - bolwk1711 | 101 | 98 |
| 2 | ACCE | 2012-10-21 - bolwk1711 | 99 | 96 |
| 3 | ACOM | 2012-10-21 - bolwk1711 | 99 | 96 |
| 4 | AFAL | 2012-10-21 - bolwk1711 | 99 | 96 |
| 5 | AGNE | 2012-10-21 - bolwk1711 | 96 | 93 |
| 6 | AJAC | 2012-10-21 - bolwk1711 | 73 | 71 |
| 7 | ALAT | 2012-10-21 - bolwk1711 | 67 | 65 |
| 8 | ALIN | 2012-10-21 - bolwk1711 | 14 | 14 |
| 9 | ALRA | 2012-10-21 - bolwk1711 | 71 | 69 |
| 10 | ALSN | 2012-10-21 - bolwk1711 | 100 | 97 |
| 11 | ALTA | 2012-10-21 - bolwk1711 | 79 | 77 |
| 12 | AMPE | 2012-10-21 - bolwk1711 | 2 | 2 |
| 13 | AMUR | 2012-10-21 - bolwk1711 | 103 | 100 |
| 14 | ANCG | 2012-10-21 - bolwk1711 | 85 | 83 |
| 15 | ANTI | 2012-10-21 - bolwk1711 | 18 | 17 |
| 16 | AO01 | 2012-10-21 - bolwk1711 | 73 | 71 |
| 17 | APRI | 2012-10-21 - bolwk1711 | 33 | 32 |
| 18 | AQRA | 2012-10-21 - bolwk1711 | 4 | 4 |
| 19 | AQUI | 2012-10-21 - bolwk1711 | 102 | 99 |
| 20 | AQUM | 2012-10-21 - bolwk1711 | 78 | 76 |
| 21 | ARBU | 2012-10-21 - bolwk1711 | 18 | 17 |
| 22 | ARCA | 2012-10-21 - bolwk1711 | 78 | 76 |
| 23 | ARCE | 2012-10-21 - bolwk1711 | 51 | 50 |
| 24 | AREZ | 2012-10-21 - bolwk1711 | 56 | 54 |
| 25 | ASCC | 2012-10-21 - bolwk1711 | 76 | 74 |
| 26 | ASCO | 2012-10-21 - bolwk1711 | 41 | 40 |
| 27 | ASIA | 2012-10-21 - bolwk1711 | 103 | 100 |

RDN Traceability: where we download data from

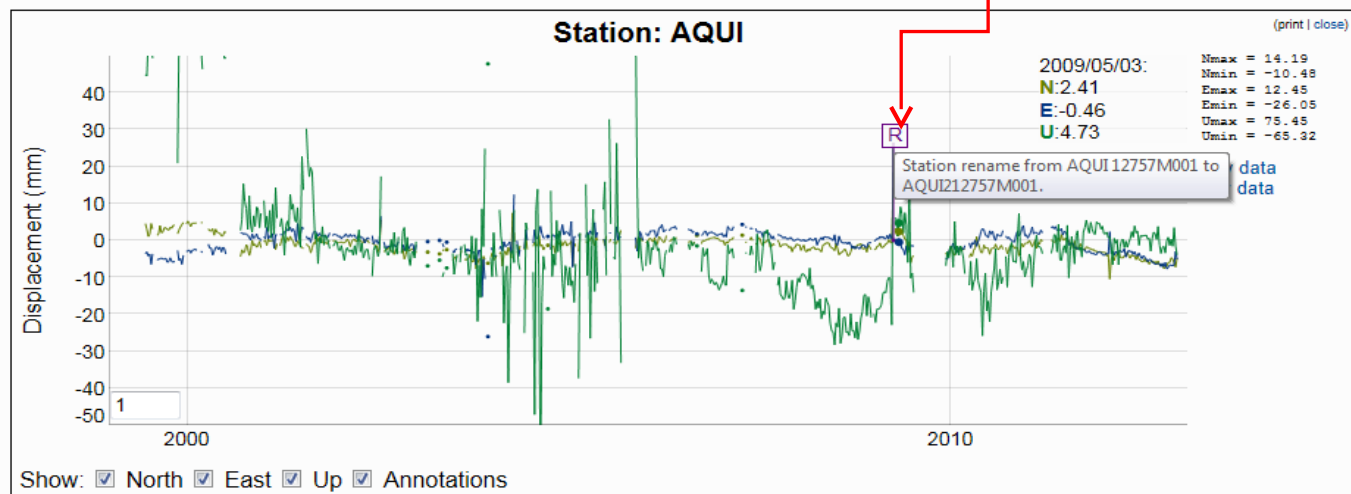
Agencies/Sites traceability (example)

| BKG | OLG | ASI | INGV | LEICA ITALPOS | | | IGMI | Regione Piemonte | Regione Umbria | Regione Abruzzo | TPOS + STPOS | NOA | Regione Friuli | FReDNet | Regione Puglia | Regione Veneto |
|---------|------|------|------|--|------|------|------|------------------|----------------|-----------------|--------------|------|----------------|---------|----------------|----------------|
| aqui | cagl | baja | amur | alat | fire | pfer | ajac | alsn | REPI | alra | brbz | kasi | Ampe | acom | acca | asia |
| bzrg | geno | beve | bras | alin | fisc | piac | ancg | busl | UNOV | aqra | bzrg | pont | Barc | afal | fasa | bl01 |
| cagl | gras | biel | bss0 | alta | fol1 | pibi | borm | canl | UNTR | atra | fdos | rlso | Beva | canv | fogg | bolc |
| gari | ieng | brix | cdru | anti | form | piti | brea | crsn | | atra | igmi | span | Gori | codr | gino | borc |
| geno | igmi | camn | cucc | ao01 | fosc | poz1 | cagz | cuor | | blra | mabz | vism | Mogg | fuse | giur | bosc |
| gras | linz | chiv | eiiv | apri | foss | prem | came | demn | | cdra | moca | | Palm | joan | isch | brse |
| igmi | mate | como | enav | aqum | foza | prig | camp | doms | | cmra | parr | | Pord | mdea | morg | btac |
| lamp | not1 | cose | fres | arbu | frmo | psan | cari | gozz | | frfa | pass | | Tarv | mpa | pogg | cgia |
| linz | pado | elba | grog | arca | fvra | pste | dubr | novr | | mrfa | pejo | | TRFV | pazo | sasa | citt |
| mate | prat | fdos | grot | arce | gavo | ptnz | eden | osta | | mtra | pozz | | Udin | trie | spci | ldns |
| medi | sbg2 | geno | hmdc | arez | gazz | pto1 | graz | serr | | ocra | ronc | | | udi1 | ugen | legn |
| mops | stpo | genu | ingp | ascc | grav | rams | grot | | | ovra | rove | | | | vale | mave |
| not1 | tori | ieng | ingr | asco | grsn | rass | hfik | | | pbra | scrn | | | | | mstr |
| pado | vlch | igmi | lasp | asti | genv | rebo | lat1 | | | scra | sper | | | | | pado |
| unpg | wien | lec1 | malt | av01 | gioi | rmn2 | mada | | | smra | stbz | | | | | prtg |
| zimm | zimm | loan | maon | av02 | gram | roma | mila | | | tera | tren | | | | | rovi |
| zouf | zouf | m0se | moco | av03 | groa | slen | nu01 | | | vcra | vear | | | | | sapp |
| | | mara | mode | bass | gub2 | saqu | pale | | | vtra | | | | | | schi |
| | | mate | monc | belp | igle | scia | reno | | | | | | | | | sdna |
| | | medi | mrge | bolo | imol | serm | riet | | | | | | | | | tamb |
| | | milo | mrlc | bor2 | imp3 | sevi | rsmn | | | | | | | | | tgpo |
| | | moca | msru | borr | iser | sfc1 | sass | | | | | | | | | trev |
| | | not1 | murb | bras | isil | sgl1 | shmn | | | | | | | | | ve01 |
| | | nova | parm | bron | lari | sin2 | sien | | | | | | | | | velo |
| INGV | | | | Istituto Nazionale di Geofisica e Vulcanologia | | | | | | | | | | | | |
| IGMI | | | | Istituto Geografico Militare | | | | | | | | | | | | |
| TPOS | | | | Provincia Autonoma di Trento | | | | | | | | | | | | |
| STPOS | | | | Provincia Autonoma di Bolzano | | | | | | | | | | | | |
| NOA | | | | Stazioni della Grecia | | | | | | | | | | | | |
| FReDNet | | | | Friuli Venezia Giulia | | | | | | | | | | | | |

Site Maintenance

Discontinuities of sites (**TYPE 001**): plots of time series on the Web are linked to the STA file

| | | | | | | | | | | |
|----------------|-----|------|----|----|----|----|----|----------------|------------|--------|
| ALAT 00000M000 | 001 | 1992 | 01 | 01 | 00 | 00 | 00 | ALAT* | | |
| ALTA 00000M000 | 001 | 1992 | 01 | 01 | 00 | 00 | 00 | ALTA* | | |
| AMPE 00000M000 | 001 | 1992 | 01 | 01 | 00 | 00 | 00 | AMPE* | | |
| AMPE100000M000 | 001 | 1992 | 01 | 01 | 00 | 00 | 00 | AMPE* | | |
| AMPE200000M000 | 001 | 2007 | 01 | 30 | 00 | 00 | 00 | AMPE100000M000 | | |
| AMPE300000M000 | 001 | 2007 | 09 | 26 | 00 | 00 | 00 | AMPE200000M000 | | |
| AMUR 00000M000 | 001 | 1992 | 01 | 01 | 00 | 00 | 00 | AMUR* | | |
| AO01 00000M000 | 001 | 1992 | 01 | 01 | 00 | 00 | 00 | AO01* | | |
| AQUI 12757M001 | 001 | 1992 | 01 | 01 | 00 | 00 | 00 | AQUI* | | |
| AQUI112757M001 | 001 | 1992 | 01 | 01 | 00 | 00 | 00 | AQUI 12757M001 | earthquake | 1526.1 |
| AQUI212757M001 | 001 | 2009 | 04 | 06 | 00 | 00 | 00 | AQUI 12757M001 | | |
| AQRA100000M000 | 001 | 1992 | 01 | 01 | 00 | 00 | 00 | AQRA 00000M000 | earthquake | 1526.1 |



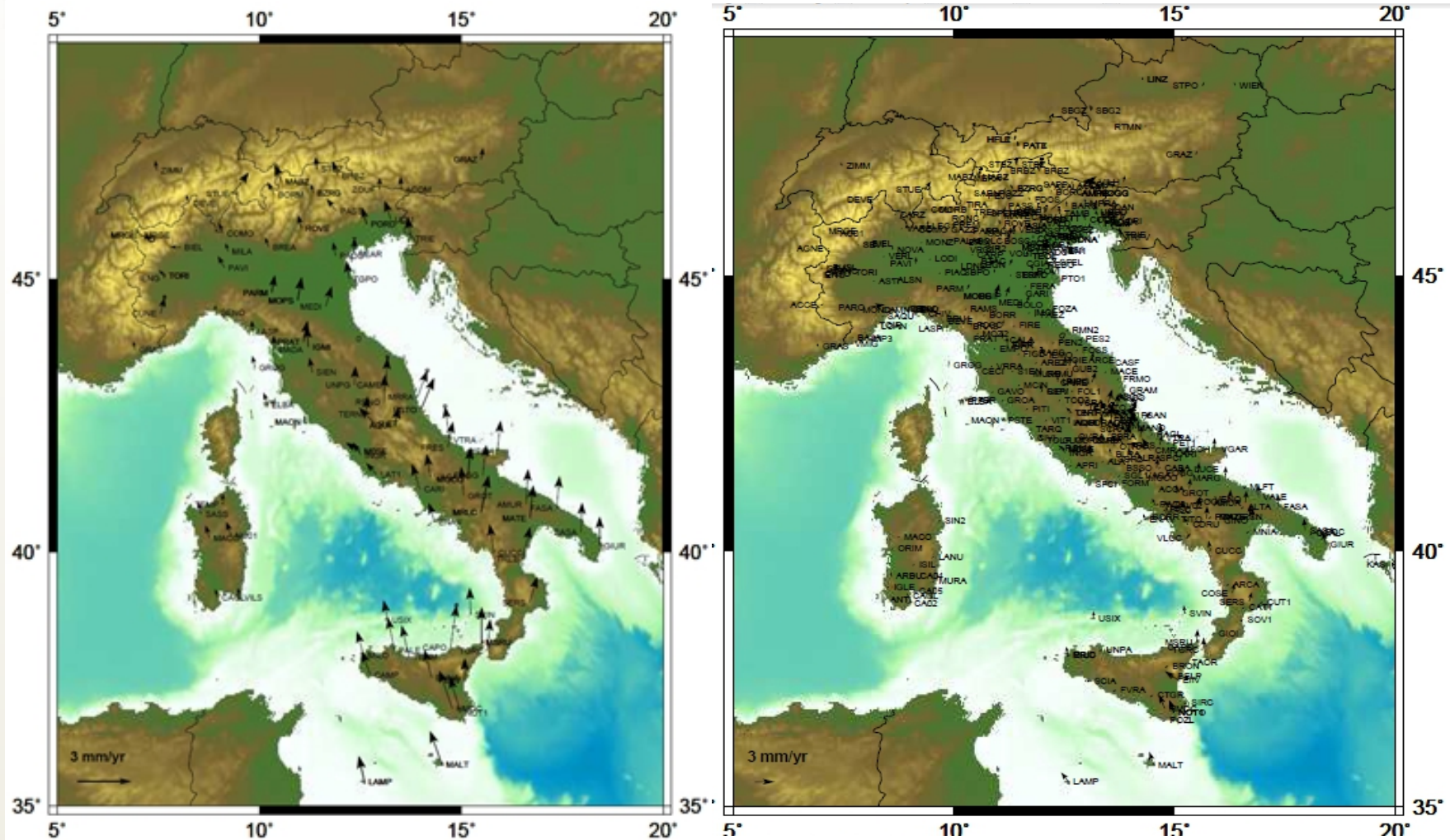
Site Maintenance

Antenna/Receivers changes (TYPE 002)

TYPE 002: STATION INFORMATION

| STATION NAME | FLG | FROM | | | | | | TO | | | | | | RECEIVER TYPE | ANTENNA TYPE | REC # | ANT # | NORTH | EAST | UP | DESCRIPTION | |
|----------------|-----|------|----|----|----|----|----|------|----|----|----|----|----|--------------------|----------------|-------|--------|--------|--------|--------|-------------|-----------------|
| ***** | *** | YYYY | MM | DD | HH | MM | SS | YYYY | MM | DD | HH | MM | SS | ***** | ***** | ***** | ***** | ***** | ***** | ***** | | |
| ACCA ACCA | 001 | 2012 | 08 | 05 | 00 | 00 | 30 | 2012 | 08 | 11 | 23 | 59 | 30 | LEICA GRX1200GGPRO | LEIAT504 | LEIS | 0 | 0 | 0.0000 | 0.0000 | 0.0000 | ACCA ACCA |
| ACCE ACCE | 001 | 2012 | 08 | 05 | 00 | 00 | 30 | 2012 | 08 | 11 | 23 | 59 | 30 | LEICA GRX1200PRO | LEIAT504 | NONE | 0 | 0 | 0.0000 | 0.0000 | 0.0000 | ACCE ACCE |
| ACOM 12767M001 | 001 | 2012 | 08 | 05 | 00 | 00 | 30 | 2012 | 08 | 11 | 23 | 59 | 30 | TPS GB-1000 | ASH701945E_M | SCIT | 0 | 24216 | 0.0000 | 0.0000 | 0.0083 | ACOM 12767M001 |
| AFAL 12766M001 | 001 | 2012 | 08 | 05 | 00 | 00 | 30 | 2012 | 08 | 11 | 23 | 59 | 30 | TPS GB-1000 | ASH701945E_M | SCIT | 0 | 23912 | 0.0000 | 0.0000 | 0.0083 | AFAL 12766M001 |
| AGNE AGNE | 001 | 2012 | 08 | 05 | 00 | 00 | 30 | 2012 | 08 | 11 | 23 | 59 | 30 | LEICA GRX1200PRO | LEIAT504 | NONE | 0 | 0 | 0.0000 | 0.0000 | 0.0000 | AGNE AGNE |
| AJAC 10077M005 | 001 | 2000 | 01 | 22 | 00 | 00 | 00 | 2008 | 11 | 26 | 00 | 00 | 00 | ASHTECH Z-XII3 | ASH700936A_M | NONE | 471 | 99999 | 0.0000 | 0.0000 | 0.0000 | Ajaccio, FR |
| AJAC 10077M005 | 001 | 2008 | 11 | 26 | 00 | 00 | 00 | 2009 | 05 | 11 | 00 | 00 | 00 | LEICA GRX1200GGPRO | LEIAT504GG | NONE | 462582 | 99999 | 0.0000 | 0.0000 | 0.0000 | Ajaccio, FR |
| AJAC 10077M005 | 001 | 2009 | 05 | 11 | 00 | 00 | 00 | 2010 | 10 | 18 | 00 | 00 | 00 | LEICA GRX1200GGPRO | LEIAT504GG | NONE | 462582 | 99999 | 0.0000 | 0.0000 | 0.0000 | Ajaccio, FR |
| AJAC 10077M005 | 001 | 2010 | 10 | 18 | 00 | 00 | 00 | 2011 | 03 | 23 | 00 | 00 | 00 | LEICA GRX1200GGPRO | LEIAT504GG | NONE | 462582 | 99999 | 0.0000 | 0.0000 | 0.0000 | Ajaccio, FR |
| AJAC 10077M005 | 001 | 2011 | 03 | 23 | 00 | 00 | 00 | 2011 | 06 | 14 | 00 | 00 | 00 | LEICA GRX1200GGPRO | LEIAT504GG | NONE | 462582 | 99999 | 0.0000 | 0.0000 | 0.0000 | Ajaccio, FR |
| AJAC 10077M005 | 001 | 2011 | 06 | 14 | 00 | 00 | 00 | 2012 | 12 | 05 | 00 | 00 | 00 | LEICA GRX1200GGPRO | LEIAT504GG | NONE | 462582 | 99999 | 0.0000 | 0.0000 | 0.0000 | Ajaccio, FR |
| AJAC 10077M005 | 001 | 2012 | 12 | 05 | 00 | 00 | 00 | 2009 | 12 | 31 | 00 | 00 | 00 | LEICA GR25 | TRM57971.00 | NONE | 830139 | 99999 | 0.0000 | 0.0000 | 0.0000 | Ajaccio, FR |
| ALRA 00000M000 | 001 | 2012 | 08 | 05 | 00 | 00 | 30 | 2012 | 08 | 05 | 23 | 59 | 30 | TPS NET-G3A | TPSCR.G3 | TPSH | 0 | 0 | 0.0000 | 0.0000 | 0.0000 | ALRA 00000M000 |
| ALAT 00000M000 | 001 | 1980 | 01 | 06 | 00 | 00 | 00 | 2009 | 12 | 31 | 00 | 00 | 00 | LEICA GMX902GG | LEIAX1202GG | NONE | 101299 | 0 | 0.0000 | 0.0000 | 0.0000 | |
| ALSN 19543M001 | 001 | 1980 | 01 | 06 | 00 | 00 | 00 | 2009 | 12 | 31 | 00 | 00 | 00 | LEICA GRX1200+GNSS | LEIAR25.R3 | LEIT | 496386 | 0 | 0.0000 | 0.0000 | 0.0083 | |
| ALTA 00000M000 | 001 | 1980 | 01 | 06 | 00 | 00 | 00 | 2009 | 12 | 31 | 00 | 00 | 00 | LEICA GMX902GG | LEIAS10 | NONE | 720127 | 0 | 0.0000 | 0.0000 | 0.0000 | |
| AMPE 00000M000 | 001 | 2012 | 08 | 05 | 00 | 00 | 30 | 2012 | 08 | 11 | 23 | 59 | 30 | TRIMBLE NETRS | TRM29659.00 | UNAV | 0 | 0 | 0.0000 | 0.0000 | 0.0000 | AMPE 00000M000 |
| AMUR 00000M000 | 001 | 2012 | 08 | 05 | 00 | 00 | 30 | 2012 | 08 | 11 | 23 | 59 | 30 | LEICA GRX1200PRO | LEIAT504 | SCIT | 0 | 0 | 0.0000 | 0.0000 | 0.0083 | AMUR 00000M000 |
| AO01 00000M000 | 001 | 1980 | 01 | 06 | 00 | 00 | 00 | 2009 | 12 | 31 | 00 | 00 | 00 | LEICA GRX1200 | LEIAX1202 | NONE | 450688 | 0 | 0.0000 | 0.0000 | 0.0000 | |
| AOBA 00000M000 | 001 | 2012 | 08 | 05 | 00 | 00 | 30 | 2012 | 08 | 05 | 23 | 59 | 30 | TPS NET-G3A | TPSCR.G3 | TPSH | 0 | 0 | 0.0000 | 0.0000 | 0.0000 | AOBA 00000M000 |
| AQUI 12757M001 | 001 | 1999 | 06 | 11 | 00 | 00 | 00 | 2001 | 08 | 27 | 00 | 00 | 00 | TRIMBLE 4000SSI | TRM22020.00+GP | NONE | 21525 | 99999 | 0.0000 | 0.0000 | 0.0000 | L'Aquila, IT |
| AQUI 12757M001 | 001 | 2001 | 08 | 27 | 00 | 00 | 00 | 2009 | 12 | 31 | 00 | 00 | 00 | TRIMBLE 4700 | TRM29659.00 | NONE | 04580 | 99999 | 0.0000 | 0.0000 | 0.0000 | L'Aquila, IT |
| AQUM 00000M000 | 001 | 1980 | 01 | 06 | 00 | 00 | 00 | 2009 | 12 | 31 | 00 | 00 | 00 | LEICA GMX902GG | LEIAS10 | NONE | 720224 | 0 | 0.0000 | 0.0000 | 0.0000 | |
| ARCA 00000M000 | 001 | 1980 | 01 | 06 | 00 | 00 | 00 | 2009 | 12 | 31 | 00 | 00 | 00 | LEICA GRX1200GGPRO | LEIAT504GG | LEIS | 355412 | 200231 | 0.0000 | 0.0000 | 0.0083 | |
| ARCE 00000M000 | 001 | 1980 | 01 | 06 | 00 | 00 | 00 | 2009 | 12 | 31 | 00 | 00 | 00 | LEICA GMX902GG | LEIAX1202GG | NONE | 101201 | 0 | 0.0000 | 0.0000 | 0.0000 | |
| AREZ 00000M000 | 001 | 1980 | 01 | 06 | 00 | 00 | 00 | 2009 | 12 | 31 | 00 | 00 | 00 | LEICA SR530 | LEIAT504 | NONE | 135259 | 0 | 0.0000 | 0.0000 | 0.0000 | |
| ASCC 00000M000 | 001 | 1980 | 01 | 06 | 00 | 00 | 00 | 2009 | 12 | 31 | 00 | 00 | 00 | LEICA GMX902GG | LEIAX1202GG | NONE | 120053 | 839007 | 0.0000 | 0.0000 | 0.0000 | |
| ASIA 12714M002 | 001 | 2012 | 08 | 05 | 00 | 00 | 30 | 2012 | 08 | 11 | 23 | 59 | 30 | LEICA GRX1200GGPRO | LEIAR25.R4 | LEIT | 0 | 1166 | 0.0000 | 0.0000 | 0.0000 | ASIA 12714M002 |
| ASTI 00000M000 | 001 | 1980 | 01 | 06 | 00 | 00 | 00 | 2009 | 12 | 31 | 00 | 00 | 00 | LEICA SR530 | LEIAT503 | NONE | 0 | 0 | 0.0000 | 0.0000 | 0.0000 | |
| ATRA 00000M000 | 001 | 1980 | 01 | 06 | 00 | 00 | 00 | 2009 | 12 | 31 | 00 | 00 | 00 | TPS NET-G3A | TPSCR.G3 | TPSH | 0 | 0 | 0.0000 | 0.0000 | 0.0000 | |
| AV02 00000M000 | 001 | 1980 | 01 | 06 | 00 | 00 | 00 | 2009 | 12 | 31 | 00 | 00 | 00 | LEICA RS500 | LEIAT504 | LEIS | 82247 | 102003 | 0.0000 | 0.0000 | 0.0000 | |
| BAJA 19519M001 | 001 | 1980 | 01 | 06 | 00 | 00 | 00 | 2009 | 12 | 31 | 00 | 00 | 00 | TPS NETG3 | TPSCR.G3 | TPSH | 0 | 0 | 0.0000 | 0.0000 | 0.0500 | |
| BASS 00000M000 | 001 | 1980 | 01 | 06 | 00 | 00 | 00 | 2009 | 12 | 31 | 00 | 00 | 00 | LEICA GMX902GG | LEIAX1202GG | NONE | 101031 | 0 | 0.0000 | 0.0000 | 0.0000 | |
| BEVA 00000M000 | 001 | 2012 | 08 | 05 | 00 | 00 | 30 | 2012 | 08 | 11 | 23 | 59 | 30 | TRIMBLE NETRS | TRM41249.00 | TZGD | 0 | 0 | 0.0000 | 0.0000 | 0.0000 | BEVA 00000M000 |
| BEVE 19520M001 | 001 | 1980 | 01 | 06 | 00 | 00 | 00 | 2009 | 12 | 31 | 00 | 00 | 00 | TPS NETG3 | TPSCR.G3 | TPSH | 0 | 0 | 0.0000 | 0.0000 | 0.0500 | |
| BIEL 00000M000 | 001 | 1980 | 01 | 06 | 00 | 00 | 00 | 2012 | 09 | 17 | 00 | 00 | 29 | LEICA GRX1200+GNSS | LEIAR25.R3 | LEIT | 496388 | 0 | 0.0000 | 0.0000 | 0.1160 | |
| BL01 00000M000 | 001 | 1980 | 01 | 06 | 00 | 00 | 00 | 2009 | 12 | 31 | 00 | 00 | 00 | TRIMBLE 5700 | TRM39105.00 | NONE | 0 | 0 | 0.0000 | 0.0000 | 0.0000 | |
| BLRA 00000M000 | 001 | 2012 | 08 | 05 | 00 | 00 | 30 | 2012 | 08 | 05 | 23 | 59 | 30 | TPS NET-G3A | TPSCR.G5 | TPSH | 0 | 0 | 0.0000 | 0.0000 | -0.0803 | BLRA 00000M000 |
| BRSE 00000M000 | 001 | 2012 | 08 | 06 | 00 | 00 | 30 | 2012 | 08 | 11 | 23 | 59 | 30 | LEICA GMX902GG | LEIAX1202GG | NONE | 0 | 0 | 0.0000 | 0.0000 | 0.0000 | BRSE 00000M000 |
| BOGI 12207M003 | 001 | 2001 | 01 | 03 | 00 | 00 | 00 | 2003 | 05 | 06 | 00 | 00 | 00 | JPS EUROCARD | ASH701945C_M | SNOW | 204751 | 99999 | 0.0000 | 0.0000 | 0.0534 | Borowa Gora, PL |
| BOGI 12207M003 | 001 | 2003 | 05 | 06 | 00 | 00 | 00 | 2003 | 08 | 08 | 00 | 00 | 00 | JPS EUROCARD | ASH701945C_M | SNOW | 204751 | 99999 | 0.0000 | 0.0000 | 0.0534 | Borowa Gora, PL |
| BOGI 12207M003 | 001 | 2003 | 08 | 08 | 00 | 00 | 00 | 2004 | 07 | 30 | 00 | 00 | 00 | JPS EUROCARD | ASH701945C_M | SNOW | 204751 | 99999 | 0.0000 | 0.0000 | 0.0534 | Borowa Gora, PL |

RDN Evolution since certified



Website where all the delivered products are made available:

<http://147.162.229.63>:

- **Systematic analysis of RDN + densification**, in parallel with **IGM** and **other Universities**
- Our cumulative products:
 - Use orbits and ERP '**repro2**': full compatibility IGb08; BSW52
 - Are organised in a **single database** open access and automatically updated
 - Are **generated within an agreement** with IGM, Regional Governments, National Cadastre, Commercial Networks
 - **Contribute regularly** to the IAG and EPN Densification Projects

Thank you for your attention!!