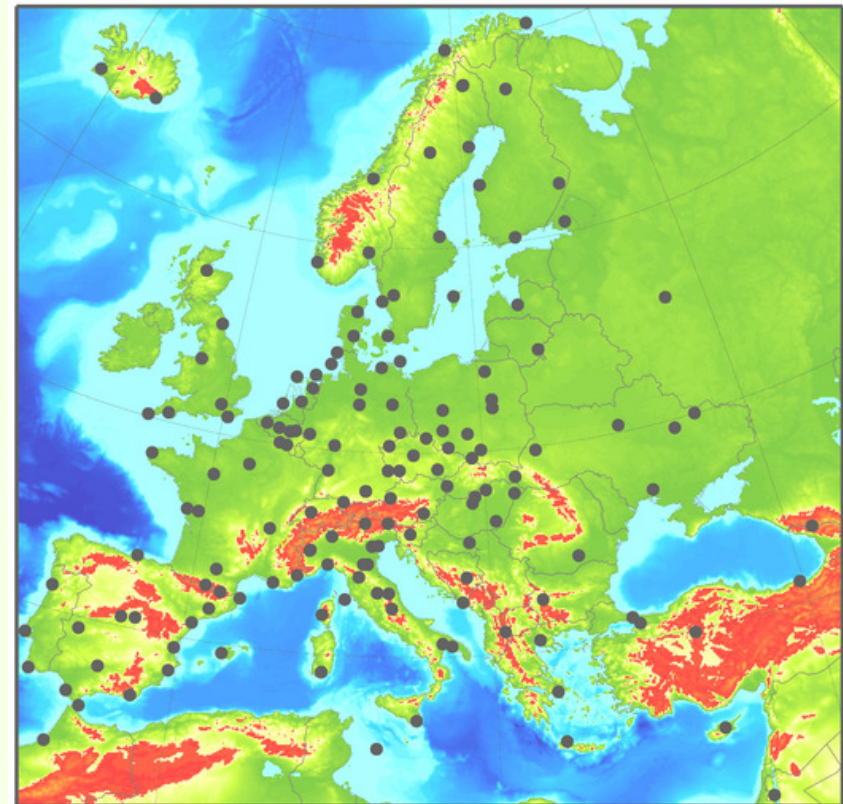


Present Status of the EUREF Permanent Network

C. Bruyninx
EPN Network Coordinator

Royal Observatory of Belgium



Outline

- ▶ Background of the EPN
- ▶ Status of the EUREF Permanent Network
- ▶ Evaluation of the EPN Data Flow
- ▶ Update of the EPN guidelines

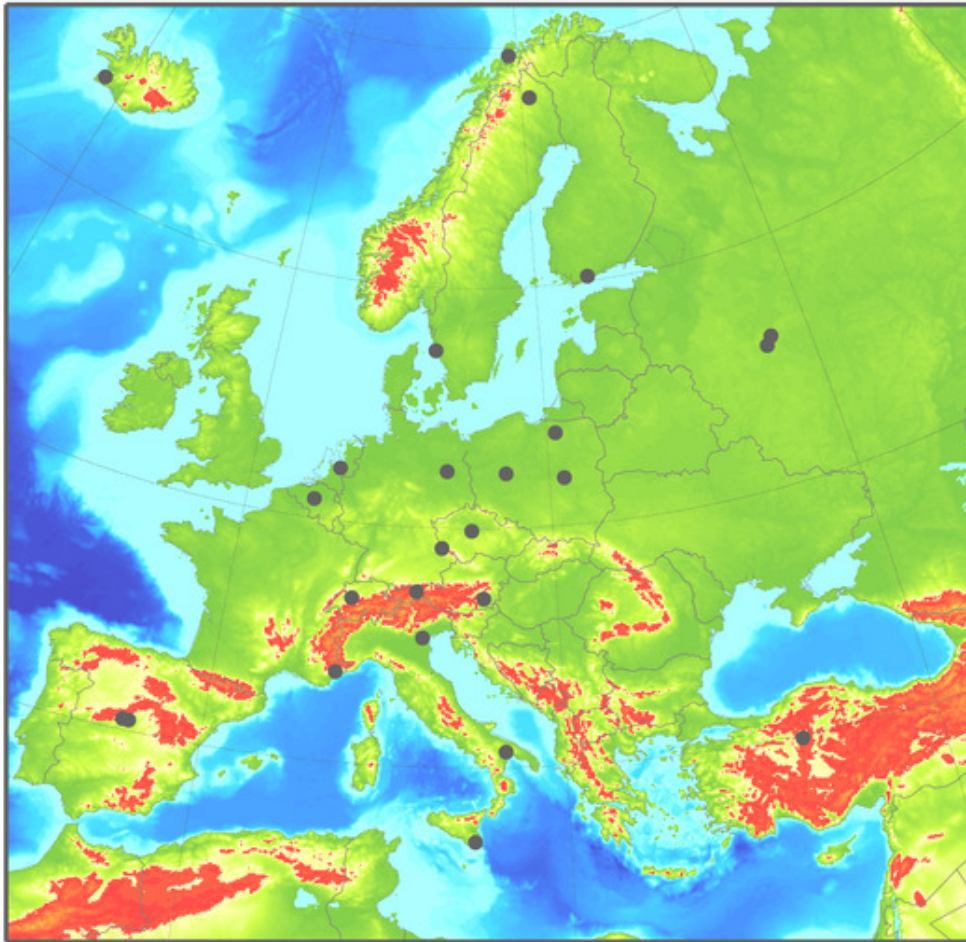
Background

EUREF Permanent Network

- Initiative of the EUREF TWG (1995)
- Use existing permanent GPS tracking stations in Europe for maintenance of ETRS89
- Structure based on the IGS example (CGPS, DC, AC)
- First EUREF weekly combined solution : Jan. 1996, ITRS coordinates of 29 tracking stations, 4 Analysis Centres

EVOLUTION OF EPN TRACKING NETWORK

January 1996



June 2005



EPN DATA CENTRES

Station/OC → Local Data Centre → Regional Data Centre

Local Data Centres

ASI, Agenzia Spaziale Italiana, *Italy*

ROB, Royal Observatory of Belgium, *Belgium*

DUT, Delft University of Technology, *Netherlands*

GOP, The Geodetic Observatory Pecny, *Czech Republic*

IGNE, Institut Géographique National, *France*

Regional Data Centres

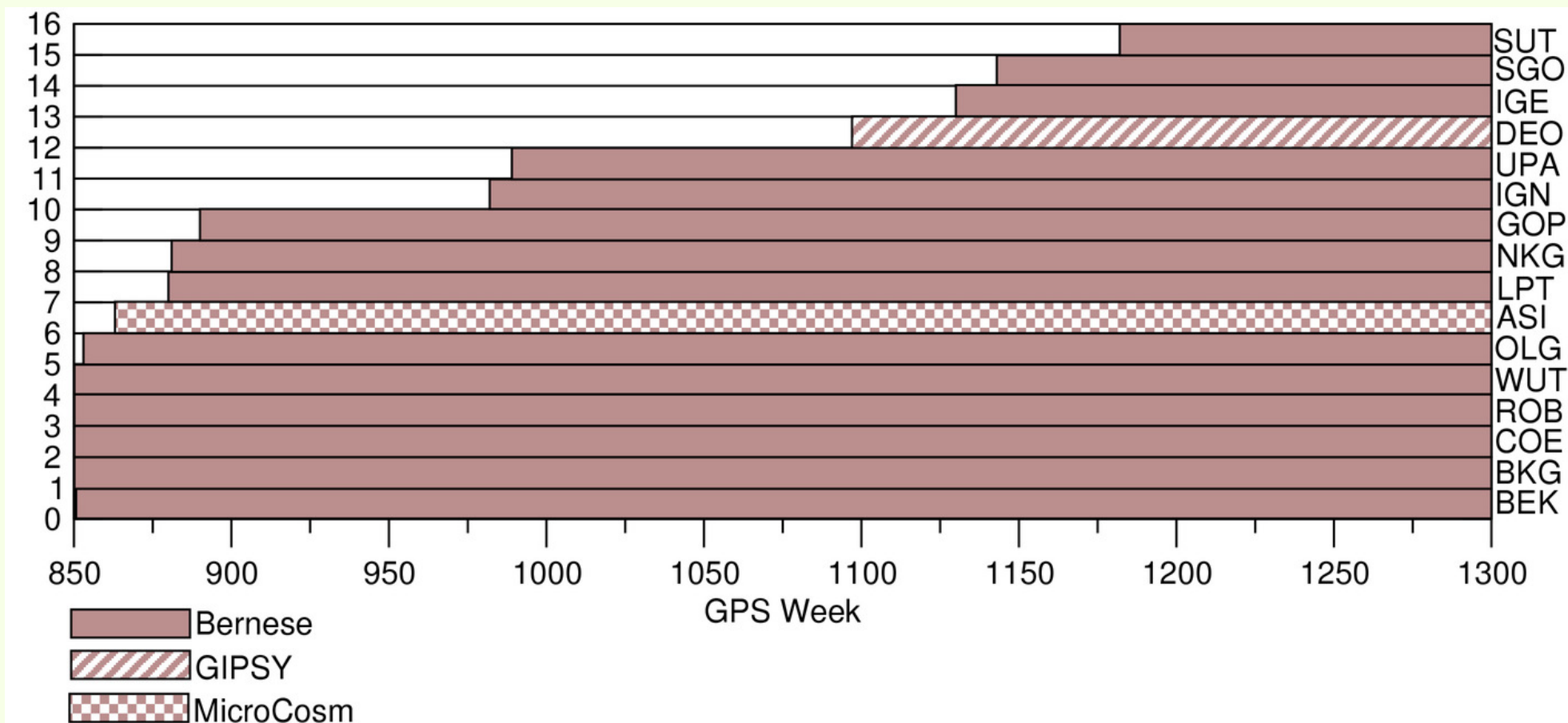
BKGE, Federal Office of Cartography and Geodesy, *Germany*

OLG, Space Research Institute, *Austria*

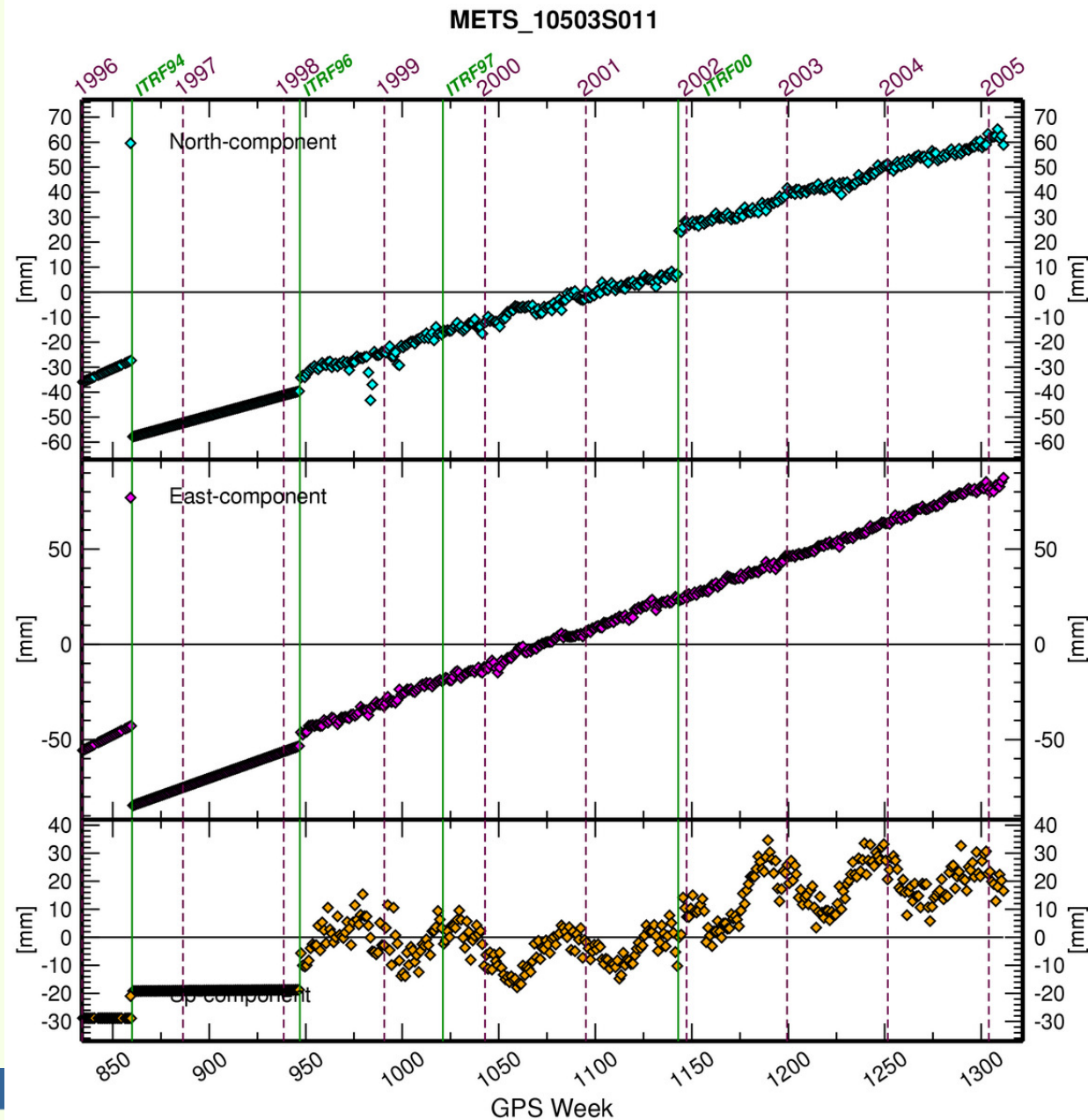
EPN ANALYSIS CENTRES

- ASI : Centro di Geodesia Spaziale "G. Colombo", Matera, *Italy*
- BEK : Bavaria Academy of Science, Munich, *Germany*
- BKG : Bundesamt für Kartographie und Geodäsie, *Germany*
- COE : Astronomical Institute of the University of Bern, *Switzerland*
- DEO : Delft Institute for Earth-Oriented Space Research, Delft, *Netherlands*
- GOP : The Geodetic Observatory Pecny, Pecny, *Czech Republic*
- IGE : Instituto Geográfico Nacional de España, *Spain*
- IGN : Institut Géographique National, *France*
- BKG : Bundesamt für Landestopographie, Wabern, *Switzerland*
- NKG : Nordic Geodetic Commission GPS data Analysis Center, *Sweden*
- OLG : Institute for Space Research, Graz, *Austria*
- ROB : Royal Observatory of Belgium, Brussels, *Belgium*
- SGO : FOMI Satellite Geodetic Observatory, Budapest, *Hungary*
- SUT : Slovak University of Technology, Bratislava, *Slovakia*
- UPA : University of Padova, Padova, *Italy*
- WUT : Warsaw University of Technology, Warsaw, *Poland*

EPN ANALYSIS CENTRES



EPN PRODUCT – WEEKLY COORDINATE ESTIMATES

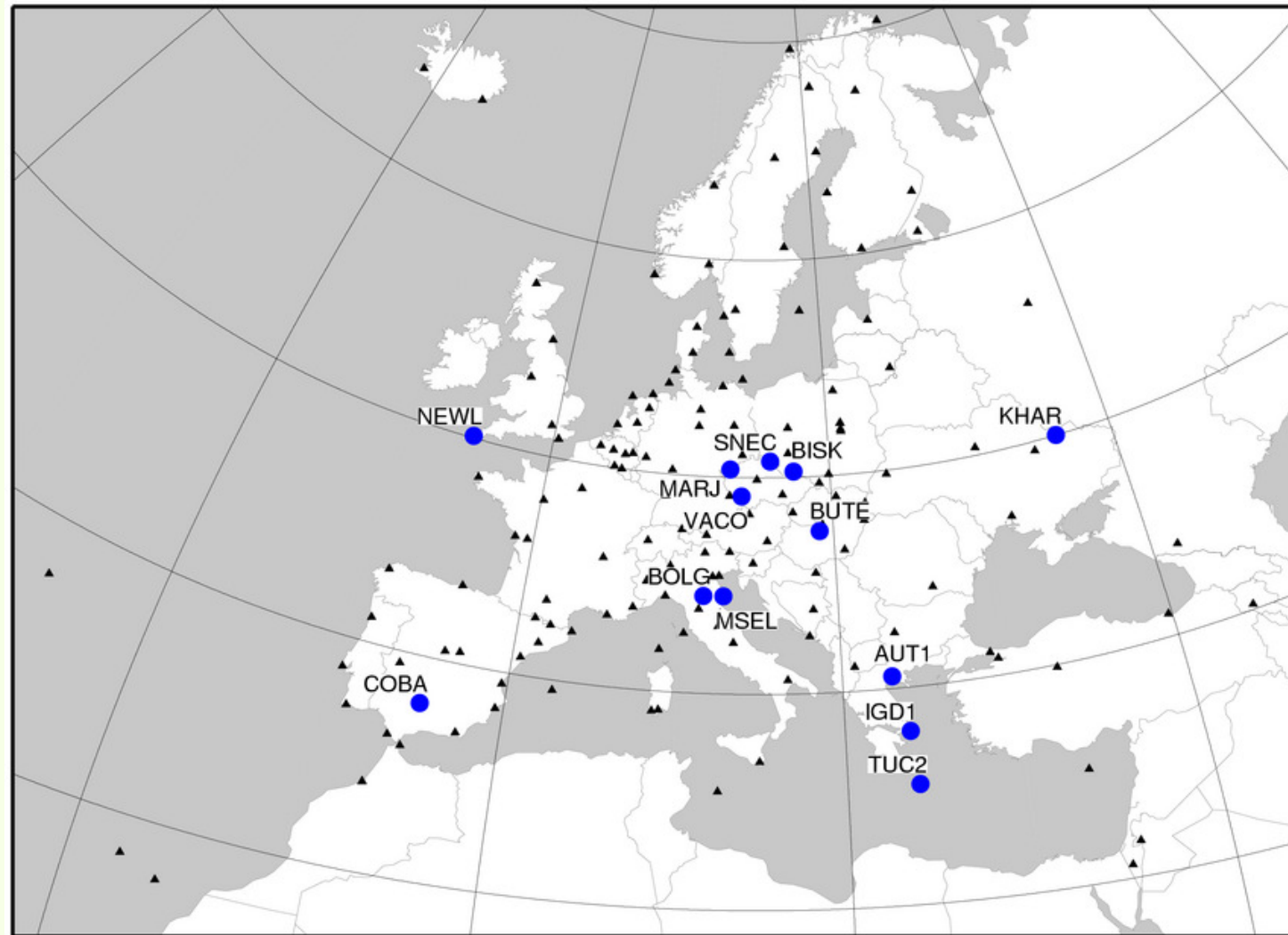


EPN Special Projects

- Time Series monitoring Project (A. Kenyeres)
 - Geodynamic interpretation of EPN coordinate time series
 - Determination of coordinate jumps and identification of periods that EPN stations have unreliable behaviour
- Troposphere Project (G. Weber, W. Söhne)
 - Generate European reference solution for tropospheric zenith path delays estimated using GPS, using post-processed EPN data
- EUREF-IP Project (G. Weber, D. Dettmering)
 - Set up and maintain a real-time GNSS infrastructure on the Internet using EPN stations (25 participating EPN stations)
- European Combined Geodetic Network (J. Ihde)
 - Connect permanent and long-term space geodetic height with repeated gravity and permanent tide gauge measurements in the European coastal regions (46 participating EPN stations)

STATUS OF EPN TRACKING NETWORK

171 permanent stations (including 4 inactive), 14 new stations

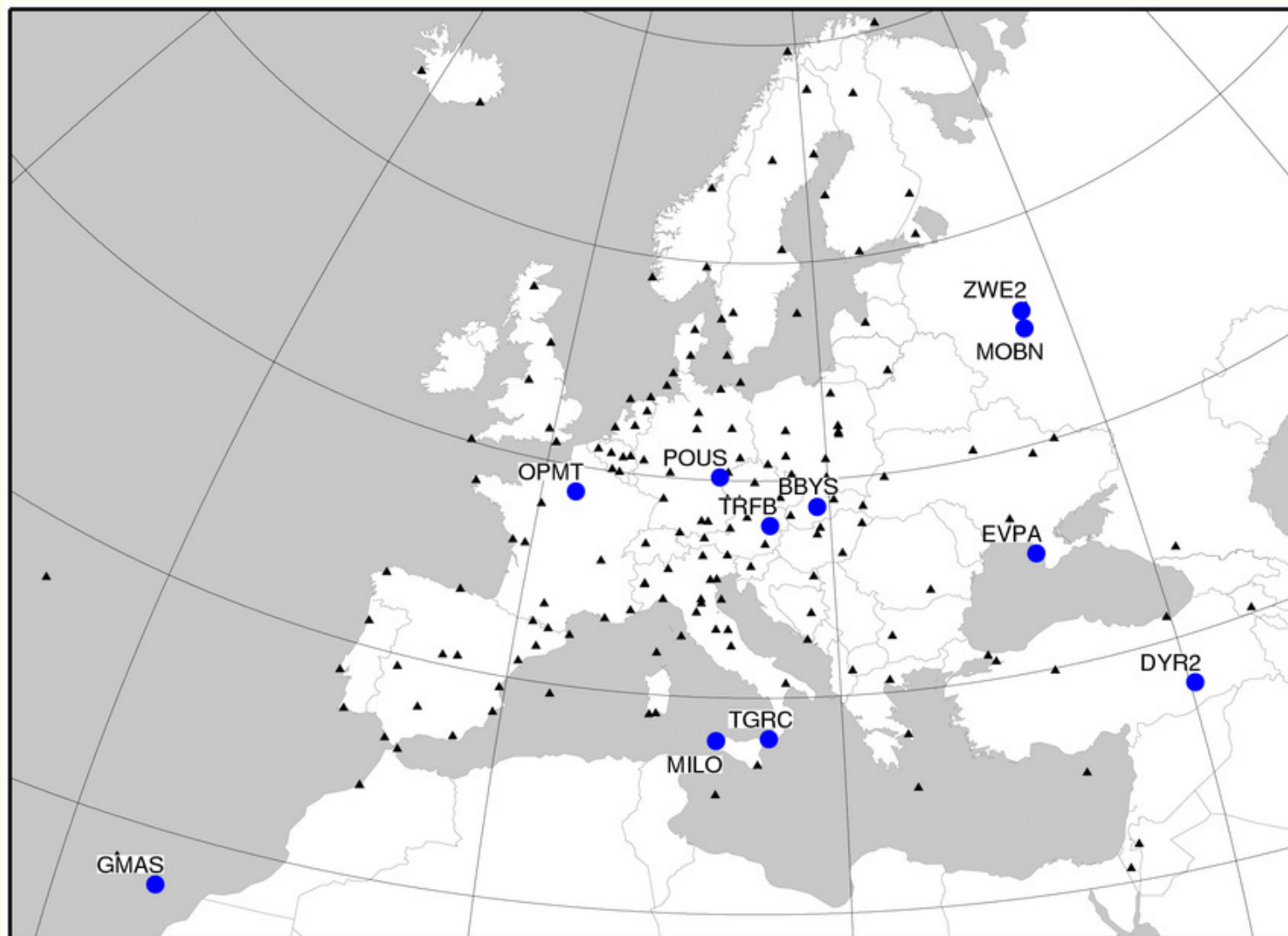


EPN TRACKING NETWORK – New stations

Station	4 char ID	Country	Date inc.	
Newlyn	NEWL	England	27-06-2004	TG ECGN
Athens	IGD1	Greece	19-09-2004	H
Medicina	MSEL	Italy	10-10-2004	ECGN
Chania	TUC2	Greece	24-10-2004	H
Budapest	BUTE	Hungary	31-10-2004	H IP
Taranto	TARS	Italy	19-12-2004	Withdrawn 04/2005
Cordoba	COBA	Spain	27-02-2005	H IP
Kharkiv	KHAR	Ukraine	20-03-2005	H
Bologna	BOLG	Italy	27-03-2005	ECGN
Thessaloniki	AUT1	Greece	24-04-2005	H
Zlate Hory	BISK	Czech Republic	24-04-2005	H GLO
Jachymov	MARJ	Czech Republic	24-04-2005	H GLO
Pec	SNEC	Czech Republic	24-04-2005	H GLO
Vacov	VACO	Czech Republic	24-04-2005	H GLO

IGS more selective when including new stations

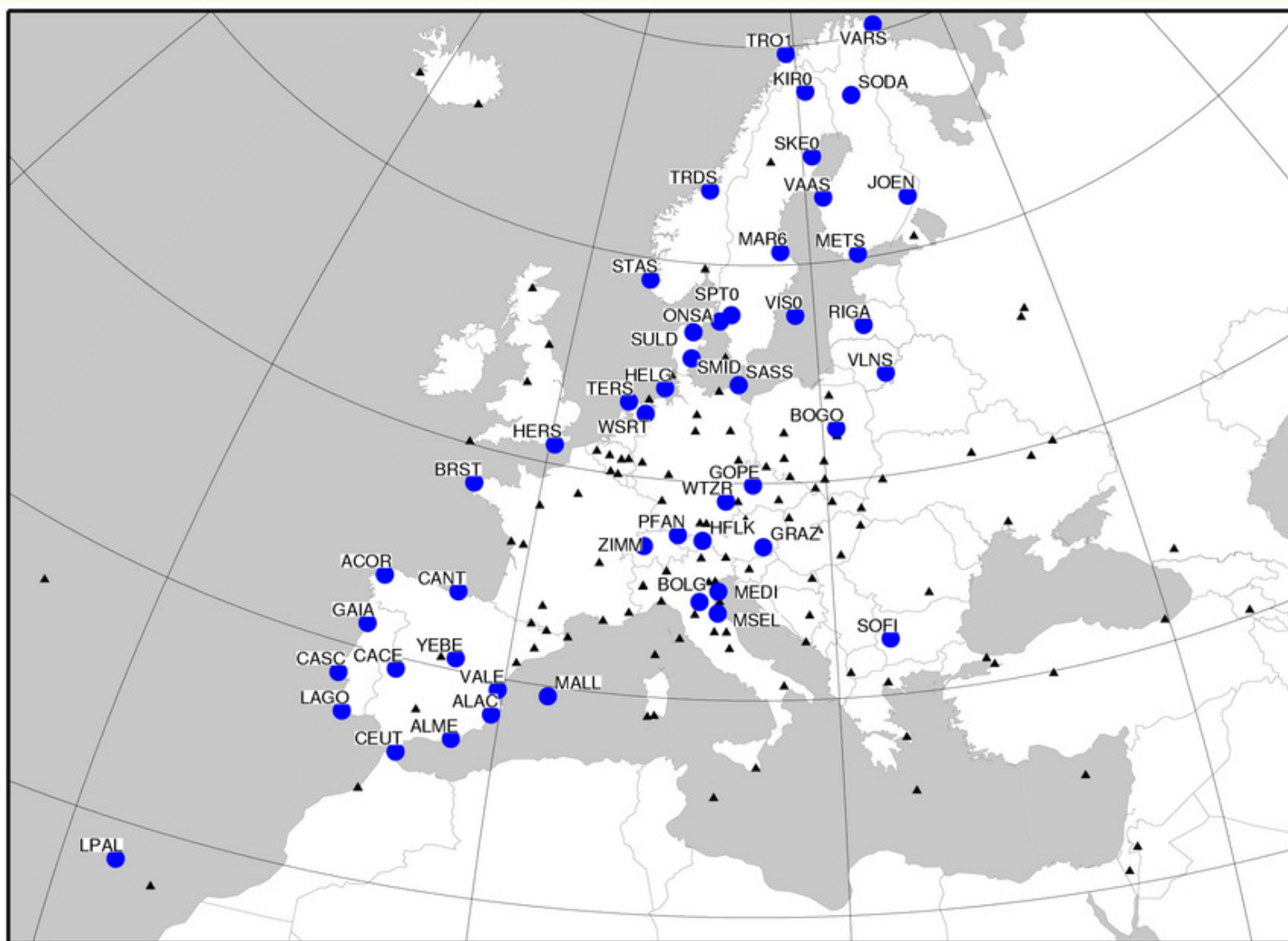
PROPOSED EPN STATIONS



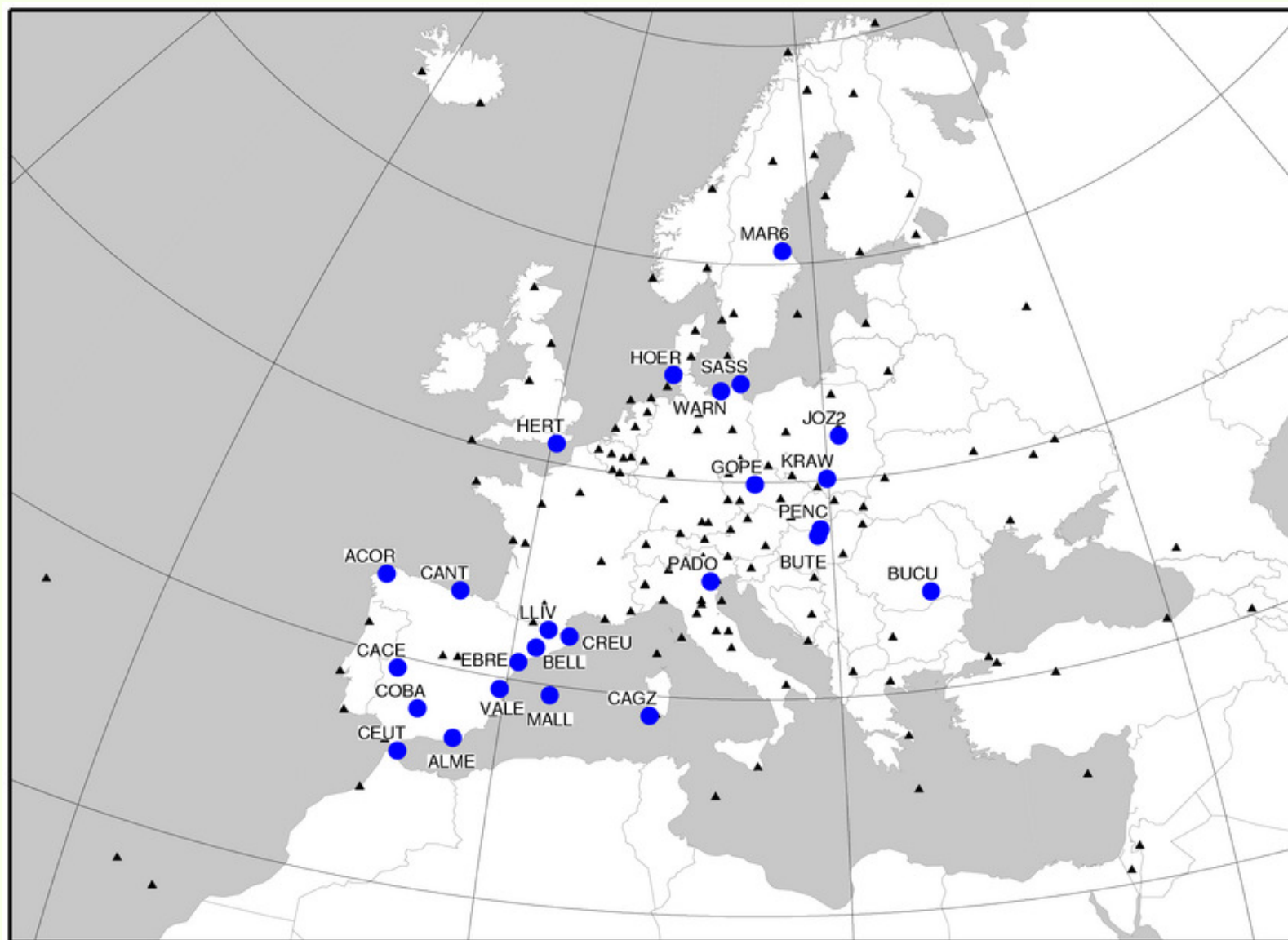
PROPOSED EPN STATIONS

Station	4 char ID	Country	Status
Banska Bystrica	BBYS	Slovak Republic	Commitment letter missing.
Diyarbakir	DYR2	Turkey	No data. Receiver to be replaced.
Evpatoria	EVPA	Ukraine	Hourly data missing.
Maspalomas	GMAS	Spain	Hourly data missing.
Trapani - Milo	MILO	Italy	Lack of low-elevation tracking data on L2.
Obninsk	MOBN	Russian Federation	Hourly data missing.
Paris	OPMT	France	Commitment letter missing.
Poustka	POUS	Czech Republic	Receiver to be repaired.
Reggio Calabria	TGRC	Italy	Lack of low-elevation tracking data on L2.
Pernitz	TRFB	Austria	Late data availability.
Zwenigorod	ZWE2	Russia	Lack of low-elevation tracking data on L2.

EPN STATIONS CONTRIBUTING TO ECGN

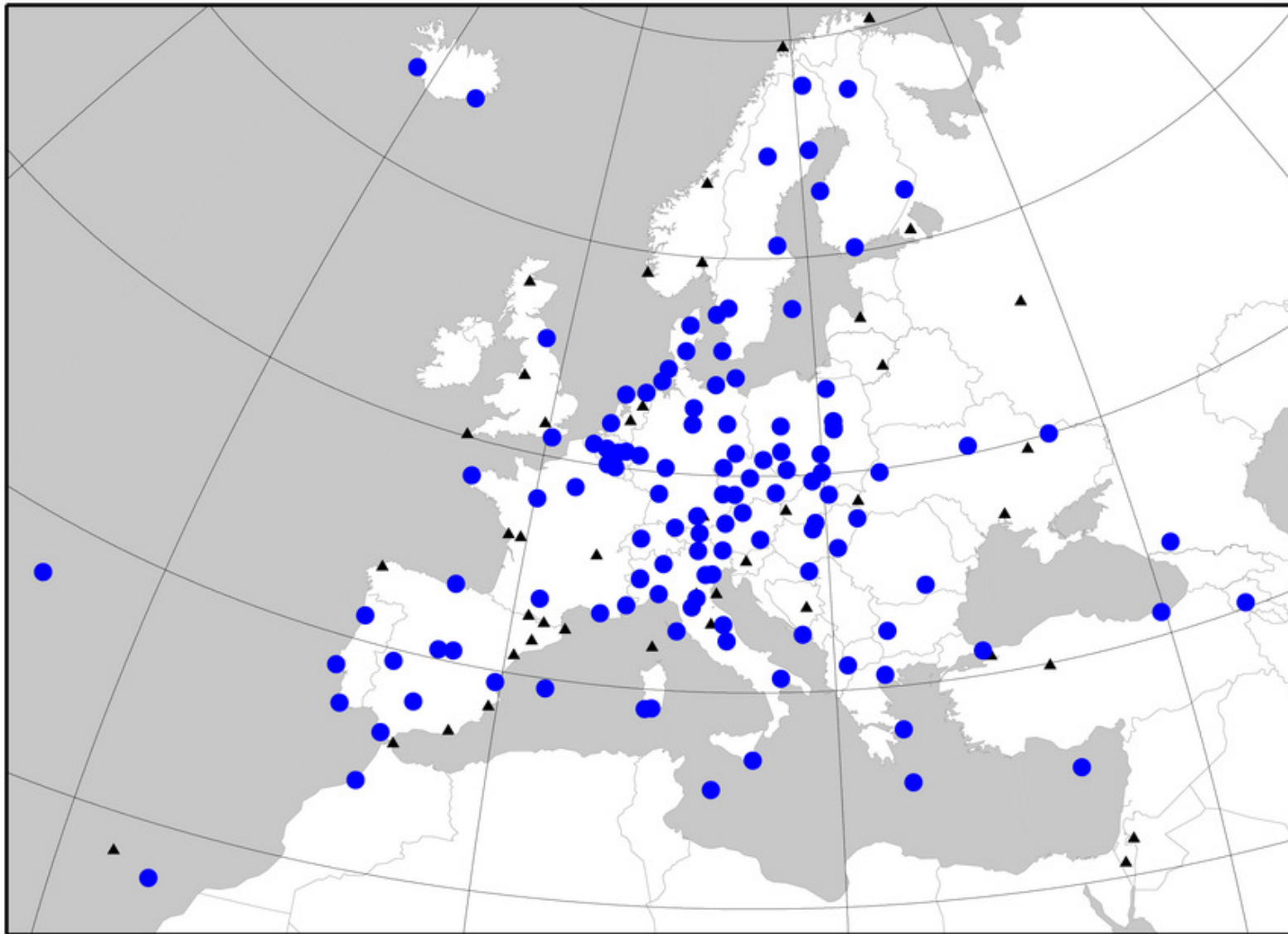


EPN STATIONS CONTRIBUTING TO EUREF-IP



EPN STATIONS SUBMITTING HOURLY DATA

2000 38%
 2001 45%
 2002 51%
 2003 58%
 2004 61%
 2005 74%



RELIABILITY OF HOURLY DATA FLOW



RELIABILITY OF DAILY DATA FLOW



New Guidelines for EPN Stations and Operational Centres

Effective December 2004

[http://www.epncb.oma.be/ organisation/guidelines/](http://www.epncb.oma.be/organisation/guidelines/)

Most important changes :

- Data flow
- Formalisation of some 'good practices'

NEW EPN DATA FLOW

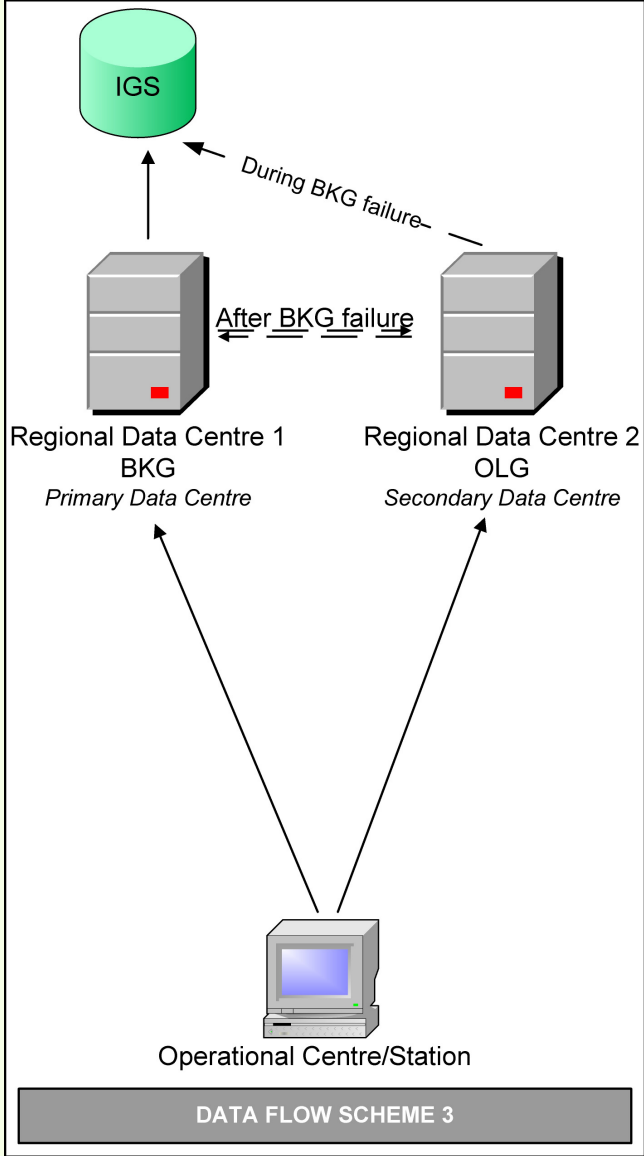
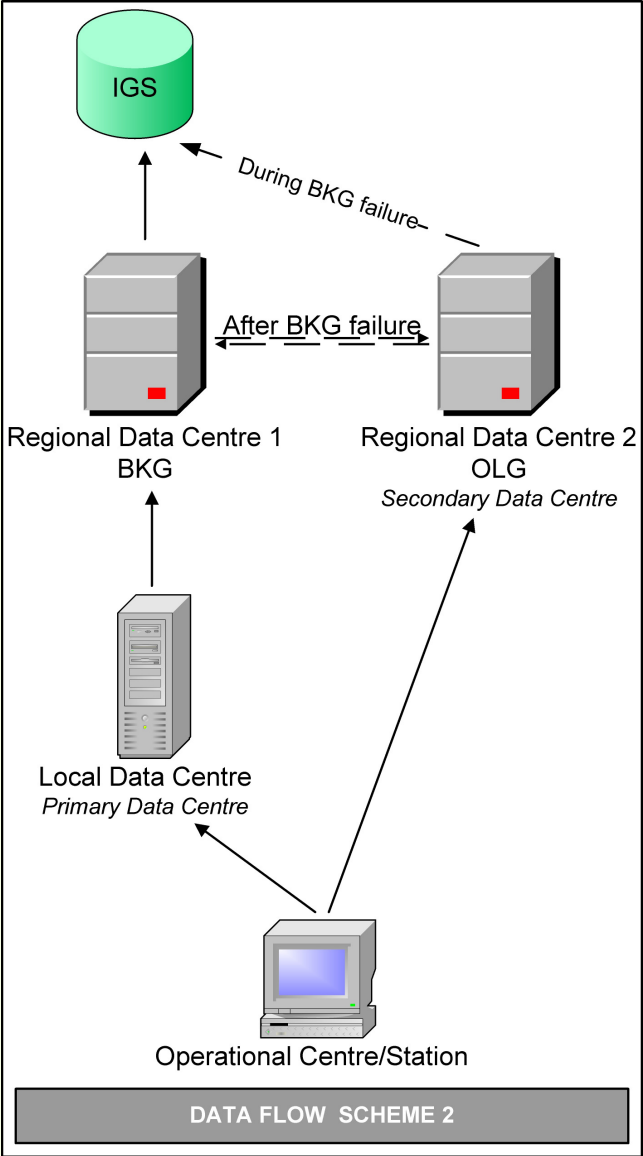
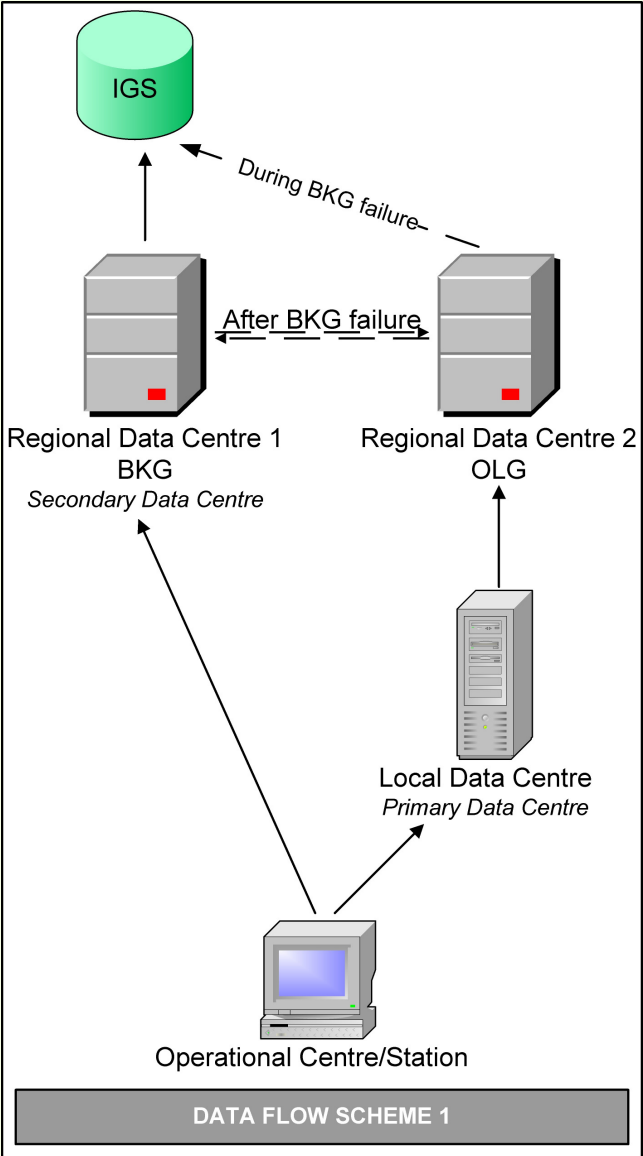
General Principle

- All EPN data are available at 2 Regional Data Centres
- The EPN data arrive at the 2 Regional Data Centres using independent data paths
- Local -> Regional -> Global

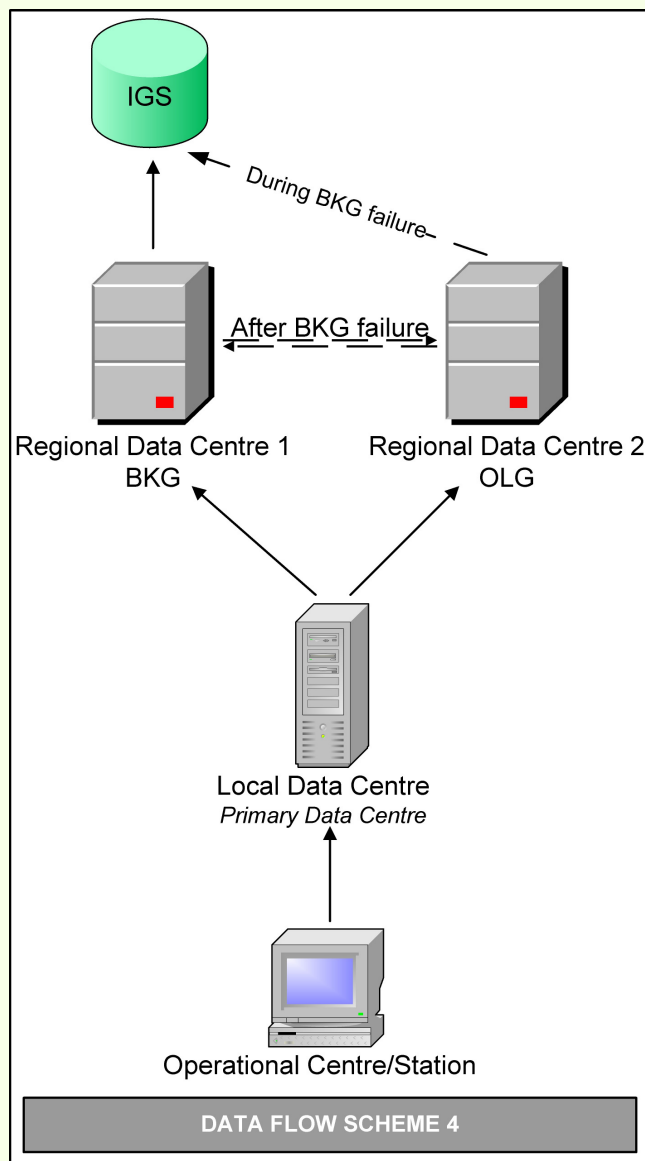
Regional Data Centres

- BKG (primary) and OLG (secondary)
- BKG routinely uploads to IGS
- OLG uploads to IGS in case of failure of BKG

EPN DATA FLOW SCHEMES



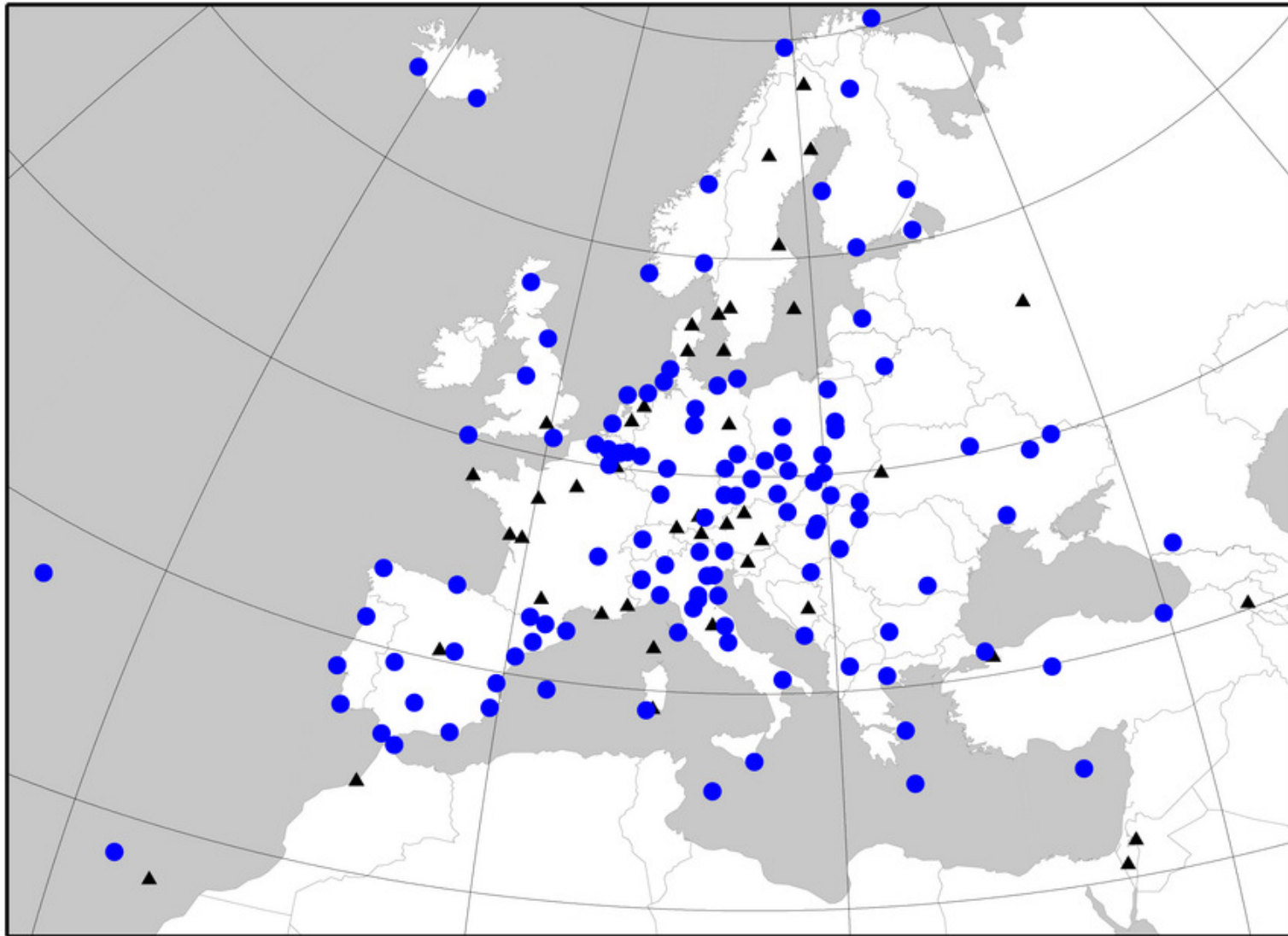
ALTERNATIVE EPN DATA FLOW SCHEME



IMPLEMENTATION OF NEW EPN DATA FLOW

- Realism in approach and schedule
- Contact each station manager individually to
 - Draw attention to new guidelines
 - Inquire about actions he/she will take to have its EPN data flow in accordance with new guidelines
 - Map present data flow
 - Propose the optimal data flow scheme
 - Assist with the implementation of this scheme

EPN STATIONS USING 2 INDEPENDENT DATA FLOW PATHS TO BKG AND OLG



OTHER NEW GUIDELINES

Formalize requirements previously considered as 'good practices'

- Data delivery asap, within 10 min
- Check if data upload is correct and retry upload if not
- Resubmit data after communication outage (station – OC, OC – data centre)
- Hourly data more than 3 days late should not be resubmitted, submit daily data instead
- Avoid radomes, unless absolutely necessary
- The receiver must be set to record down to a cut off of 5 degrees or less
- Additional monuments are desirable for surveys and testing, but keep one antenna + receiver pair as the best site for the EPN, rather than to submit more than one "site" to the EPN

Thank You

For your support to the EPN Activities

Station operators and their agencies

Data centres

Analysis centres

And everyone contributing to the EPN