EUREF Activities

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EUREF
Reference Frame Sub Commission 1.3a for Europe of the International Association of Geodesy (IAG)

- EUREF is composed of representatives from European IAG member countries; annual symposium (plenary) and Technical Working Group (TWG)
- Links to about 130 European organizations, agencies, universities from more than 30 countries – related to geo-referencing, positioning, and navigation (activities like EUREF Permanent Network and annual symposium)
- The TWG is composed of members elected by the plenary, members in charge of special tasks and ex-officio members. Control of EUREF activities and policy.
- Close co-operation with pertinent IAG components (Services, Commissions, and Inter-commission projects), EuroGeographics (the consortium of the European National Mapping and Cadastre Agencies), EUPOS (DGNSS service providers), UN-GGIM Europe (Geo-information expert group) among others
- EUREF is a user and a provider of GNSS
- Provides all of its products and services on the “best effort” basis and free of charge to the public
EUREF

- Plenary
- Member States

EUREF Technical Working Group

- UELN
- Facilities

- EPN
  - EPN Central Bureau
  - Coordinators
  - Facilities

External Interfaces
- CEGRN
- EUMETNET
- EUPOS
- EUROGEOGRAPHICS

Working Groups
- EPN Densification
- EPN Reprocessing
- EPN Real-Time Analysis
- Multi-GNSS
- Deformation Models
- European Combined Geodetic Network (ECGN)

Pilot Projects
Main activities of EUREF

- Develop the **EUREF Permanent Network (EPN)** for the maintenance of the European Reference Frame, as contribution to the ITRF and as infrastructure to support other relevant projects, e.g. European initiatives related to Galileo;

- Implement necessary projects for the long-term maintenance of the **ETRS89** (European Terrestrial Reference System) and the **EVRS** (European Vertical Reference System);

- Promote the adoption of the reference systems defined by EUREF (ETRS89 and EVRS) in the European countries and European-wide organizations involved in geo-referencing activities;

- Improve the **Unified European Levelling Network (UELN)** by extending it to all European countries, taking into account the perspective of a geokinematic computation
EPN, EUREF Permanent Network

More than 200 permanent GNSS stations

Data centers; data upload and archiving

Analysis centers; data analysis, daily and weekly solutions of station position, tropospheric parameters; combination

EPN Central Bureau

EPN products freely available
EPN Activities

• **EPN Densification**: Provide an added-value to the EPN, fill possible gaps in network, network extension, @tide gauges, multi-GNSS receivers, real-time data; must fulfil guidelines for station structure, equipment, data flow and quality

• **Data reprocessing**: Reprocessing historic data to improve station time series, antenna corrections, satellite orbit information,… Several teams.

• **Multi-GNSS**: New GNSS available (Galileo, BeiDou); GPS and Glonass. More stations are able to observe all available GNSS satellites. EPS is adopting new systems.

• **RINEX3 format**: Adoption of RINEX3 format for GNSS data submission, archiving and analysis. Needed for new GNSS data
EUREF real-time GNSS data transfer and products

Stations providing real-time GNSS data is slowly increasing

Number of users is increasing rapidly; there is a need for European-wide real time data

(Courtesy: Söhne)
EUREF Broadcaster

- **Purpose:** User should be able to get access to RT data through different casters, and be able to switch between broadcasters without degradation of performance (e.g. availability, latency, …)
- **Requirement:** Identical setup at each broadcaster
- **IGS Real-Time Service (RTS) started in 2013; EPN RT Data used as input for IGS RTS**
- **EPN RT Analysis; currently no real EUREF RT products**
- **Precise Point Positioning (PPP) increasing; needs real-time analysis e.g. for troposphere, orbits, clocks,…; new RT PPP software are coming**
Reference frames in PPP

- Local RTK networks (national level)
  - realization of ETRS89
  - a few cm accuracy
  - local reference stations and reference frames realization

- PPP-RTK
  - PPP is a global approach; does not use local reference stations
  - global reference frame realization; if needed transformed to regional or local reference frames
  - Basic input for science and safety (e.g., tectonic risk assessment) in large networks (e.g., Japan)
  - Global reference frames
  - Issues when needed on national level; one needs to know crustal movements and transformation to the national system
  - Network RTK resources will not become obsolete, combination of PPP-RTK will be an alternative; EUREF contribution in testing/validation/software
EUREF Multi-GNSS activities

• TWG established 2012 a Multi-GNSS Working Group
  • Handling data formats RINEX3.0x and/or RINEX2.1x and compatibility to RTCM 'High Precision Multiple Signal Messages' (HP MSM) and procedure for implementation in the EPN
  • Enhancing the EPN infrastructure by Multi-GNSS-ready receivers and antennas
  • Developing of software (post-processing and real-time) capable to handle multi-GNSS signals
  • Setting up a time schedule in order to plan the operational switch to RINEX3 which also is in line with IGS
• EUREF will support all satellite navigation systems: currently GLONASS and Galileo from data collection to analysis
• The new GNSS satellites will be a big challenge for EUREF by upgrading the station equipment while maintaining a stable reference frame; issue of software as well for data analysis.
EUREF and UN-GGIM Europe

- UN-GGIM Europe is a regional committee of the United Nations Initiative on Global Geospatial Information Management (UN-GGIM)
- It shall identify European issues relevant to geospatial information management and recommend necessary actions on them
- The aim is to ensure that e.g. the national mapping and cadastral authorities contribute to the more effective management and availability of geospatial information in Europe
- GGRF (Working Group on Global Geodetic Reference Frame) of UN-GGIM provides an intergovernmental forum for communication and cooperation on issues relating to the maintenance and enhancement of a GGRF; UN Resolution on a global geodetic reference frame for sustainable development (Feb 2015); roadmap and implementation ongoing
- An European group, within the UN-GGIM Europe will deal with special issues related to Europe and to implement the global topics within Europe. EUREF will be the central technical advisor for this group.
Future

Multi-GNSS

• New satellite systems will be fully operational during next few years
• EPN challenges to track all systems
• Software challenges to analyse and compute all signals
• ETRS89 maintenance with new stations and new satellites
• Emerging PPP; rules and guidelines for users, compatibility of coordinates with old ones, crustal movements
• Increasing use of real time applications
EUREF links

- EUREF web page: http://www.euref.eu/
- EUREF permanent Network EPN: http://www.epncb.oma.be

Thank you for your attention