# **NTRIP-based DGPS service in Hungary**

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# The Satellite Geodetic Observatory

- Department of the Institute of Geodesy, Cartography and Remote Sensing (FÖMI)
- Space geodetic research, technology and know-how transfer
- Active GPS network development
- International EUREF analysis centre (24 stations)
- GPS levelling and crustal movement monitoring
- EUPOS® participant since 2002
- NtripCaster operator since 2004
- GNSS Service Centre established in 2004 → *EUPOS<sup>®</sup>* National Competence Centre
- Network RTK software testing 2005





# Contents



- Network configuration
- Services
- Data dissemination
- User community
- Further development

### **Existing Reference Station Network**



# The TAKARNET Network

- Intranet network connecting 117 Hungarian Land Registry offices
- Designed for cadastre data exchange
- Central unit located at the FÖMI headquarters in Budapest
- The Satellite Geodetic Observatory is also an endpoint of TAKARNET
  - Bandwidth: 256-448/128 kbps baui-Zempler Nógrác loson Sopro Nagykur zhré Bács-Kiskup Sonf Csontarta Barany

# Reference Station and Network Control Centre





Ntrip monitoring PCs, Rack with Internet routers



NtripCaster, Webserver, Data processing PCs

### Services

- RINEX data (hourly and daily files) for post-processing
- RTK corrections (RTCM 2.1 Message Types 3, 20/21)
- DGPS corrections (RTCM 2.1 Message Types 1, 2, 3)
- EGNOS ESTB VRS corrections (RTCM 2.1 Message Types 1, 2, 3)
- GPS equipment calibration
- Support during normal working hours

1-5 cm accuracy

submetre accuracy

for testing only, intermittent

### **RINEX Data Downloading**



# **RINEX** Data Availability



#### Average availability of RINEX files since April: 98.3%





# Potential User Community

- Cadastre management
- Area-based EU agricultural subsidy control
- Precision agriculture
- Land surveying
- GIS (e.g. public utility management)
- Traffic and transportation management
- Motorway/railway and bridge construction
- Machine guidance
- Environmental protection
- Natural disaster management
- Security services
- Hidrography
- Forestry
- Archaeology
- Universities & research institutes
- Etc.





















# Growing Number of Users







### Further Development

<u>2005</u>

- 3 new stations to be deployed around Budapest
- Network RTK software to be installed at the NCC
- Homogeneous RTK coverage for greater Budapest
- Monitoring system to be developed
- Extended testing and demonstrations

#### <u>2006 - 2007</u>

- Network densification → 25 30 reference stations Infrastructure development financed by the state budget and by EU and bilateral projects
- Homogeneous RTK coverage for the whole country
- Real-time service charges to be introduced
- Supporting application development

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# New Services to be introduced

- Real-time correction data:
  - RTCM-EU (*EUPOS®* format using FKP)
  - VRS corrections (RTCM 2.1 Message Types 20/21)
  - RTCM 3.x (Master-Auxiliary concept)
- Data for post-processing:
  - (>)1Hz RINEX files
- Rover receivers for rent
- Training courses for end users and state officials
- RINEX data processing service
- Extended support

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### Thank you for your attention!

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