Latvian Geospatial
Information Agency

CORS “LatPos” multipurpose State geodetic network

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United Nations / Argentina Workshop on the Applications of Global Navigation Satellite Systems
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Outline

- LatPos base stations and coverage
- LatPos applications
- LatPos field tests on stability
- Future plans
- Innovative solutions in Geomatics

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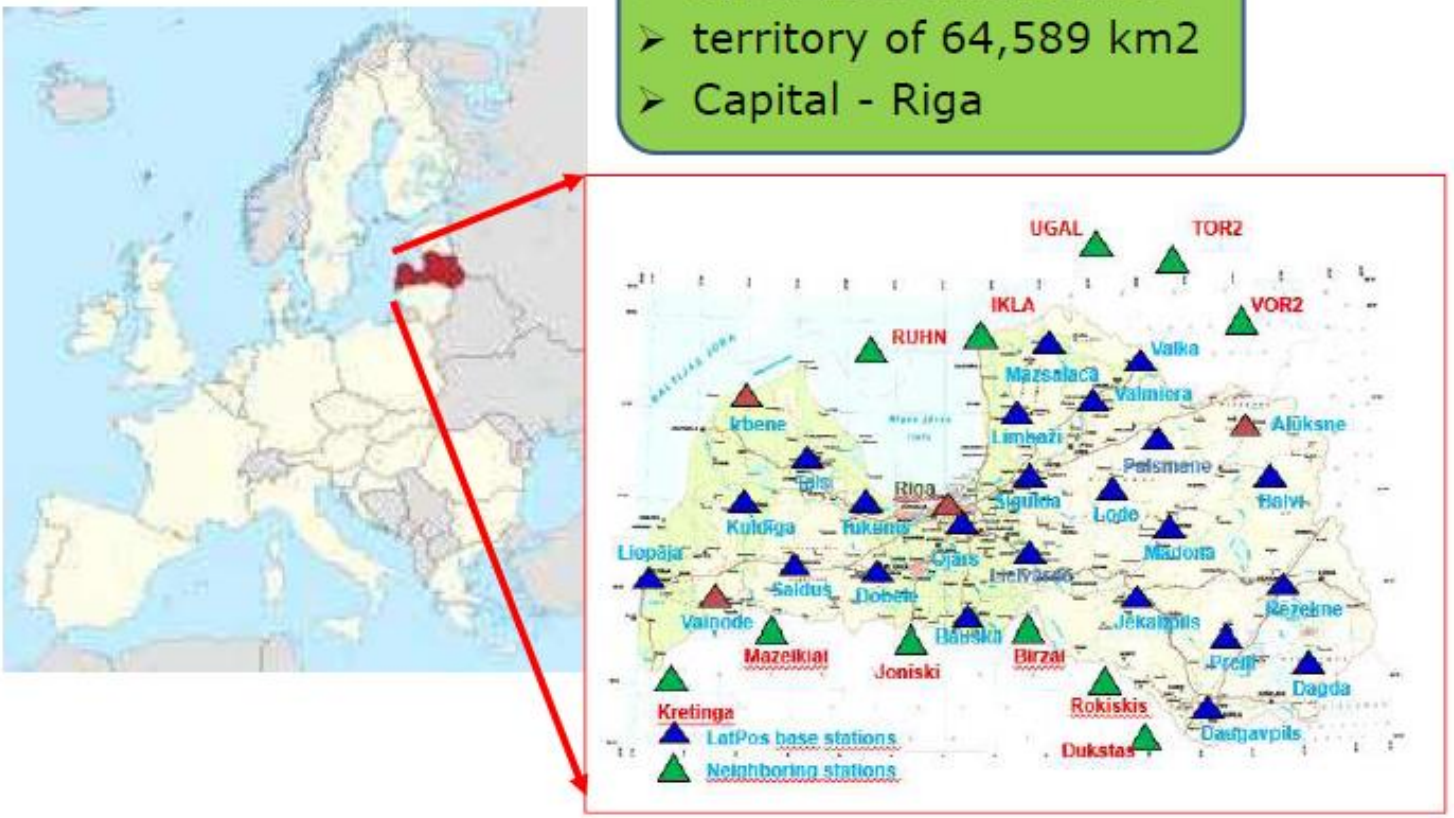
Latvia located in North of Europe

- 1,957,200 inhabitants
- territory of 64,589 km2
- Capital - Riga



LatPos Base stations
25

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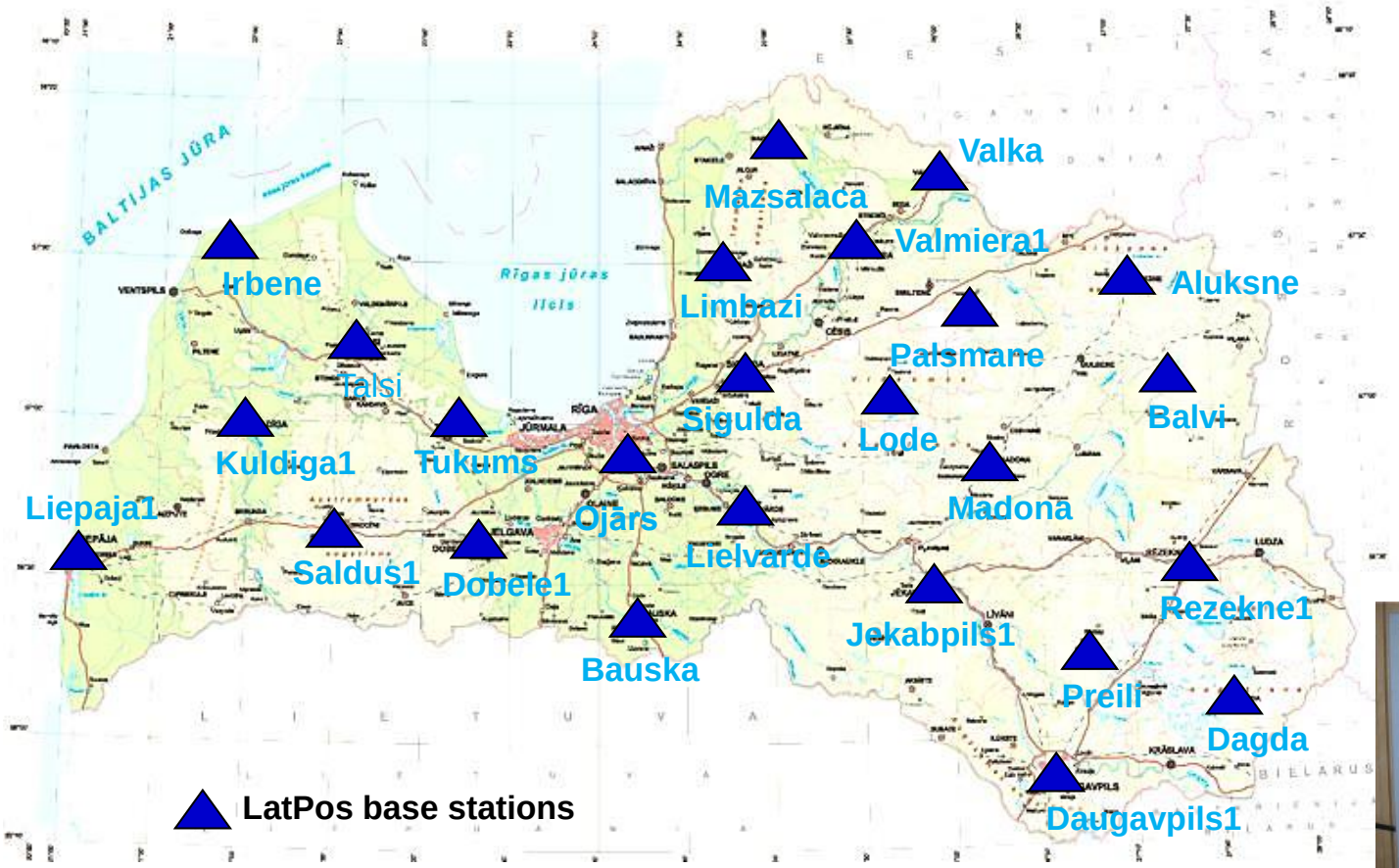
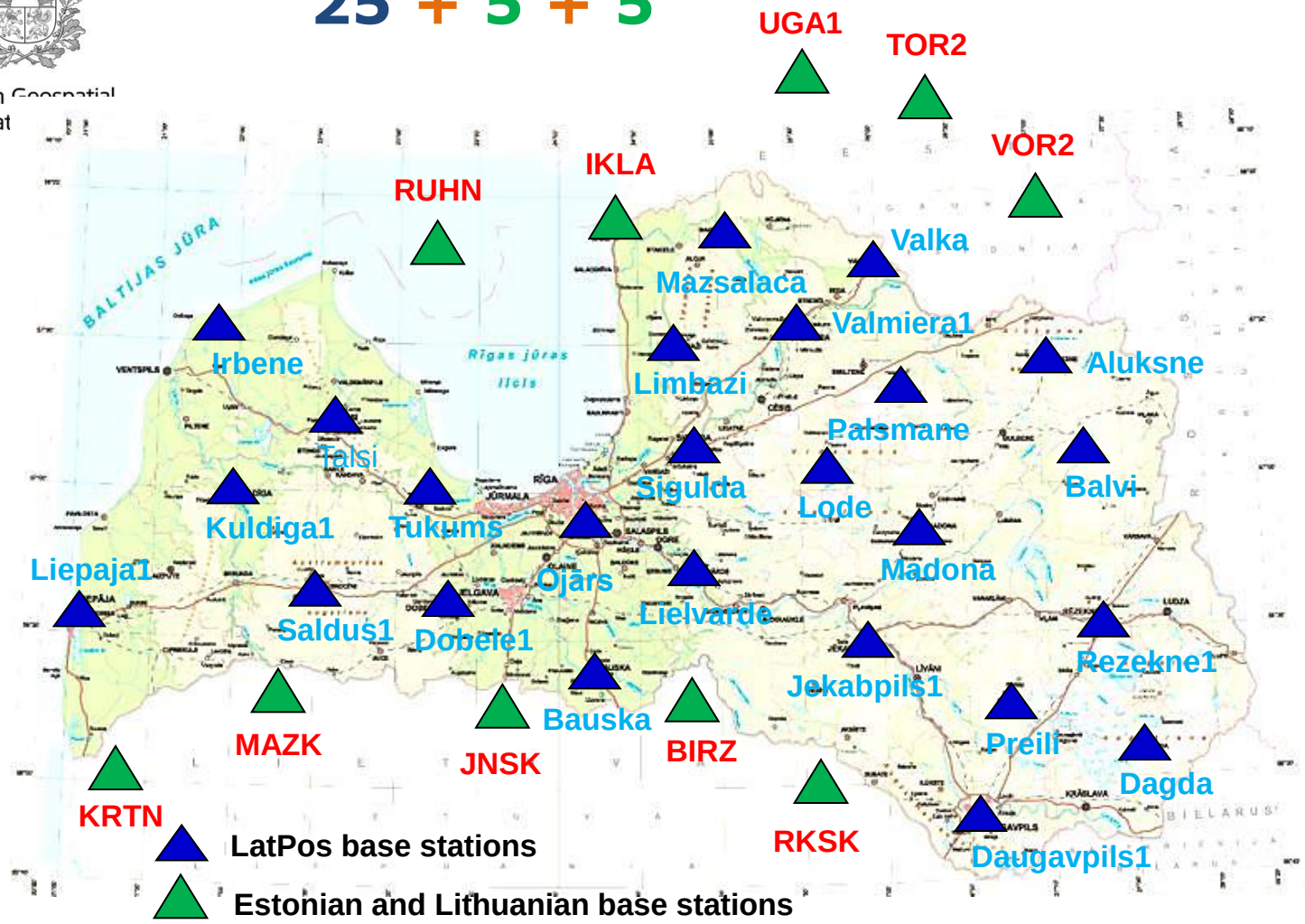
Chockering Antennas

UPS for 48 hours

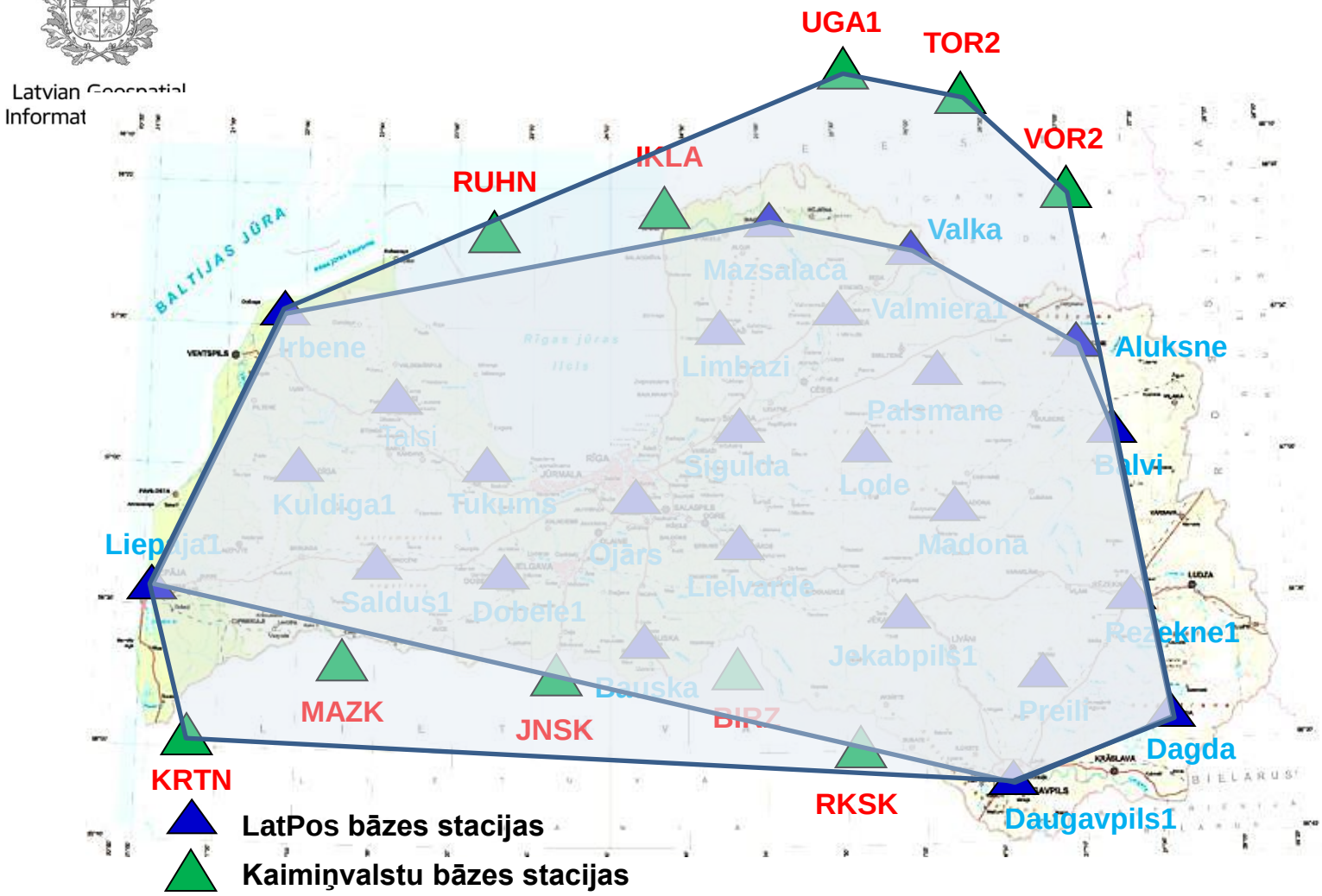


LatPos Base stations

25 + 5 + 5



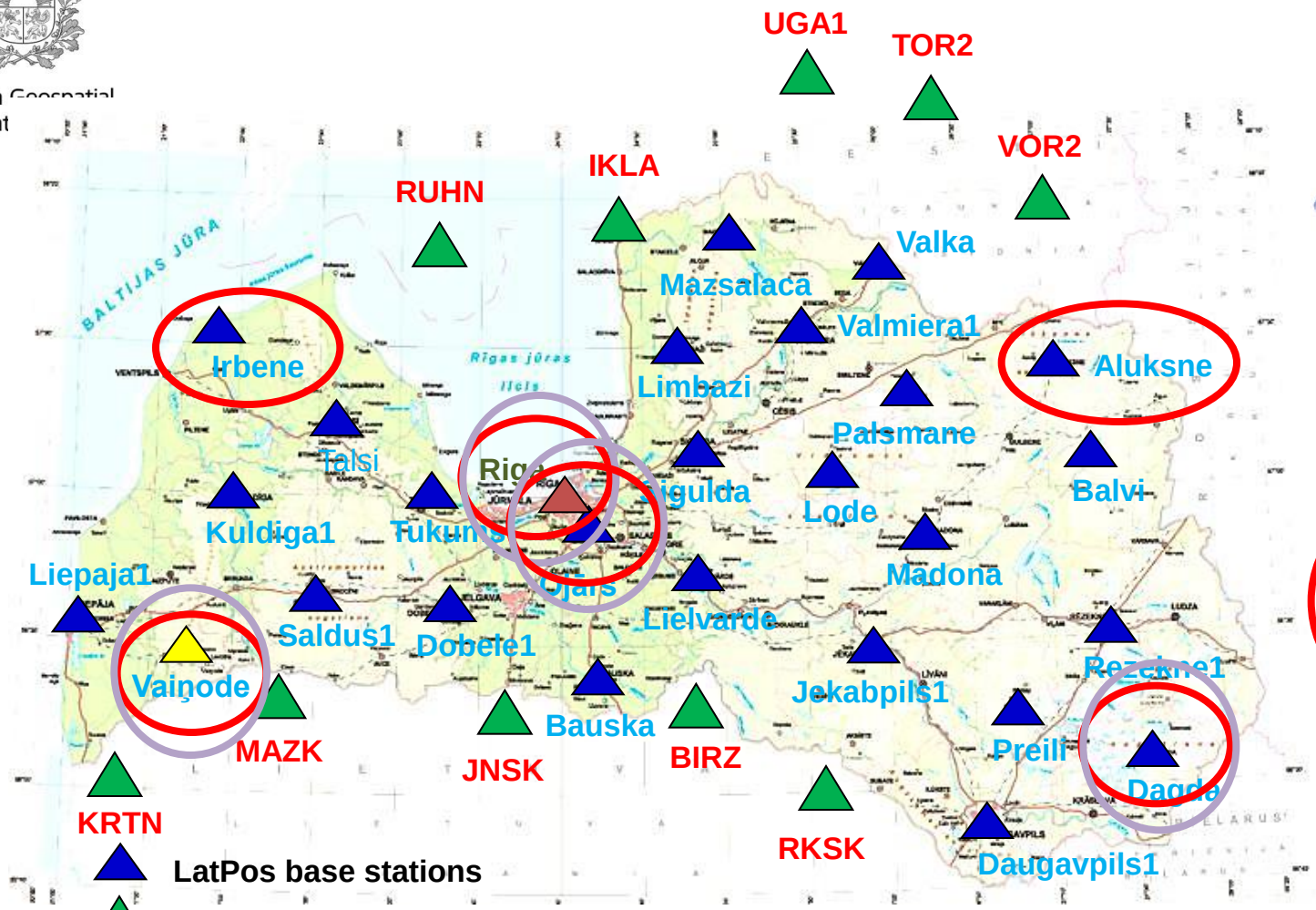
LatPos cluster layout



Base stations 25 + 5 + 5

LatPos received GNSS signals

Latvian Geospatial Informat



All = GPS+GLO
Aluksne,Irbene = GPS+GLO+GAL
Ojars, Dagda, Vainode = GPS+GLO+GAL+BDS
Riga = GPS+GLO+GAL+BDS

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LatPos RTK corrections:

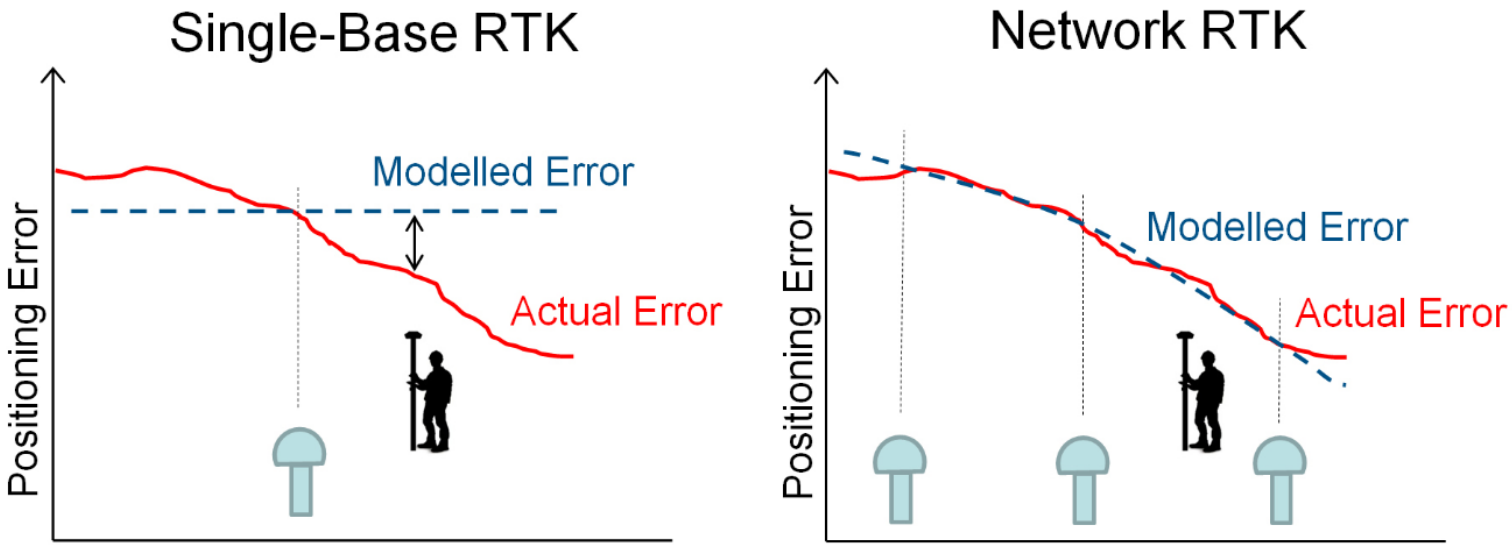
LatPos provides:

Single-Base RTK

- ✓ SITE

Network RTK

- ✓ MAX
- ✓ iMAX
- ✓ VRS
- ✗ FKP



Source: Janssen, V and Haasdyk, J and McElroy, S (2011) *Network RTK: Same look and feel... only better.* Position (56). pp. 20-24. ISSN 1447-2635

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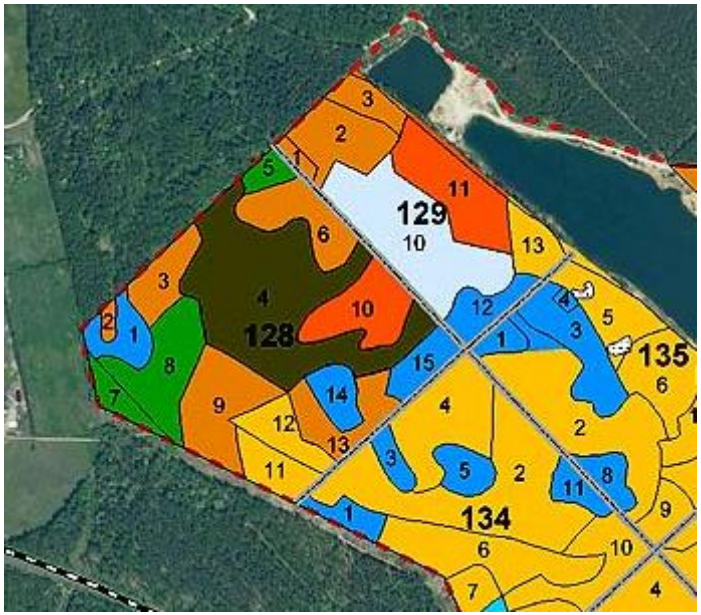
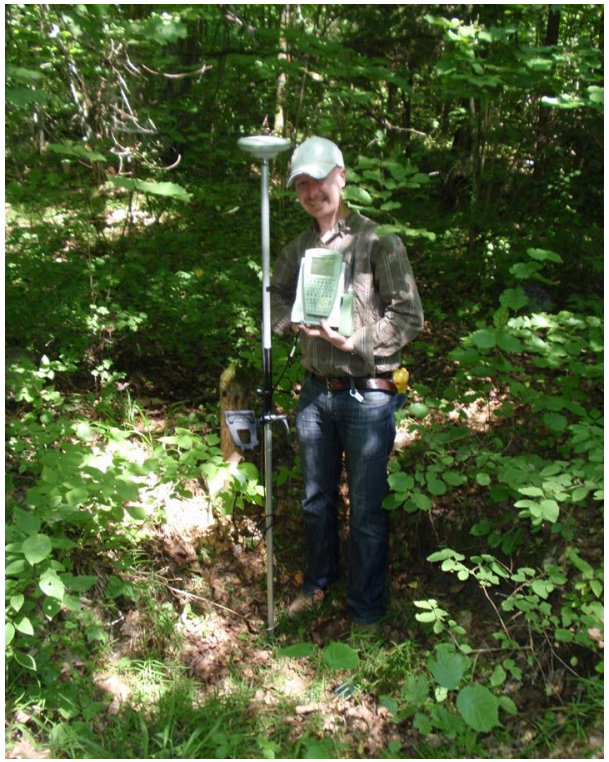
LatPos applications Decimeter level - Forestry



Source: Ogre municipality



- Collect data about trees (type, age, hight
- Survey cutted down areas
- Syrvey disaster areas

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LatPos applications

Centimeter level

- Topography
- Cartography

- Cadaster

- Finished construction measurements
  - (example – electric cables)

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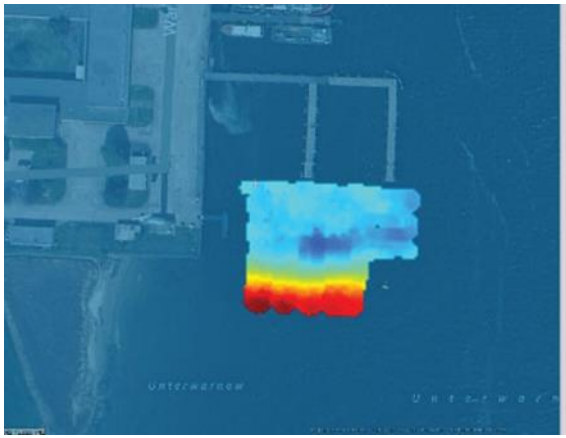
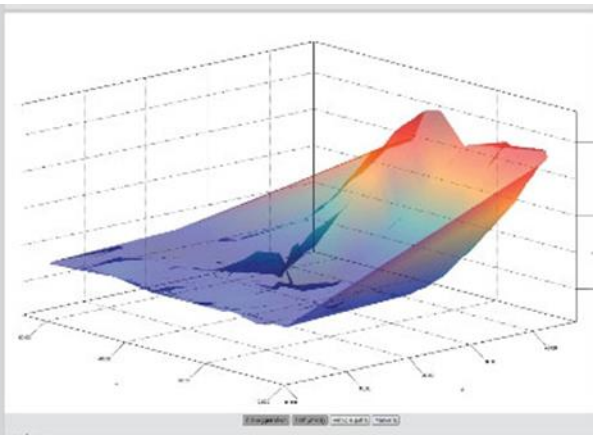
LatPos applications

Centimeter level

- Road construction
- Marine surveying

Road construction





Underwater scanning
-River bottom mapping
-Search for sinked Ships

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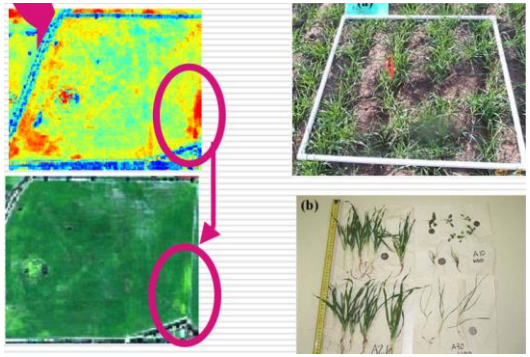
LatPos applications Centimeter level - Precise Agriculture

Seeding
With 2cm

Remote sensing
With RTK Drone

Precise Chemical Distribution



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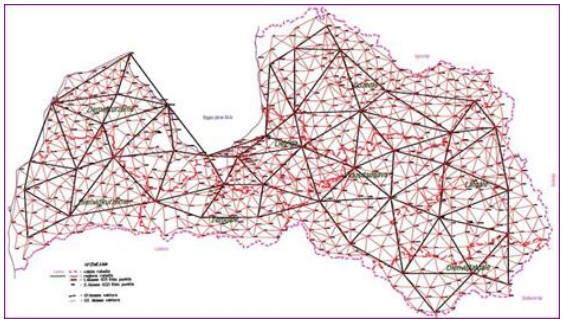
LatPos applications

Millimeter level

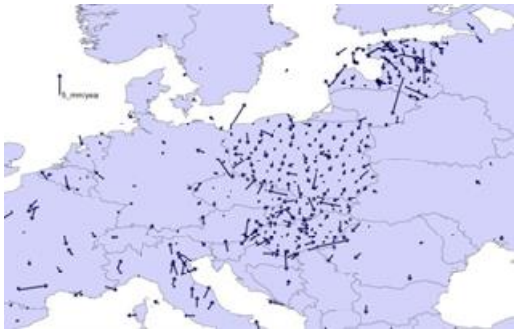
- **Maintenance of State Geodetic Network**



State Geodetic Network

Benchmark

- **Continental drift and Geology EUREF Network**



EUREF Network

Data Time series
From Year 2005

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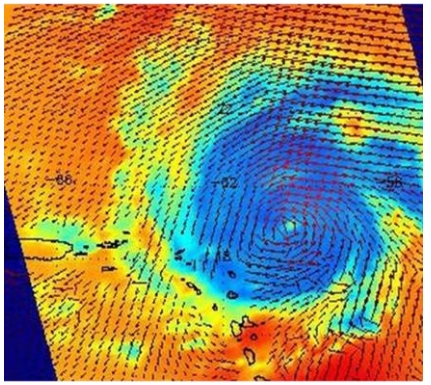
LatPos applications



- **Wather, Water Wapour**
- **Scientific Applications – with VLBI**

GNSS and
32m Telescope

Irbene 32 m Telescope

16m Telescope

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LatPos operational tests

1. Time to FIX (distance to base station, data transmission)
2. Initialization repeatability
3. RTK stability in time period
4. Post processing data (not in this presentation)

5. Measurements done at State Geodetic Network Benchmarks.

State Benchmark

Syrveyors at work

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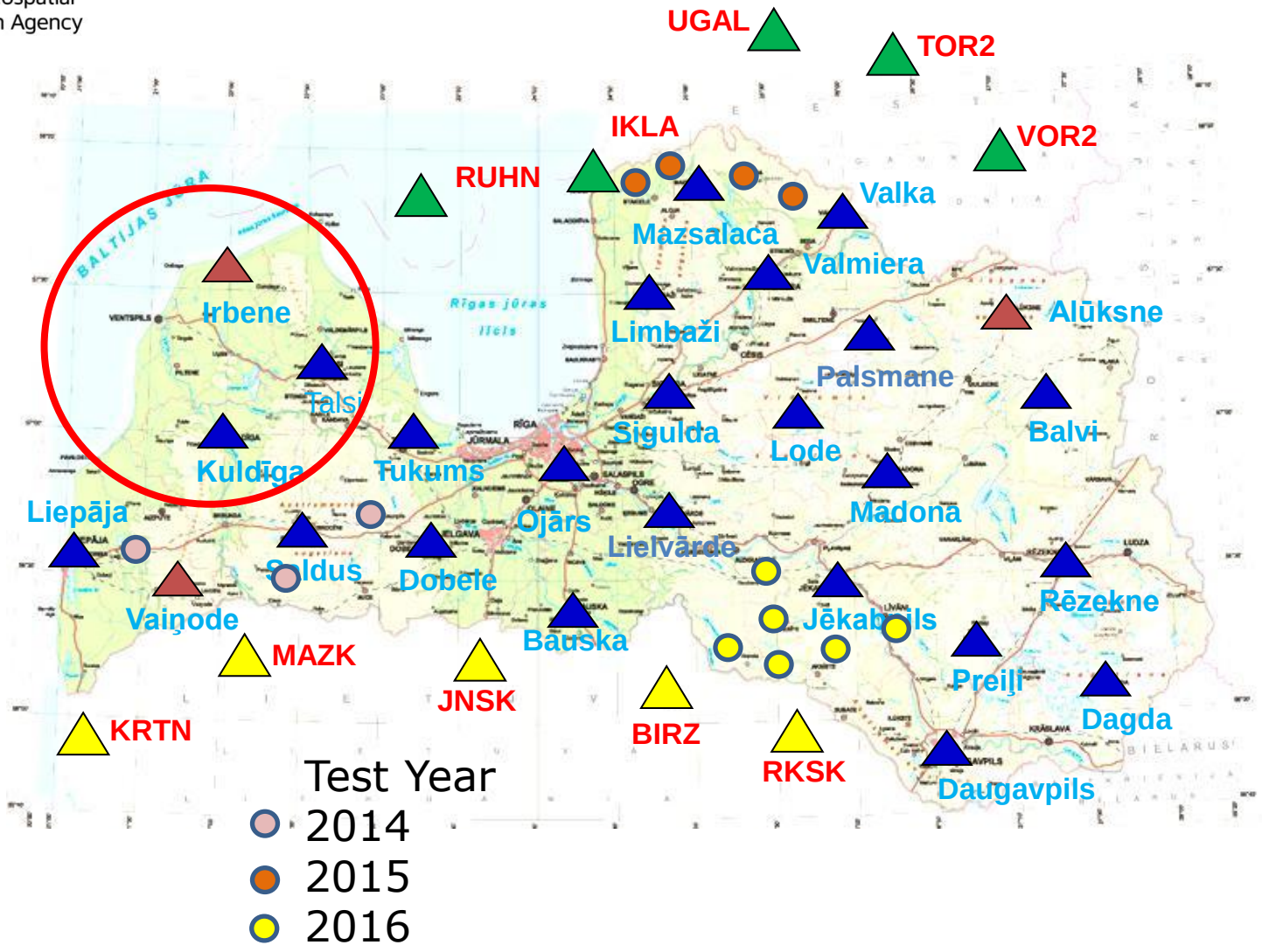
LatPos operational tests
Test Areas



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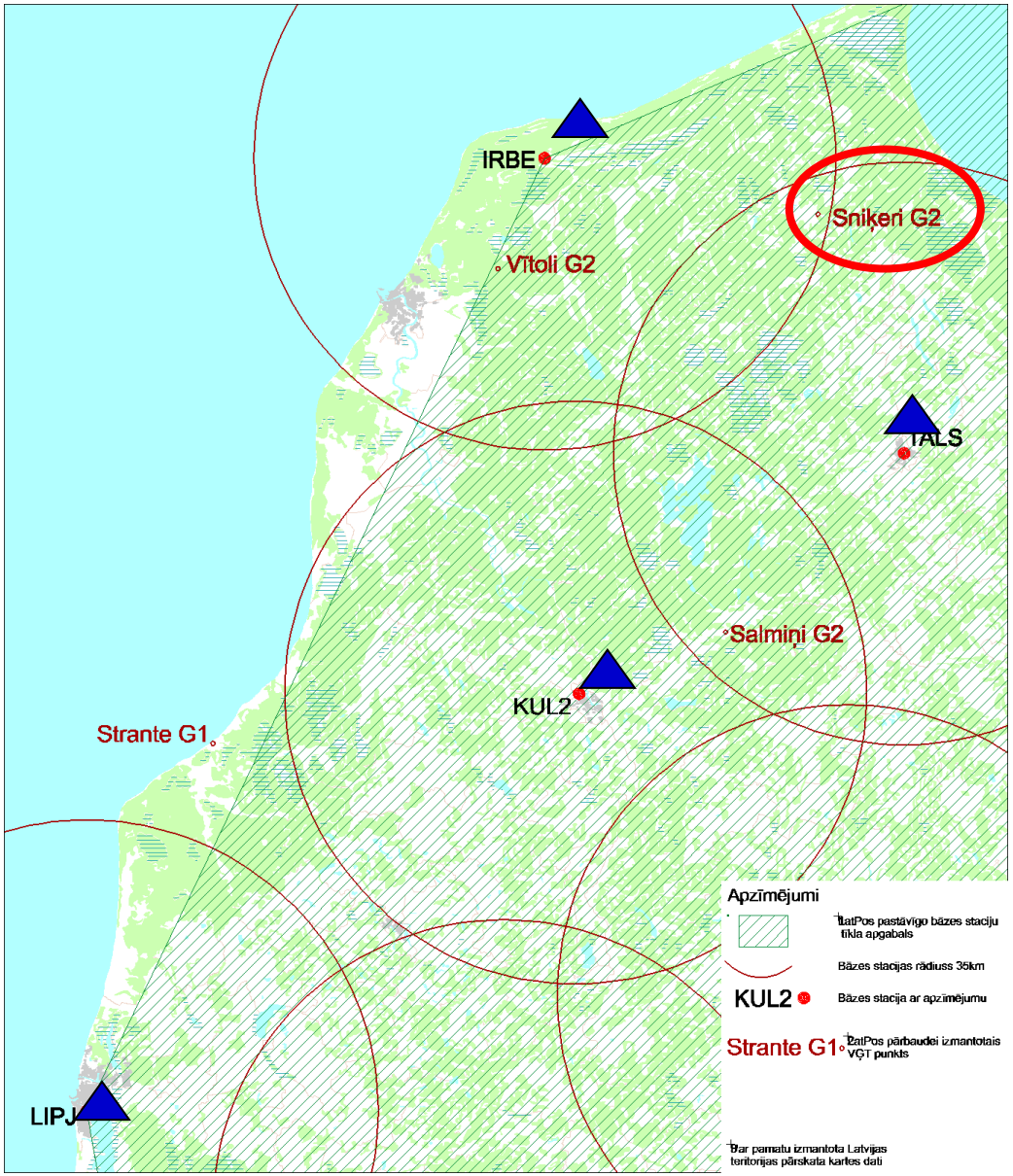
LatPos operational tests

- Year 2017
- G2 point Snikeri



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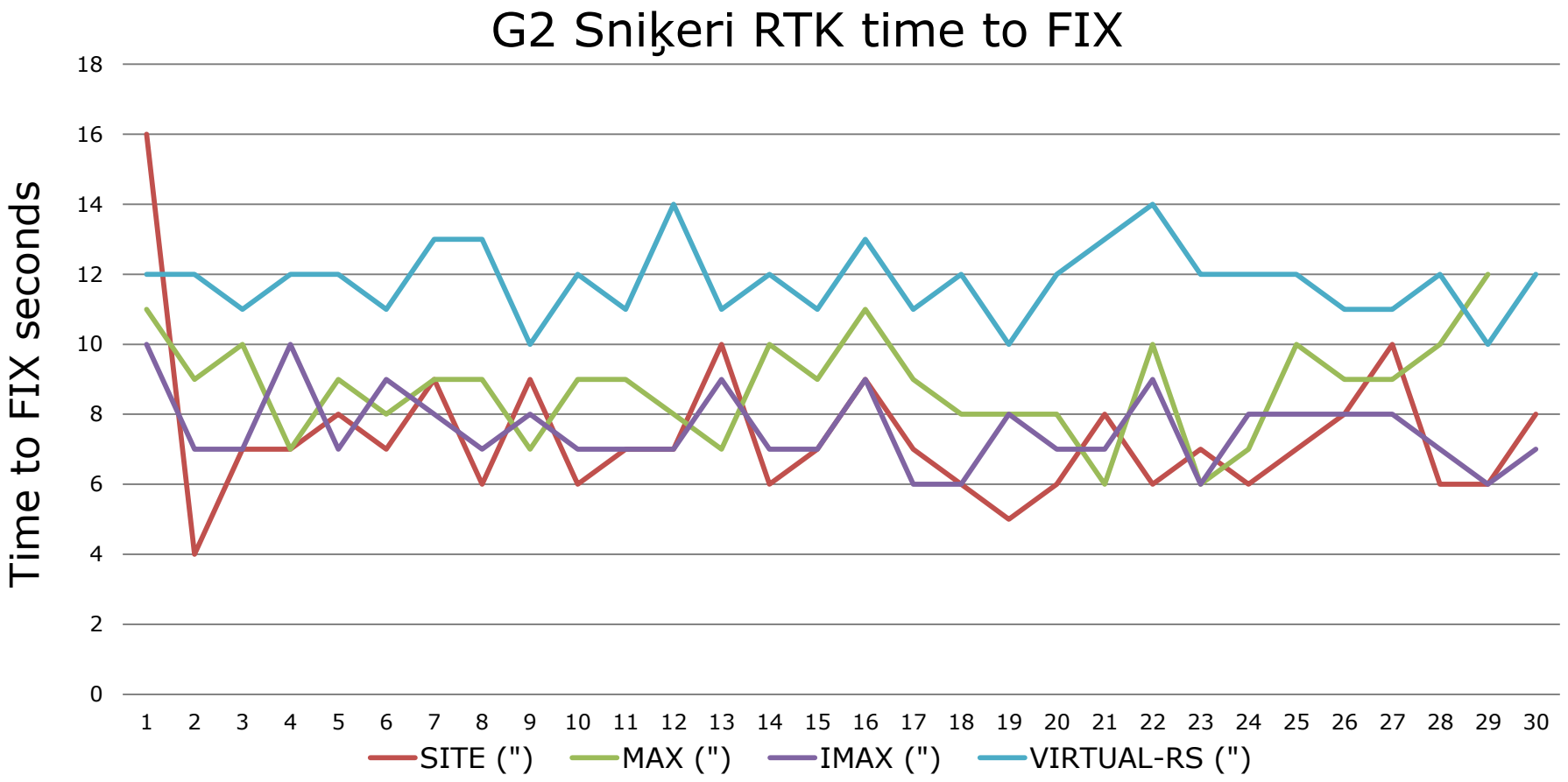
LatPos operational tests



LatPos operational tests

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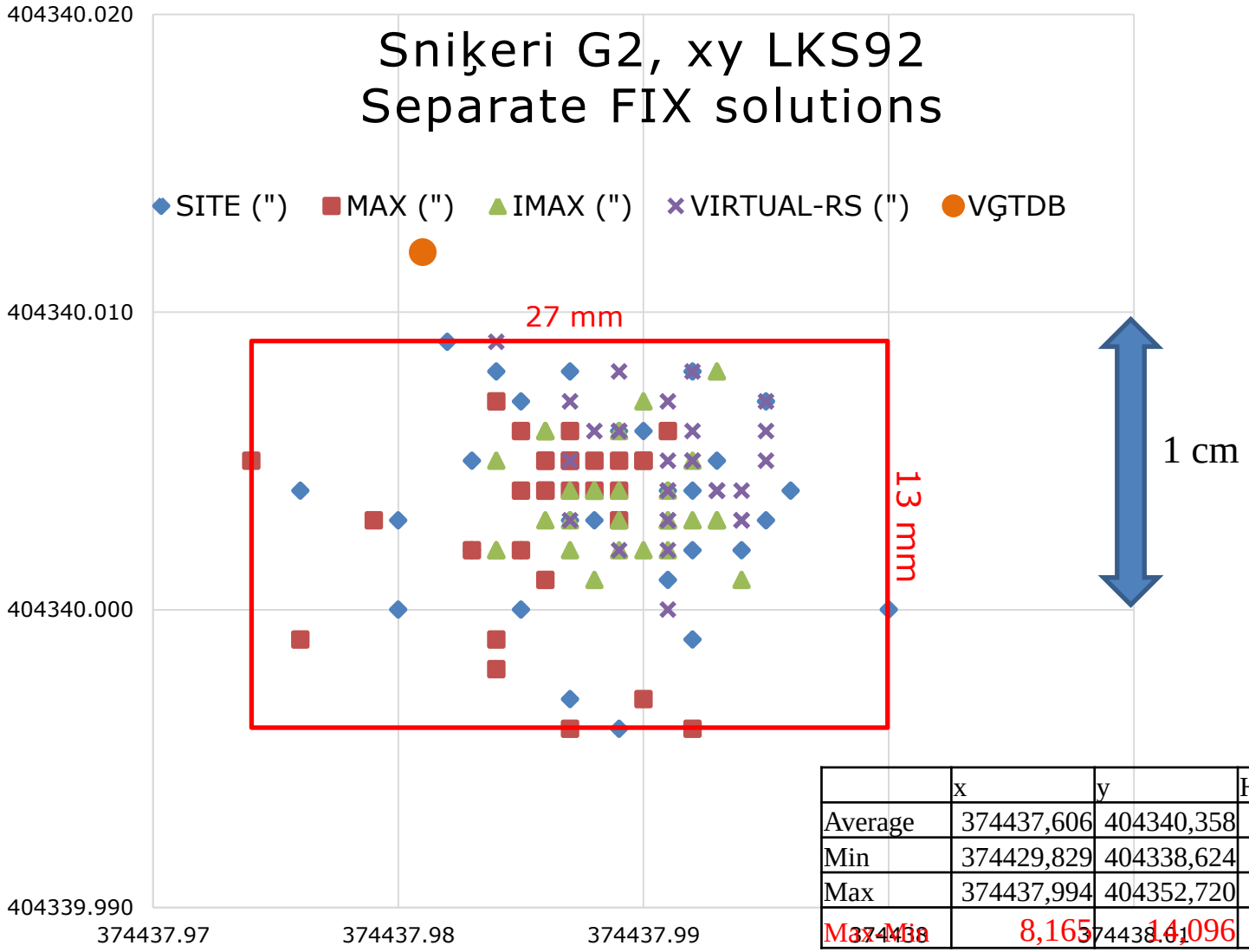

	x	y	H
Average	374437,606	404340,358	80,626
Min	374429,829	404338,624	80,217
Max	374437,994	404352,720	80,653
Max-Min	8,165	14,096	0,436

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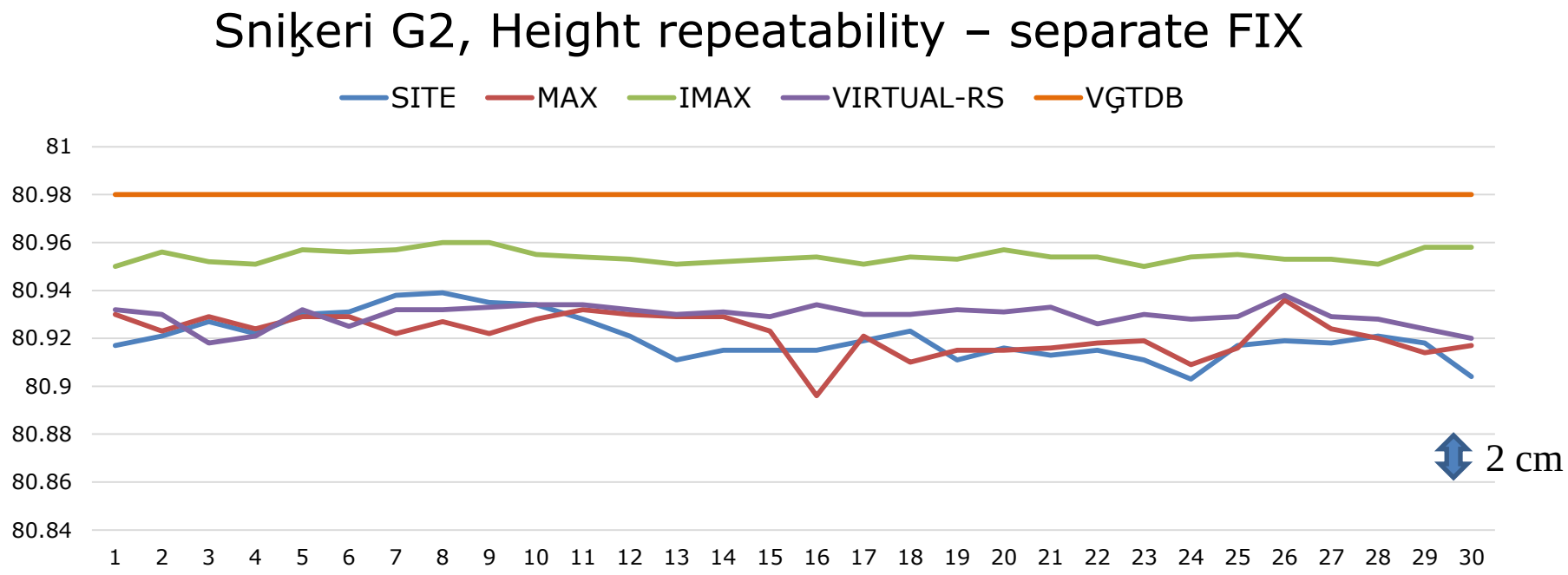
LatPos operational tests

- Separate fixation
- Fix solution obtained about 15 meters from benchmark



- Measurement count
- Time span – more than one hour

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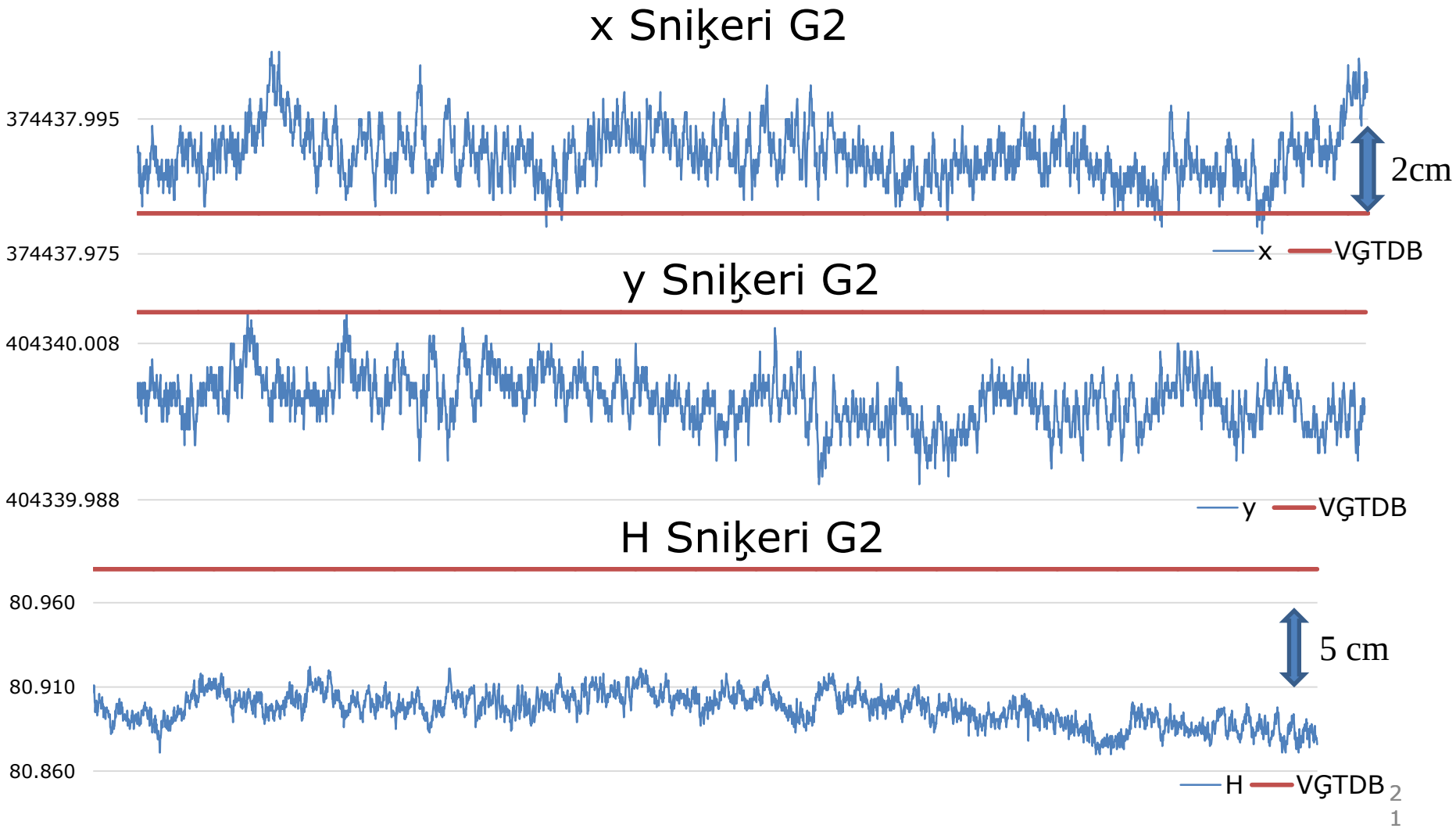
LatPos operational tests

1 hour Session



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LatPos operational tests

RMS improvements

Year, Point	σ x, m	σ y, m	σ H, m
2014, G2 Valteri	0,011	0,007	0,019
2015, G1 Rūjiena	0,011	0,007	0,021
2016, G2 Vižuļi	0,006	0,005	0,013
2017, G2 Sniķeri	0,008	0,006	0,016

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LatPos Live View

- Are User name already used?
- Rover has been connected to LatPos?
- Supervisors – better work planning!

Live Usage

Total: 36, Fixed (Network): 11 (30%) , Fixed (Single Base): 6 (16%)

Search Rovers

Pin	No.	NMEA Quality	Fixing Status	User Name	Rover User Name	Duration	Last Received	Satellites Ref./Rover	RTCM Ref. Stn. ID	NMEA Ref. Stn. ID	Distance
☐	1		Fixed (Network)	GEOEKORI2	Zeps Ilmars	0:09:10	14:25:02	15/12	REZ1-0038	38	21.40 km
☐	2		Fixed (Single Base)	GEOFOREST	Bruveris Vilnis	2:02:17	14:25:04	18/14	DAU1-0041	41	2.55 km
☐	3		Fixed (Network)	GEOPRO	Siugals Armands	0:04:32	14:25:00	13/11	0944 (PLSM)	-	10.40 km
☐	4		Fixed (Network)	MTMERN	Tuomas Sentis	0:01:31	14:24:59	15/15	0945 (KUL2)	945	19.22 km
☐	5		Fixed (Single Base)	AEC	Kikuts (1) Imants	2:47:04	14:24:57	17/14	BALV-0043	43	4.65 km
☐	6		Not fixed	BINDERS	Volfs (2L) Lauris	1:06:23	14:24:46	19/0	OJAR-0037	-	6366.83 km
☐	7		Fixed (Network)	AUZINAS1	Galzons (2) Aigars	0:10:20	14:25:02	15/11	OJAR-0037	37	5.48 km

LOG file picture

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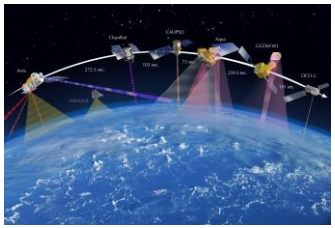
LatPos in future 2020

2018 LatPos free of charge



2018 All system NAVSTAR, GLONASS, GALILEO, BeiDo corrections from seperate base stations

2019 -2020 System upgrade to new equipment

2020. Provide all GNSS corrections.

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Innovative solutions in Geomatics

1862
RIGA TECHNICAL UNIVERSITY

New Course includes:

- Computer graphics in Geomatics
- Fundamentals of Land Management
- Global Positioning Systems
- Digital Terrain Models
- Local Geodetic Networks
- Geodetic Laser Scaninng
- Remote Sensing Methods
- Building Information System

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Thank You for Your attention!

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