

Realization of EUVN densification project in the Republic of Croatia

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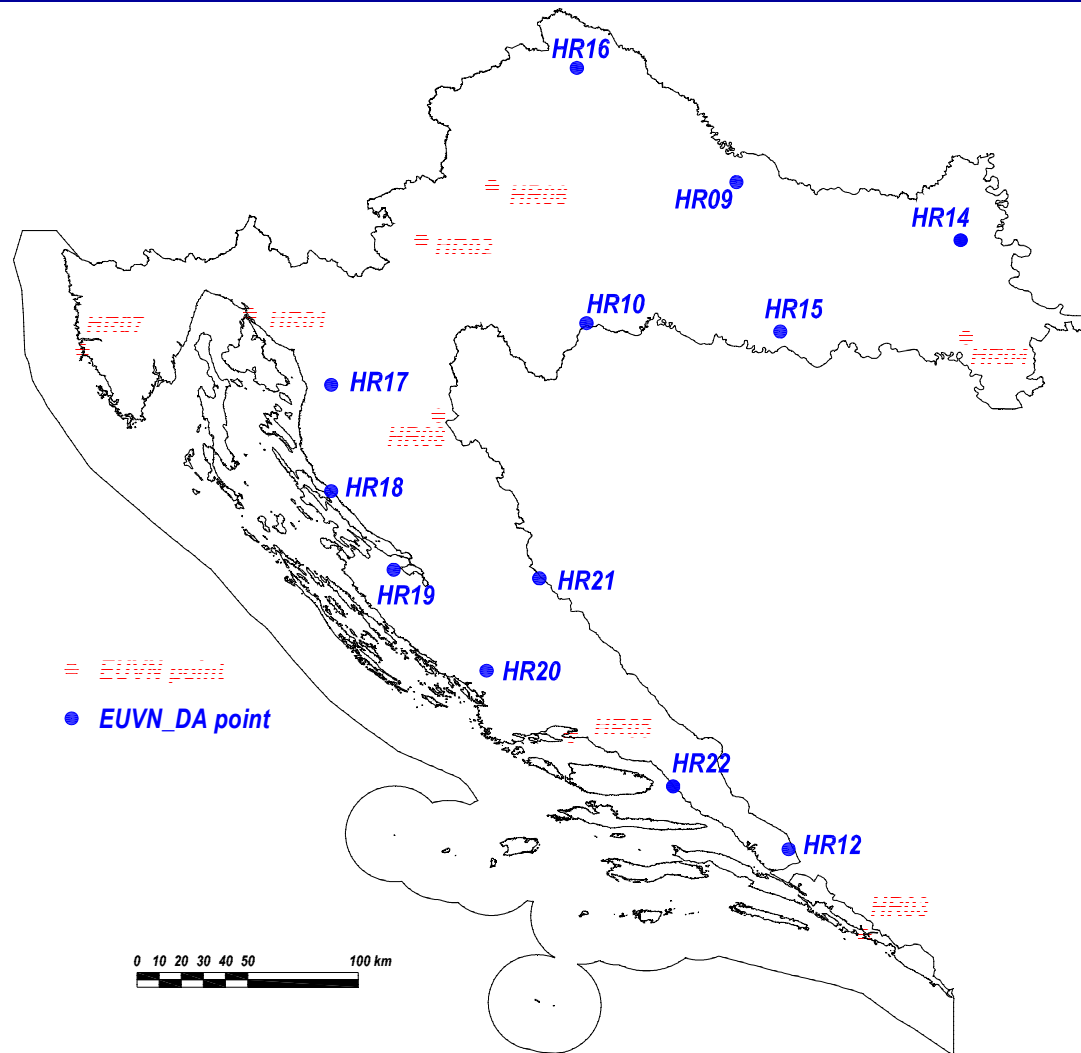
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Introduction:

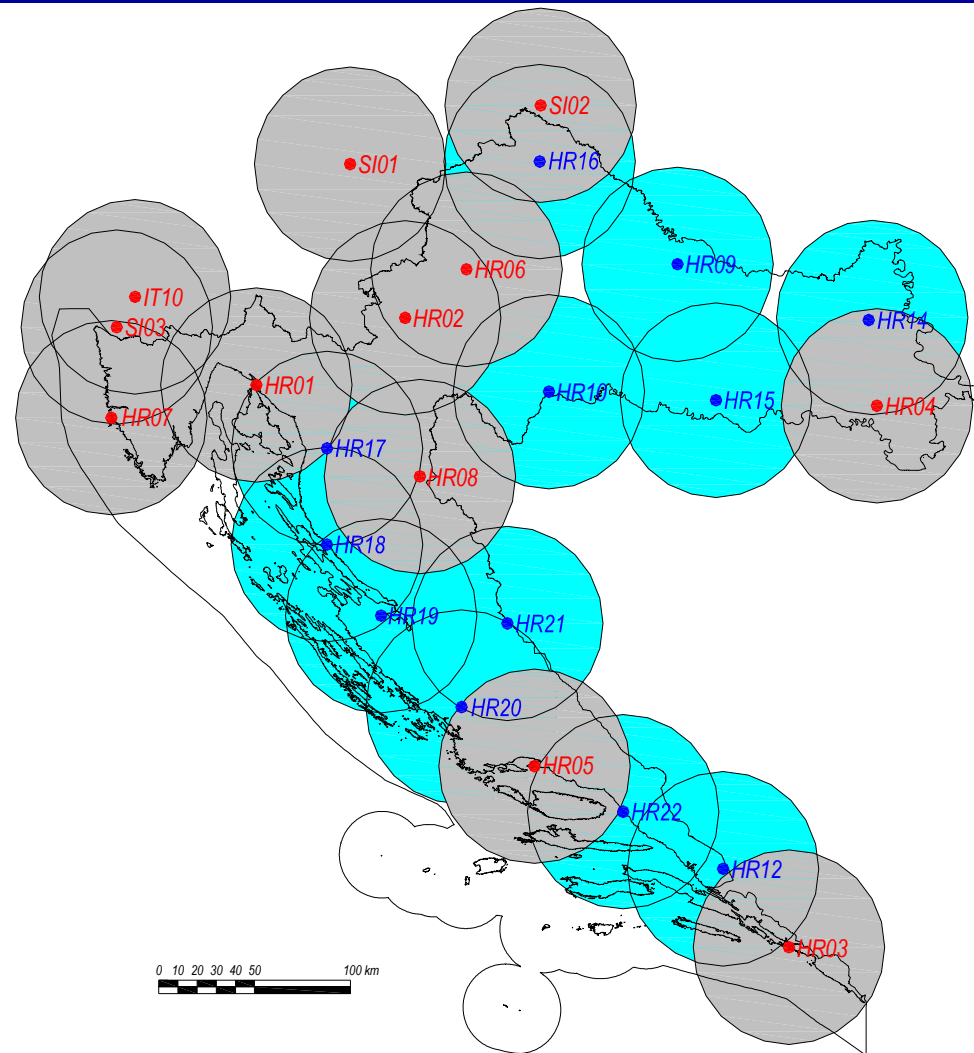
- Overview of old EUVN and new EUVN_DA points**
- Field works: GPS, gravimetric and precise levelling measurements,**
- Control measurements on the old EUVN points,**
- Correcting old EUVN points with big errors,**
- Checking quality of EUVN and EUVN_DA points using European EGG97 and Croatian national geoids.**

EUVN and EUVN_DA characteristics

- **Croatia has 8 EUVN points established in 1997,**
- **EUVN points do not homogeneously cower Croatia,**
- **Indications that big errors ($<0,5$ m) occurred on two EUVN points (comparison with EGG97),**
- **EUVN_DA project - 12 new points,**
- **Croatia is homogeneously covered with points.**



EUVN points and EUVN_DA points



Points overleaping (R=50 km)

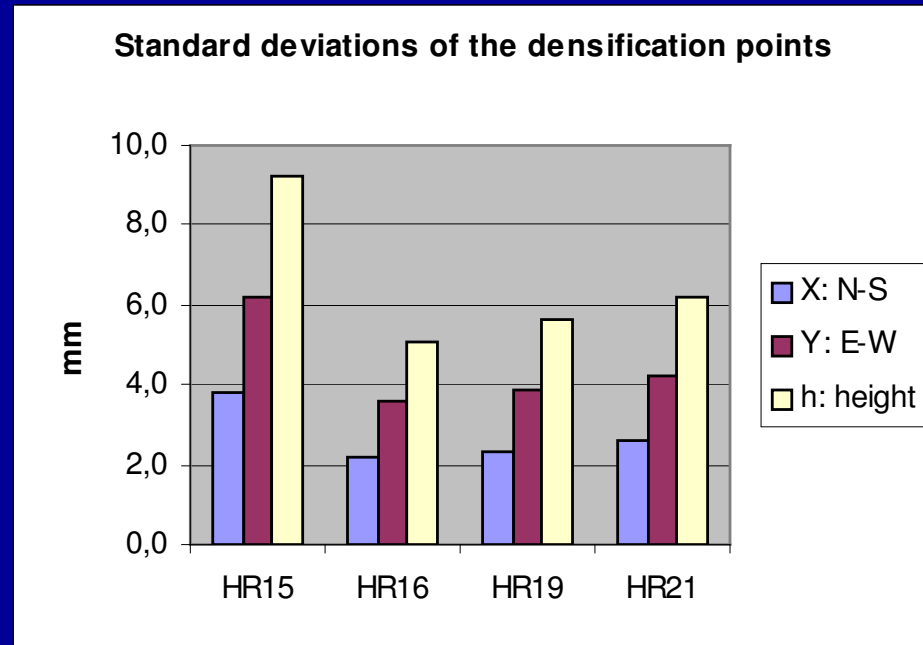
GPS MEASUREMENTS



- Trimble R7, Zephyr Geodetic L1/L2 antenna,
- 24 hours, 15° elevation mask

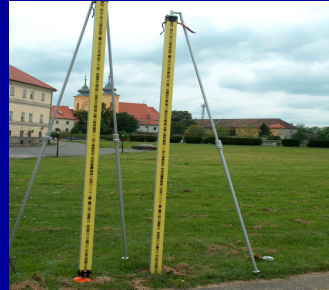
GPS data processing:

- Bernese GPS software and
- Trimble Total Control software



Standard deviations of the
adjusted coordinates

LEVELLING



Digital level Leica NA3003

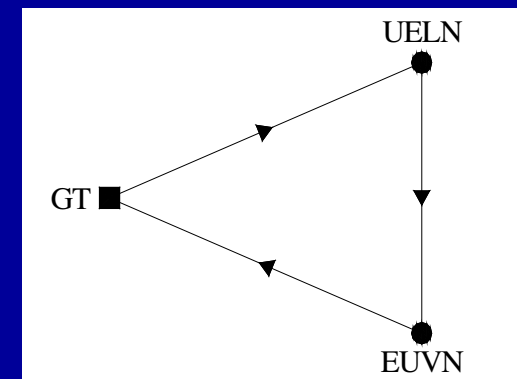
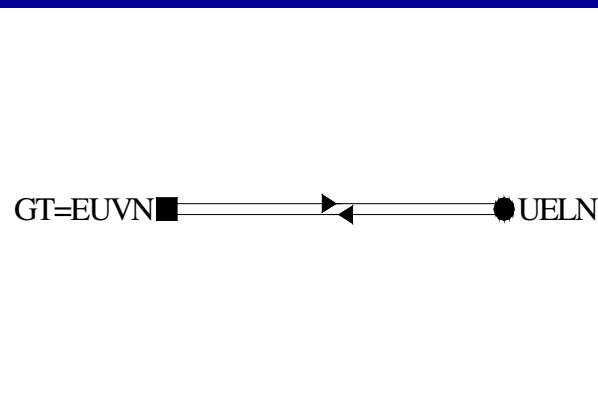
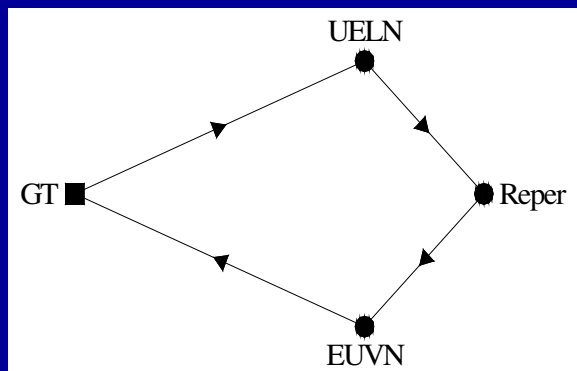
EUVN point	Distance [km]	Max. specified differences [mm]	ΔH [m]	St. deviation [mm]	H-benchmark HVRS71 [m]	H-EUVN point HVRS71 [m]
HR01 Bakar	1.327	4.6	0.72125	0.25	136.9799	137.70115
HR05 Split	0.235	1.9	1.84680	0.30	3.2516	5.09840
HR07 Rovinj	0.050	0.9	4.86265	0.15	4.8377	9.70035
HR12 Metković	0.932	3.9	8.05765	0.45	52.0765	60.13415
HR14 Osijek	0.874	3.7	-4.54160	0.60	91.5521	87.01050
HR15 Nova Kapela	0.035	0.7	-1.22500	0.00	123.5145	122.28950
HR16 Štefanec B.	1.044	4.1	-0.26230	0.20	162.4581	162.19580
HR18 Karlobag	0.050	0.9	-1.72130	0.10	3.2081	1.48680
HR20 Mandići	0.050	0.9	-0.52985	0.05	171.9329	171.40305
HR21 Strmica	0.200	1.8	0.08340	0.10	362.3857	362.46910
HR22 Makarska	0.927	3.8	8.13850	0.40	3.7274	11.86590

Adjusted data and achieved accuracy

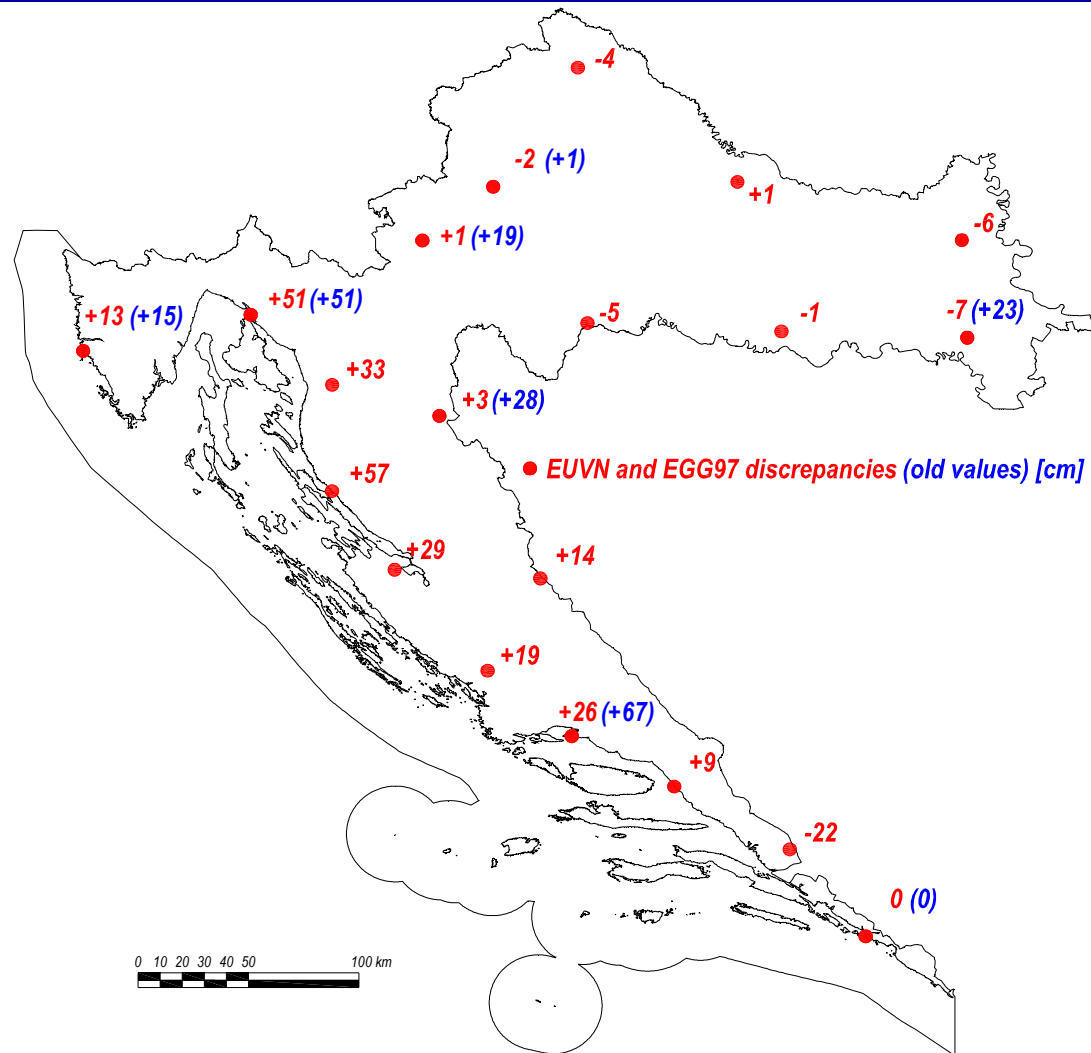
GRAVIMETRY



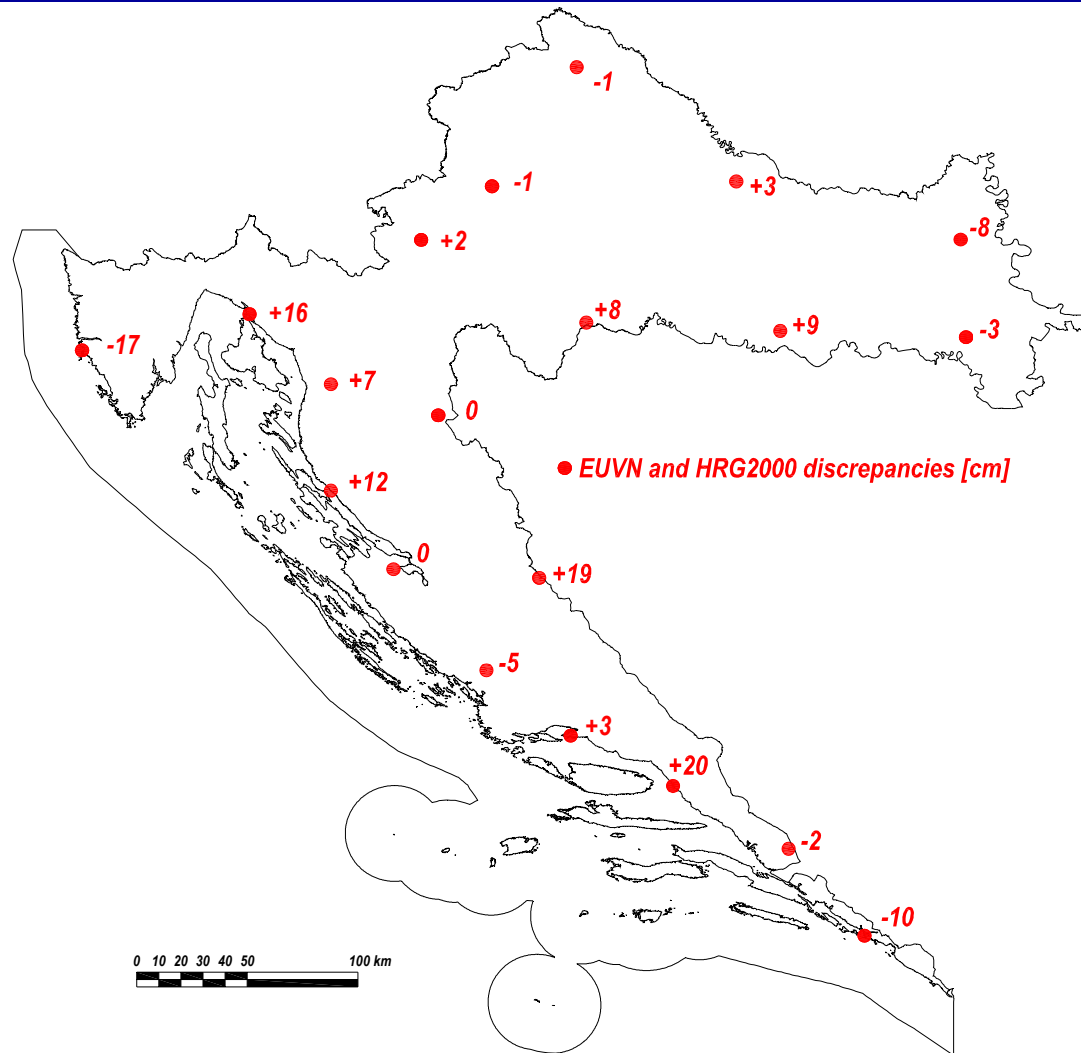
- Two Scintrex CG-3M gravimeters
- Gravimeters calibration
- Micro gravimetric networks



Micro gravimetric networks



Differences of the EGG97 and EUVN undulations



Differences of the HRG2000 and EUVN undulations

Conclusions

- Total number of EUVN sites in Croatia is expanded from 8 to 20,
- EUVN points now homogeneously cover Croatian territory in distances of about 75 km,
- One old EUVN point with big error is corrected,
- Checking of quality of EUVN points using European EGG97 and Croatian national HRG2000 geoids are indicating better agreement with Croatian geoid,
- Croatia is successfully continuing to contribute to EUVN (EUVN_DA) project.