



UNITED NATIONS  
Office for Outer Space Affairs

## **United Nations /Latvia Workshop on the Applications of Global Navigation Satellite Systems**

Organised jointly by  
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### **Abstracts**

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Geodynamical observatory Riga carried out optical and later photo observations of Artificial Earth Satellites since launch of the first satellite in October 4, 1957.

Regular satellite laser ranging (SLR) started in 1989 and permanent GPS receiver was installed in 1996. Now station Riga is a member of EUREF Permanent Network (EPN), International GNSS Service (IGS) and International Laser Ranging Service (ILRS) networks. This paper discusses present station state and eventual future developments including modernization of SLR and GNSS systems and adding additional geodetic measurement techniques.

### Latvia

#### On the height component for GNSS positioning

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The accuracy of height component in GNSS positioning is most sensitive issue comparing with the positioning in plane coordinates only. On the basis of Riga city levelling network control the height component determination using GNSS technique has been examined.

Last 2<sup>nd</sup> order levelling campaign in Riga city was performed at 1975-77. Mainly negative vertical movement was discovered at several places comparing with the levelling results of 1949-54. There were no levelling networks controlled nor developed in Riga city after 1977. However, the high accuracy levelling network is still important for many civil engineering tasks and for geodetic and geophysical research as well. Application of Global Navigation Satellite Systems (GNSS) in geodesy discovers a powerful tool for the verification and validation of the historically long time ago established geodetic levelling benchmarks. Both the differential GNSS static and RTK methods appears very useful to identify the deformation of levelling networks.

However, the key issue for GNSS applied height determination is the availability of high quality geoid model. The European Space Agency (ESA) achievements in GOCE mission are very promising for the future National geoid model improvement. Acquired ground based gravimetric and GNSS/levelling data will be very useful for this purpose.

Additionally at the Institute of Geodesy and Geoinformation, University of Latvia, the digital zenith camera for vertical deflection is under development now. There is a reasonable grounds to believe that application of zenith camera will accelerate the geoid model improvement in Riga and its surroundings.

The control measuring campaign using *EUPOS*<sup>®</sup> – *Riga* RTK network has been carried out recently. Preliminary results has discovered a land downlift at the bank of Riga Bay and on several other places. The additional test measurements are planned for summer 2012. The results of the GNSS based control results obtained till now will be reported.

### Latvia

#### Attractiveness of GNSS in education

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Due to rapid development of GNSS technologies we meet receivers of such kind more often and it is more common not only in scientific part, but as well as in household conditions. Nowadays GNSS devices have been become integral part of our life. Each person has had experience with receivers to measure geodetic coordinates or determine his location, for example, using possibilities of mobile phone with implemented GPS options, mobile GIS, etc.