

## 2<sup>nd</sup> CROPOS Conference held

**The State Geodetic Administration and the Faculty of Geodesy of the University of Zagreb, in cooperation with the Croatian Chamber of Licensed Geodetic Engineers and Croatian Geodetic Society, organized the 2<sup>nd</sup> CROPOS Conference, held on 8 April 2011 at the Faculty of Geodesy of the University of Zagreb, Kačićeva Street 26.**

With only two years in operation, the CROPOS system has become an inevitable positioning service in the performance of the daily tasks of not only the geodetic and cadastral system but also the wider community. The reason is, first and foremost, high reliability and quality of services enabling the user to perform field surveys in a simpler and more economical way. In late March 2011, the number of registered users amounted to 348 companies. In total, 897 user licenses were issued for three CROPOS services: DPS, VPPS and GPPS. The greatest number of licenses (478) was issued for the VPPS service, as can be seen from the fact that the users are using the system up to 8,000 hours a month. Furthermore, the CROPOS system has been upgraded by the new VPPS on-line transformation service (CROPOS\_VRS\_HTRS96/TM), that enables the measurements in new, official geodetic datums, launched on 3 January 2011. This year, the users will be able to use also the second VPPS on-line transformation service (CROPOS\_VRS\_HDKS) containing the new, unified transformation model. The introductory lectures on the CROPOS current status and the new on-line CROPOS services were held by the Assistant Director, Mr. Marinko Bosiljevac, and the Department Head, Marijan Marjanović, Ph.D., from the State Geodetic Administration.



This has all contributed to the fact that over 400 participants, experts and representatives of economic and public bodies gathered at the 2<sup>nd</sup> CROPOS Conference. By exchanging the Croatian and international experiences related to the permanent GNSS network operations and use, the objective of this Conference was to familiarize the geodetic and wider public with the implementation of the new, official geodetic datums

and plane cartographic projections of the Republic of Croatia as well as with the introduction and application of the T7D unique transformation model that was launched in official use on 31 March 2011, upon the decision by the Director-General. It enables the users to perform the daily tasks in a simpler and more effective way which extends the circle of users to an ever growing number of stakeholders of the geodetic and cadastral system as well as to other State administration bodies, public companies, economy and the public at large.



After the introductory words by the Chairman of the Organisational Board, Prof. Tomislav Bačić, Ph.D., from the Faculty of Geodesy, and the State Geodetic Administration Director-General, Prof. Željko Bačić, Ph.D., the Conference was honoured and opened by the Minister of Environmental Protection, Physical Planning and Construction, Mr. Branko Bačić, whose address announced options for applying the

positioning services in the State administration bodies and wider community. The Conference opening was attended also by high representatives of the State institutions of the neighbouring countries: Mr. Bence Toronyi, FÖMI Director, Mr. Predrag Femić, Head of the Real Estate Administration of Montenegro, Mr. Aleš Seliškar, Director of the Geodetic Administration of the Republic of Slovenia, Mr. Dragan Macanović, Deputy Director of the Republic Administration for Geodetic and Property-Rights Operations of the Republic of Srpska, and

Mr. Željko Obradović, Director of the Federal Bureau for Geodetic and Property Relations of the Federation Bosnia and Herzegovina.

Apart from the guests from the State geodetic and cadastral organizations of the neighbouring countries with which we successfully exchange the data of referential stations and apart from 30 Croatian GNSS stations, seven Slovenian, four Hungarian and two Montenegrin stations involved in the network solution and calculation of correctional parameters, the current status of permanent networks was presented along with the transformation models of the neighbouring countries: SIGNAL positioning system, Slovenian transformation model and BiHPOS system implementation.

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### *Conference Program*

#### *INTRODUCTORY LECTURES*

1. **Marinko Bosiljevac: CROPOS – two years later**
2. **Marijan Marjanović: Positioning – never easier or simpler in Croatia**

#### *INVITED LECTURES*

3. **Carine Bruyninx: Maintenance of the ETRS89 using EUREF's Permanent GNSS Network**
4. **Bojan Stopar, Oskar Sterle, John Weber and Marko Vrabec: The Role and Importance of GNSS for Geodynamics**
5. **Ana Karabatić: GNSS Meteorology – Use of GNSS Reference Station Data for Troposphere Monitoring**
6. **Volker Wegener: Globalization of GNSS Networks**
7. **Heiner Denker and Tomislav Bašić: The European Gravimetric Geoid EGG2008 and the Croatian Geoid HRG2009**

#### *PERMANENT GNSS NETWORKS AND DATUM TRANSFORMATIONS*

8. **Sandi Berk, Katja Bajec, Klemen Kozmus Trajkovski and Bojan Stopar: Status of the SIGNAL Positioning Service and Transformation between the Local and ETRS89 Coordinates in Slovenia**
9. **Darko Mišković and Nedžad Pašalić: BiHPOS Project implementation**
10. **Margareta Premužić and Marko Šljivarić: T7D user application**
11. **Mihajla Liker and Branka Vorel: Reverse transformation of Jalkovec CO in HTRS96/TM**
12. **Željko Hećimović: System of coordinates, referential system and referential framework for the new system of positional determination in Croatia.**

#### *CROPOS PRACTICAL APPLICATION – USER EXPERIENCES*

13. **Marko Pavasović, Željko Bačić, Milan Rezo, Olga Bjelotomić, Danko Markovinović and Tomislav Bašić: Analysis of the time-independent signals in CROPOS network**
14. **Ilija Grgić, Maro Lučić, Ivan Malović, Davor Kršulović and Tomislav Bašić: Statics or VRS?**
15. **Danko Markovinović, Milan Rezo, Olga Bjelotomić, Marko Pavasović and Tomislav Bašić: Height control at GPS network points of the City of Zagreb by using the CROPOS VPPS service**
16. **Milan Rezo, Olga Bjelotomić, Marko Pavasović, Danko Markovinović and**

## **Tomislav Bašić: Comparison of leveled coordinates directly surveyed and CROPOS-generated**

### **17. Ivan Vojnović, Ivan Miljković, Danko Gjuretek and Tomislav Bašić: Measuring the preciseness of terrestrial and RTK-GNSS method of geodetic survey**



It was our great pleasure to observe the fact that, this year, the invited lectures were held by the following prominent experts from the field of the GNSS permanent station networks, geodynamics, GNSS meteorology and gravimetrics: Carine Bruyninx, Ph.D., from the Belgian Royal Observatory, who held a lecture on the status of European permanent GNSS network, Prof. Bojan Stopar, Ph.D., from the Faculty of Civil

Works and Geodesy of the University of Ljubljana, with the lecture on the role and importance of the GNSS in the geo-dynamic research, Ana Karabatić, Ph.D., from the Institute for Geodesy and Geo-Physics of the Technical University in Vienna, who held a lecture on the options to use the GNSS reference station data in the GNSS meteorology, and the lecture on the GNSS network globalisation held by Mr. Volker Wegener from the Trimble company, Germany. Prof. Tomislav Bašić, Ph.D., from the Faculty of Geodesy, presented the paper entitled „European gravimetric and geoid EGG2008 and Croatian geoid HRG2009, co-authored by Heiner Denkerom, Ph.D., from the Institute for Geodesy of the Leibnitz University in Hanover.



Along the presented papers on the neighbouring permanent GNSS networks and datum transformation as well as the practical application of CROPOS, the Collection of Papers of the 2<sup>nd</sup> CROPOS Conference will publish over 20 scientific papers prepared for this Conference. All lectures were extremely well attended and stirred great interest in the geodetic and wider circles, given that the implementation of the new

datum and the transformation problem are closely linked to the user or rather improvements of the CROPOS system.

During the Conference, Minister Branko Bašić, and State Geodetic Administration Director-General, Prof. Željko Bašić, Ph.D., awarded honourable mentions to the following prominent individuals and geodetic administrations of the neighbouring countries for their special contribution to the GNSS technology development in Croatia and the improvement of the CROPOS system:



**Prof. Petar Krešimir Čolić, Ph.D., academician**

Prof. Petar Krešimir Čolić, Ph.D., academician, extraordinary scientist and promoter of the Croatian geodesy, certainly deserves the epithet of the pioneer of the mathematical and physical geodesy in Croatia. Among his numerous efforts as the leader of a number of scientific and specialist projects, it is necessary to emphasize CROREF94, CROREF95 and CROREF96, linking Croatia to the European referential network and establishing the basic preconditions for the introduction of the new referential system. By implementing the project of absolute gravimetric surveys under his leadership, the foundation was laid to define and establish the gravimetric referential system of Croatia.



**Prof. Tomislav Bašić, Ph.D.**

Prof. Tomislav Bašić, Ph.D., authored the scientific study entitled “Proposal of the New Official Positional and Gravimetric Datum of RoC”, thus giving a special contribution in the field of defining the new Croatian referential system. Apart from this, he is the author of the joint levelling of the GNSS network of 2<sup>nd</sup> order and the study entitled „Base Geo-Magnetic Network of RoC“. Under his leadership, gravimetric surveys were implemented and processed the the gravimetric network of 1<sup>st</sup> order established. His scientific efforts in the field of datum transformations and geoid model definition led to the development of a unified transformation model for Croatia which resulted in the new CROPOS services.



**Prof. Nevio Rožić, Ph.D.**

Prof. Nevio Rožić, Ph.D. co-authored the scientific study entitled „Proposal of the New Official Altitude Datum of RoC”, thus giving a special contribution to the field of defining the new Croatian altitude referential system Since 2003, Prof. Rožić has paid special attention and interest to defining the relationships between altitude systems which has resulted in the Croatia transformation altitude model integrated into the unified transformation model. Apart being active at the Faculty of Geodesy, his extraordinary energy and persistence as well as his involvement as the first director of the Croatian Geodetic Institute gave an extraordinary impetus to the development of the Croatian geodesy and the establishment of the CROPOS system.



REPUBLIKA SLOVENIJA  
MINISTRSTVO ZA OKOLJE IN PROSTOR  
GEODETSKA UPRAVA REPUBLIKE SLOVENIJE

**Geodetic Administration of the Republic of Slovenia**

In order to increase the quality and reliability of the CROPOS system in the borderline north-western part of Croatia, the previous, good cooperation between the State Geodetic Administration and the Geodetic Administration of the Republic of Slovenia had continued so the Agreement on Data Exchange between Borderline GNSS Stations of CROPOS and SIGNAL Networks had been signed at the first CROPOS conference in 2009. Thus, the number of the CROPOS network stations increased by 7 stations whereby the State Geodetic Administration ensured for the CROPOS system users better coverage, reliability and accuracy of measurements in borderline areas.



### **Branimir Gojčeta, graduate geodetic engineer**

Branimir Gojčeta assumed the position of the State Geodetic Administration Director-General in the most critical moments of Croatia gaining its independence. Keeping abreast with what was happening in the European countries in early 1994, he passed the decision of Croatia accessing the European referential model. Under his leadership, the cooperation with respectable European institutions was established, especially with the German Institute for Applied Geodesy that assisted in the successful organization and implementation of the GNSS surveying campaigns that connected us to the EUREF network. That created the basic preconditions for the introduction of the new referential system in Croatia and the subsequent CROPOS establishment.



### **Volker Wegener, graduate engineer**

Volker Wegener, graduate engineer and long-standing Director of the SAPOS Head Office in Hanover, today the director of Trimble VRS-Now, was personally involved as a consultant in the CROPOS system establishment and unselfishly conveyed the experiences of German colleagues related to the establishment, daily functioning and maintenance of the permanent GNSS system in Germany and Europe. His personal involvement in the production and final shaping of the CROPOS project contributed to the latest and best technological solutions being integrated into CROPOS, which is of great importance for the reliable and accurate work of the system as achieved today by CROPOS.



### **Zlatko Medić, graduate geodetic engineer**

Mr. Medić, graduate geodetic engineer and Assistant Director-General, worked as the Head of the Basic Geodetic Operations Department at the State Geodetic Administration between 1992 and 2000 and was directly responsible for organizing and implementing the first GNSS surveying campaigns: CROREF94, CROREF95 and CROREF96. He contributed to its successful realization with his extraordinary personal involvement and ensured, through the international cooperation, the preconditions for further surveying result processing i.e. the final network levelling, which is a precondition for subsequent works in determining the Croatian referential system and the subsequent CROPOS system establishment.



### **Institute for Geodesy, Cartography and Remote Sensing of the Republic of Hungary**

In order to increase the quality and reliability of the CROPOS system in the borderline North-Eastern part of Croatia, good cooperation had been established between the State Geodetic Administration and the Institute for Geodesy, Cartography and Remote Sensing of the Republic of Hungary so the Agreement on Data Exchange between Borderline GNSS Stations of CROPOS and GNSSnet.hu Networks had been signed at the first CROPOS conference in 2009. Thus, the number of the CROPOS network stations increased by 4 stations whereby the State Geodetic Administration ensured for the CROPOS system users better coverage, reliability and accuracy of measurements in borderline areas.



### **Real Estate Administration of Montenegro**

Good cooperation between the State Geodetic Administration and Real Estate Administration of Montenegro has significantly contributed to the quality and reliability of the CROPOS system in the south of Croatia. The Agreement on Data Exchange between Borderline GNSS Stations of CROPOS and MontePOS Networks had been signed at the first CROPOS conference in 2009. Thus, the number of the CROPOS network stations increased by 2 new stations whereby the State Geodetic Administration ensured a total of 43 stations for the CROPOS system users and also better coverage, reliability and accuracy of measurements throughout the territory of the Republic of Croatia.

Margareta Premužić/Marijan Marjanović/Maša Ećimović