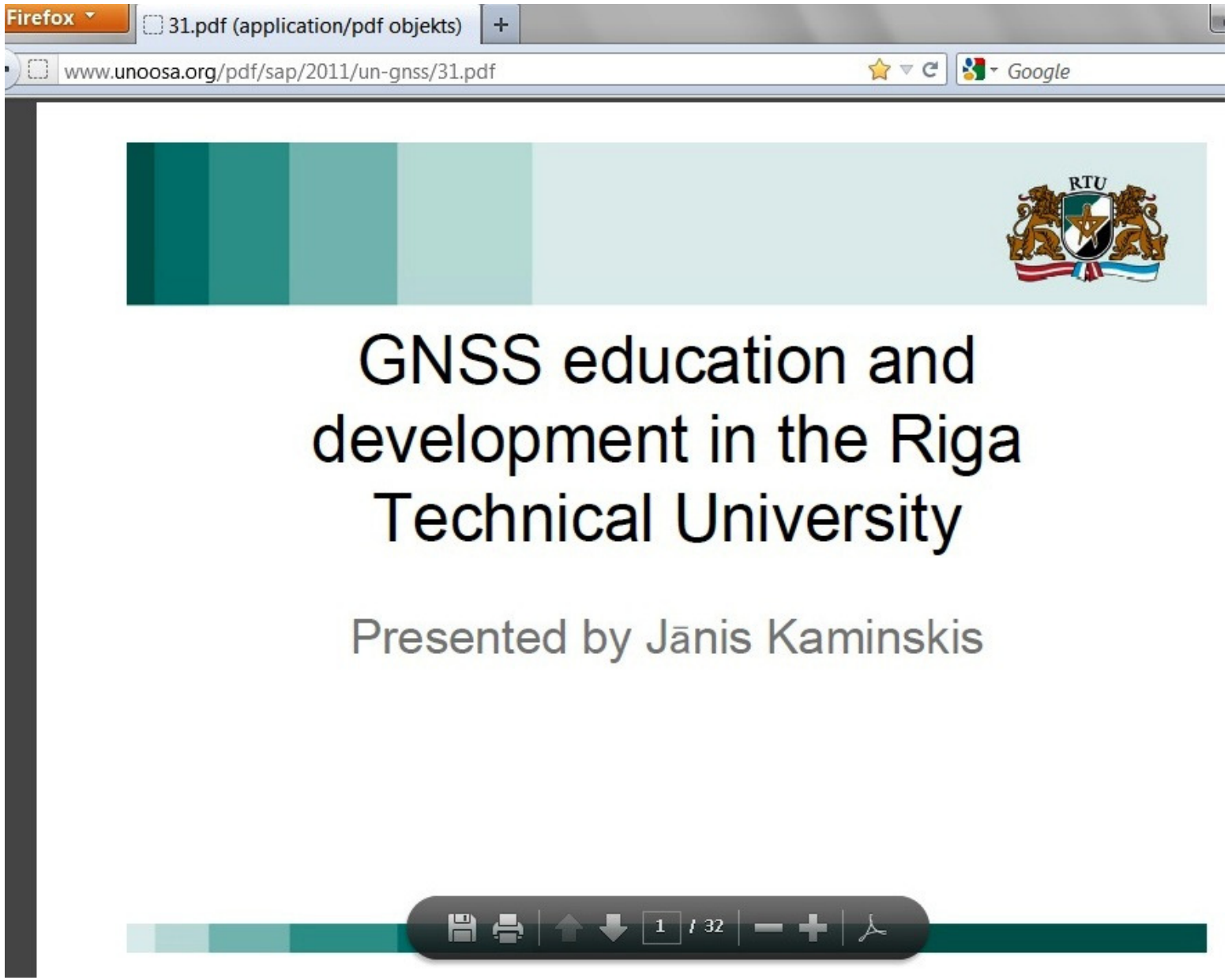
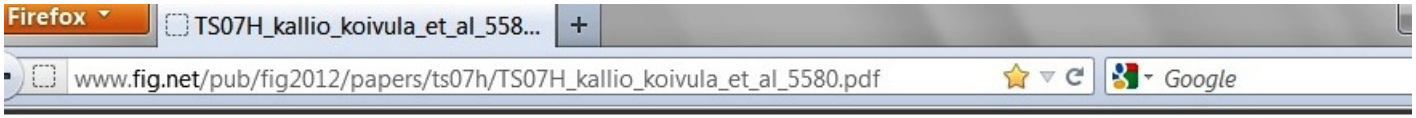
Attractiveness of GNSS in education

Presented by Jānis Kaminskis

Reference to previous presentation in Vienna about RTU/GNSS



Cooperation with FGI, Finland & RTU, outcome



THIS IS A PEER REVIEWED PAPER
FIG Working Week 2012

GNSS antenna offset field test in Metsähovi

Ulla KALLIO, Hannu KOIVULA, Sonja NYBERG, Pasi Häkli, Paavo Rouhiainen, Veikko Saaranen, Finland
Zane Cirule, Didzis Dobelis, Vladimirs Golovka, Latvia

Key words: GNSS antenna offset, field calibration

SUMMARY

The phase center variation and the mean phase center of the GNSS antenna can be determined in the robot calibration. We have studied how well the offset values are valid in the field and the consistency between two sets of antennas of different type.

We measured 24 full 48-hour-sessions in our relative GNSS antenna field calibration test at Metsähovi fundamental station during three months in summer 2011. We chose the full roving observation strategy (Banyai 2005) and circulated nine Ashtech Choke Ring antennas without radome and eight Leica AR25 antennas with radome on three concrete pillars. Data were processed with Bernese GPS Software ver. 5.0 and offset estimation was coded using Octave software. In the Bernese processing we used the Geo++ absolute calibration offset values but in combining the 24 session solutions we still found significant antenna dependent

Novosibirsk, Russia – partner

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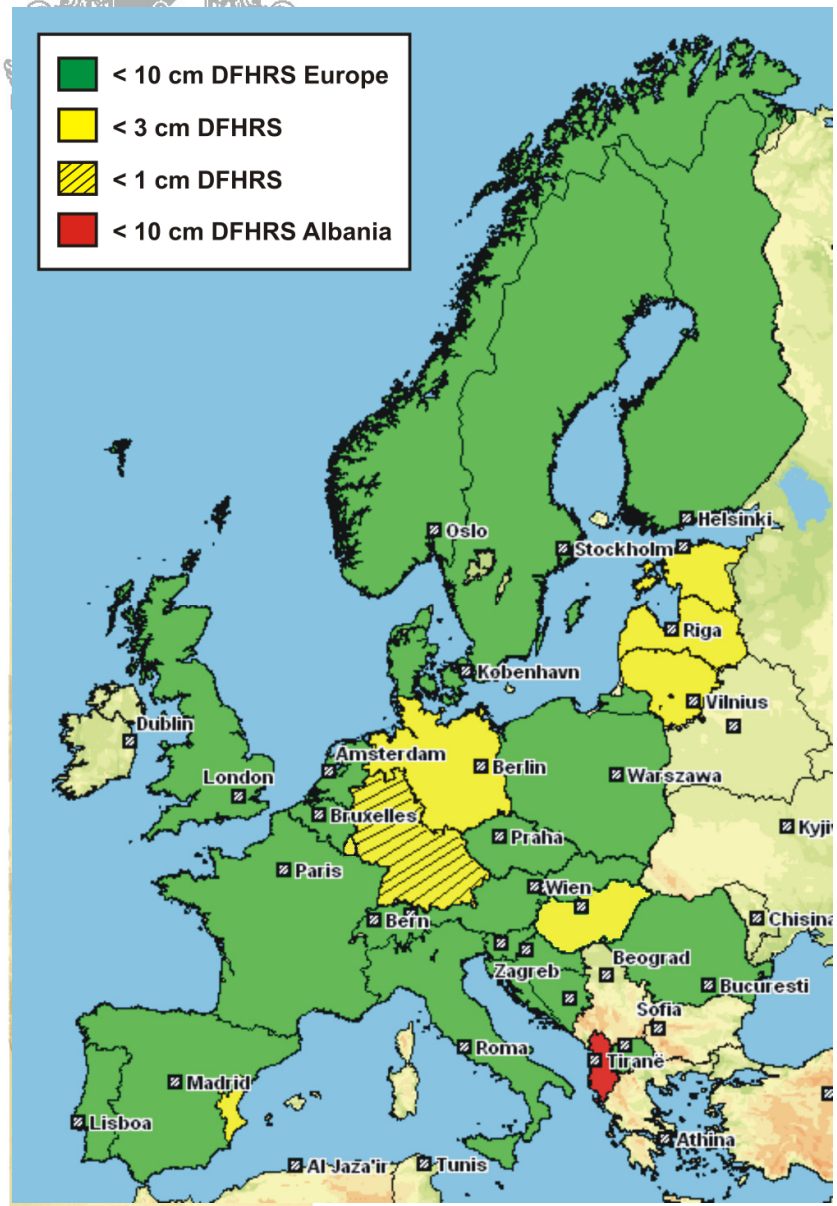
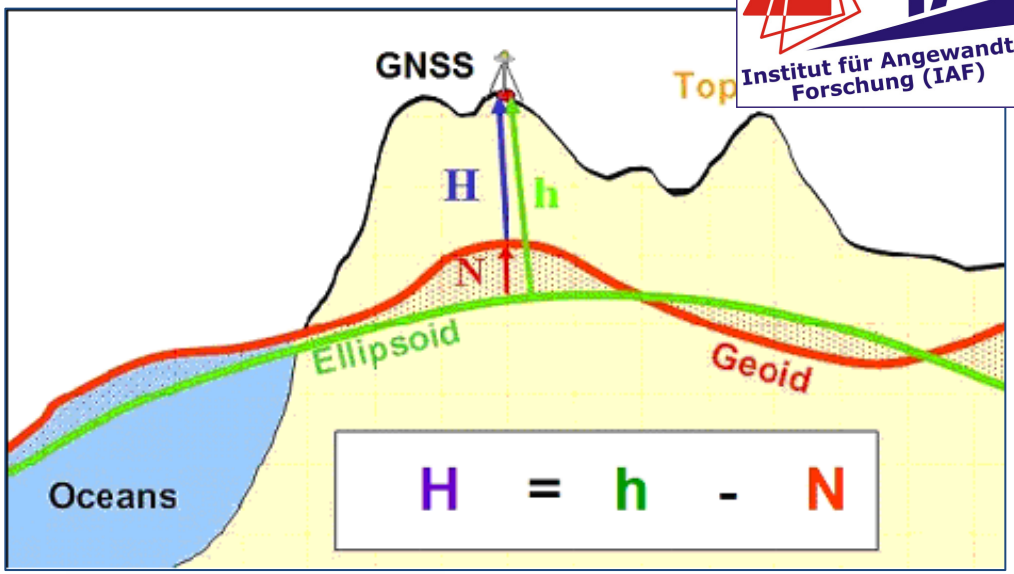
History behind, since 2001, start from Riga

Continuation with Karlsruhe, HsKA





DFHBF - DataBase

$$N_G = N_{QG} + \frac{\bar{g} - \bar{\gamma}}{\bar{\gamma}} \cdot H$$

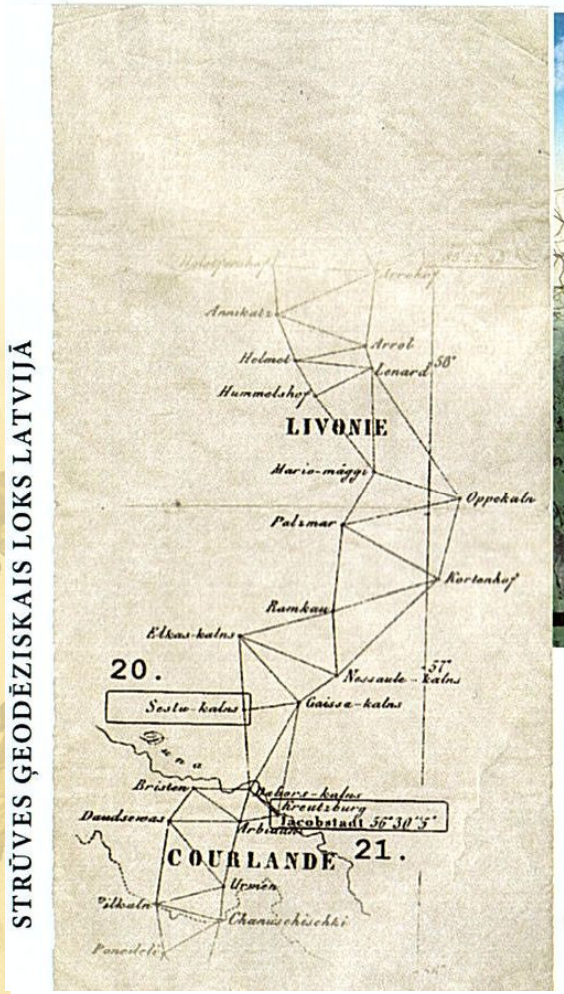
Quasi-Geoid N_{QG} Quasi-Geoid N_G

Next time to meet in Riga at the Conference & Congress in October 11-12; 2012

Service in Latvia for GPS monitoring and control

Service in Latvia for video and temperature monitoring

STRUVE arc memorial post stamp with envelope; May 2011



STRŪVES ĢEODĒZISKAIS LOKS LATVIJĀ

Paldies par sadarbību

A. Golovanova

12.05.2011

PDA

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05.04.2012 № 5-2-2/2630

На № _____ ад _____

Invitation
to the Struve Arc Coordinating Committee Meeting

Dear Colleagues!

It is a great pleasure and honor for me to invite you to the Struve Arc Coordinating Committee Meeting which will take place in Minsk and in the town of Ašmiany, the Republic of Belarus on 3-5th July, 2012.

The official members of the Struve Arc Coordinating Committee Meeting are presumed to participate as well as representatives of national cartographic and geodetic agencies and other organizations. The meeting will allow to share the latest information on the outstanding memorial inscribed on the UNESCO List of World Heritage Monuments – Struve Geodetic Arc and also reevaluate and confirm its unique importance in preservation of world cultural values.

Attaches:

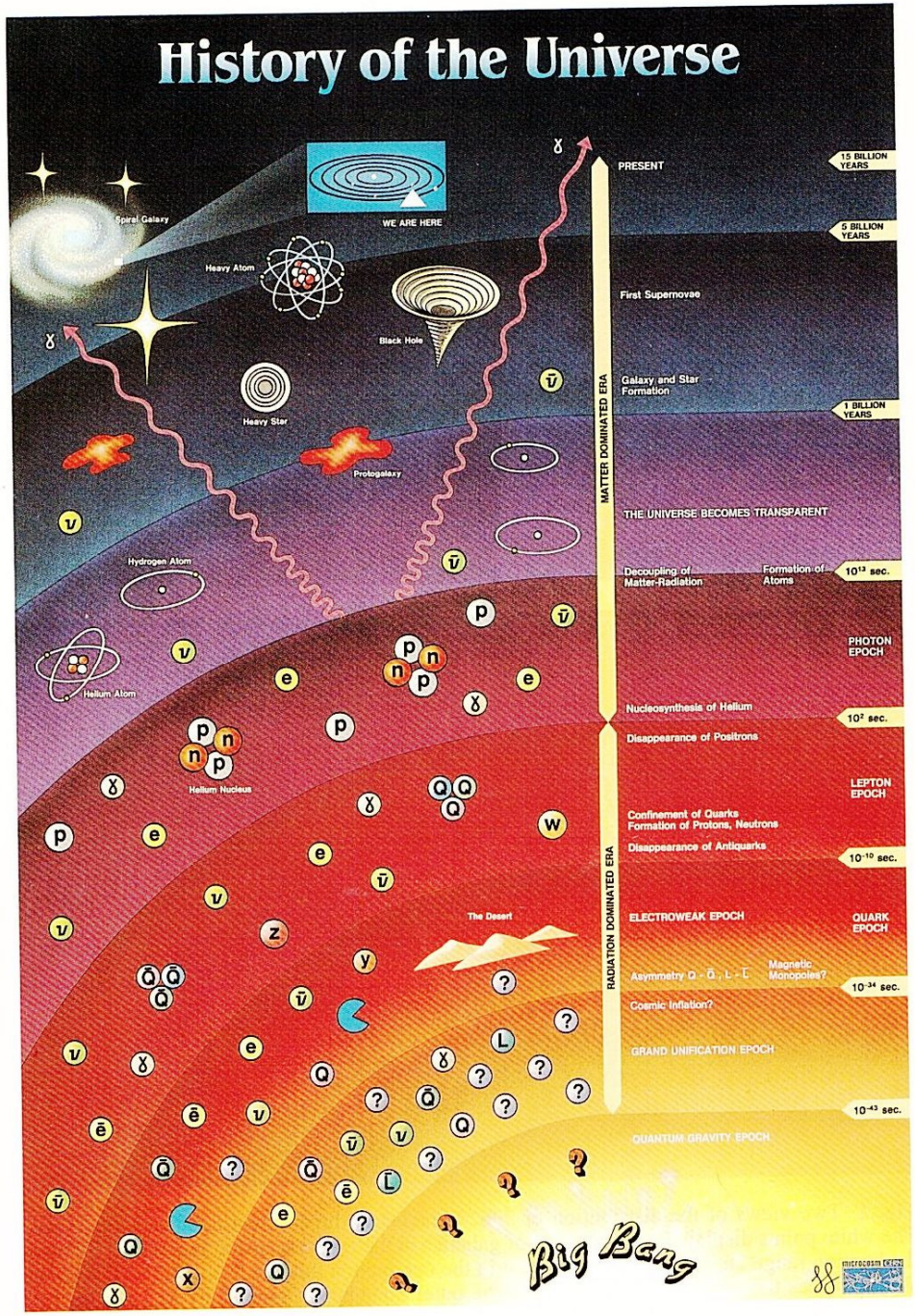
1. Registration form;
2. Program of the Meeting;
3. Brief information about the Meeting venue.

Yours sincerely,

Chairman of the State Committee on Property of the Republic of Belarus — Georgiy Kuznetsov

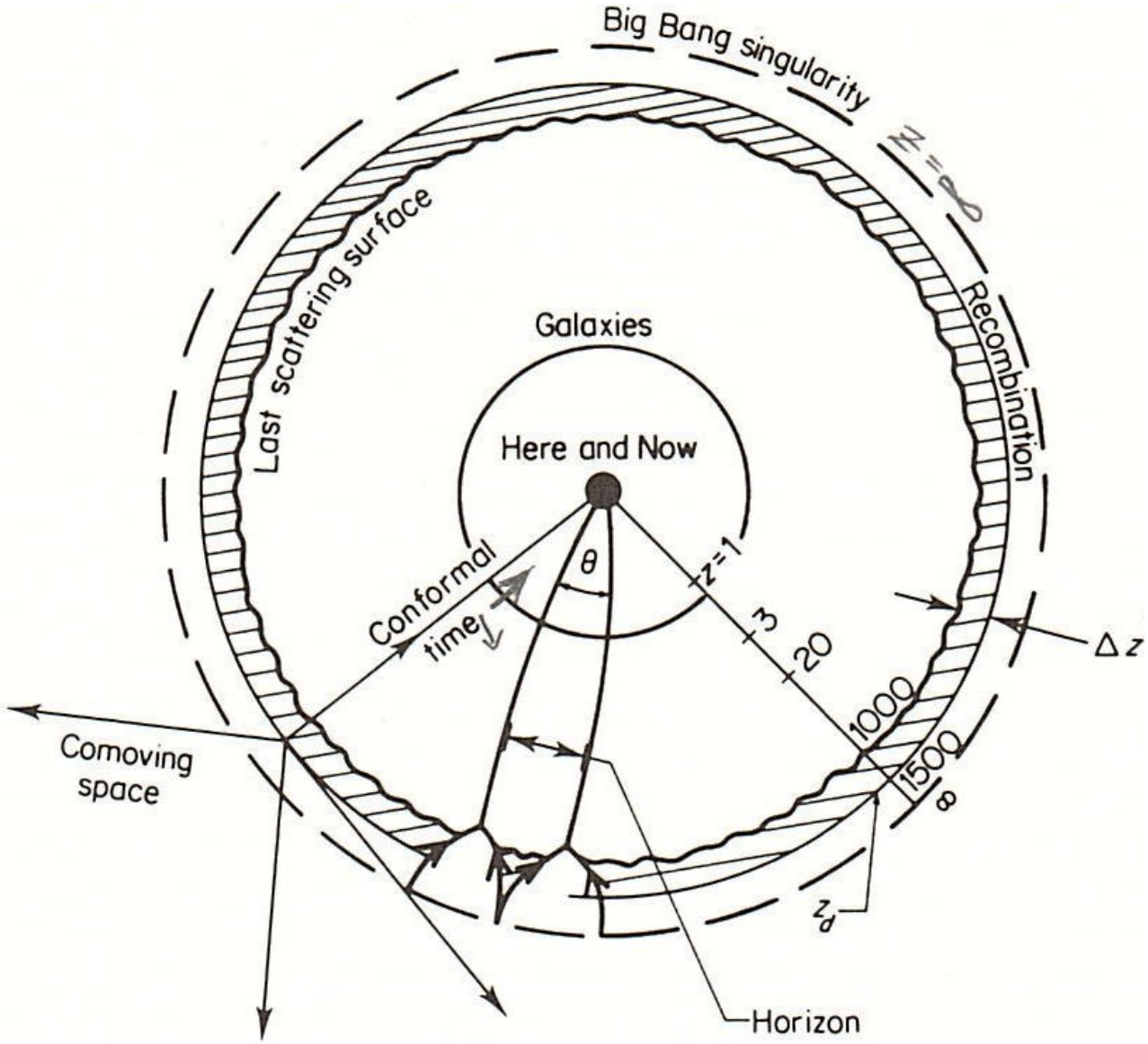
STRUVE geodetic arc, part of IAG great history, and within UNESCO list

Activity for 2012

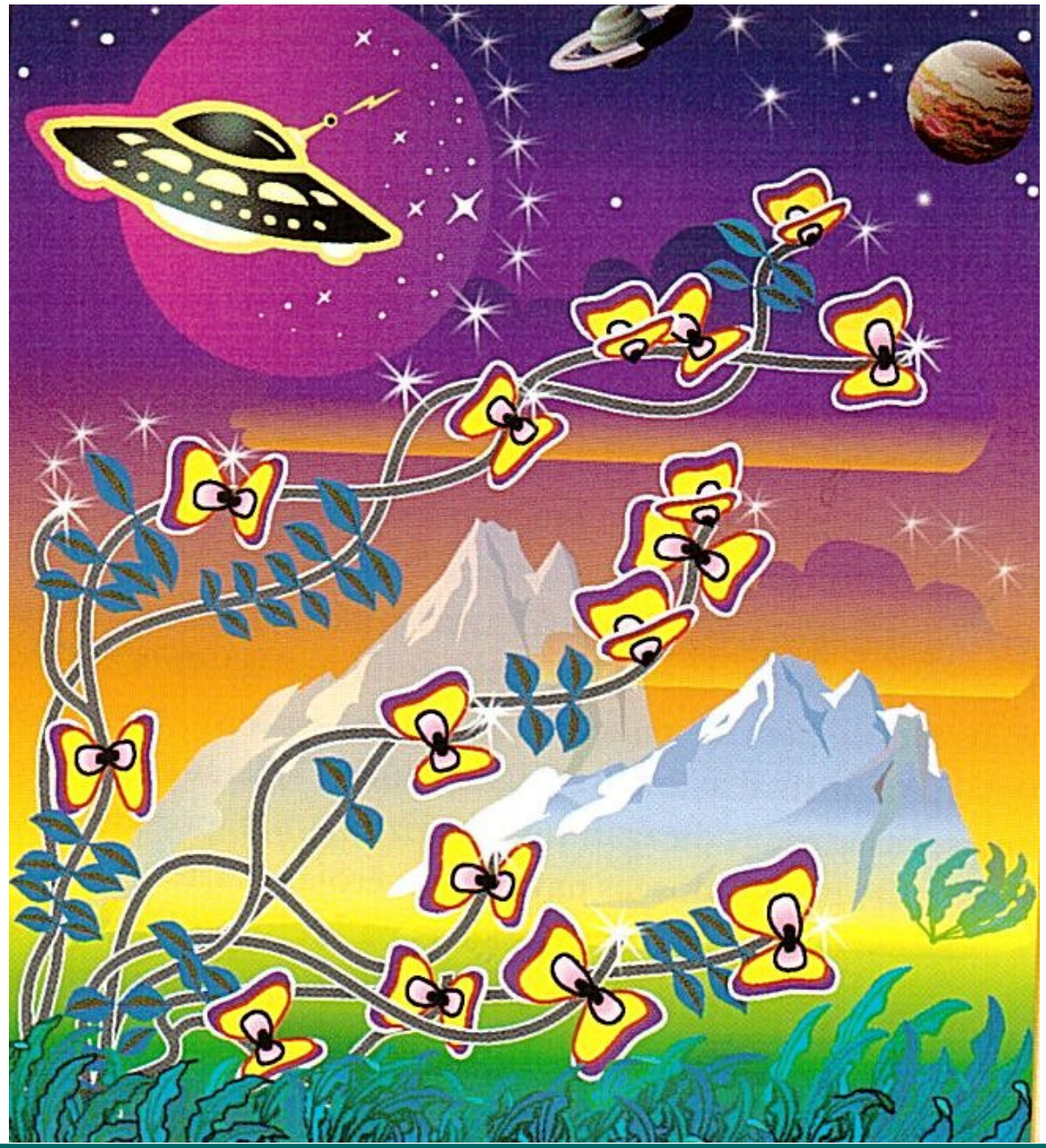


Astronomic and geodetic releations since 15 Billion years from Big Bang till GNSS and next …..with ICG, FIG, IAG, etc.

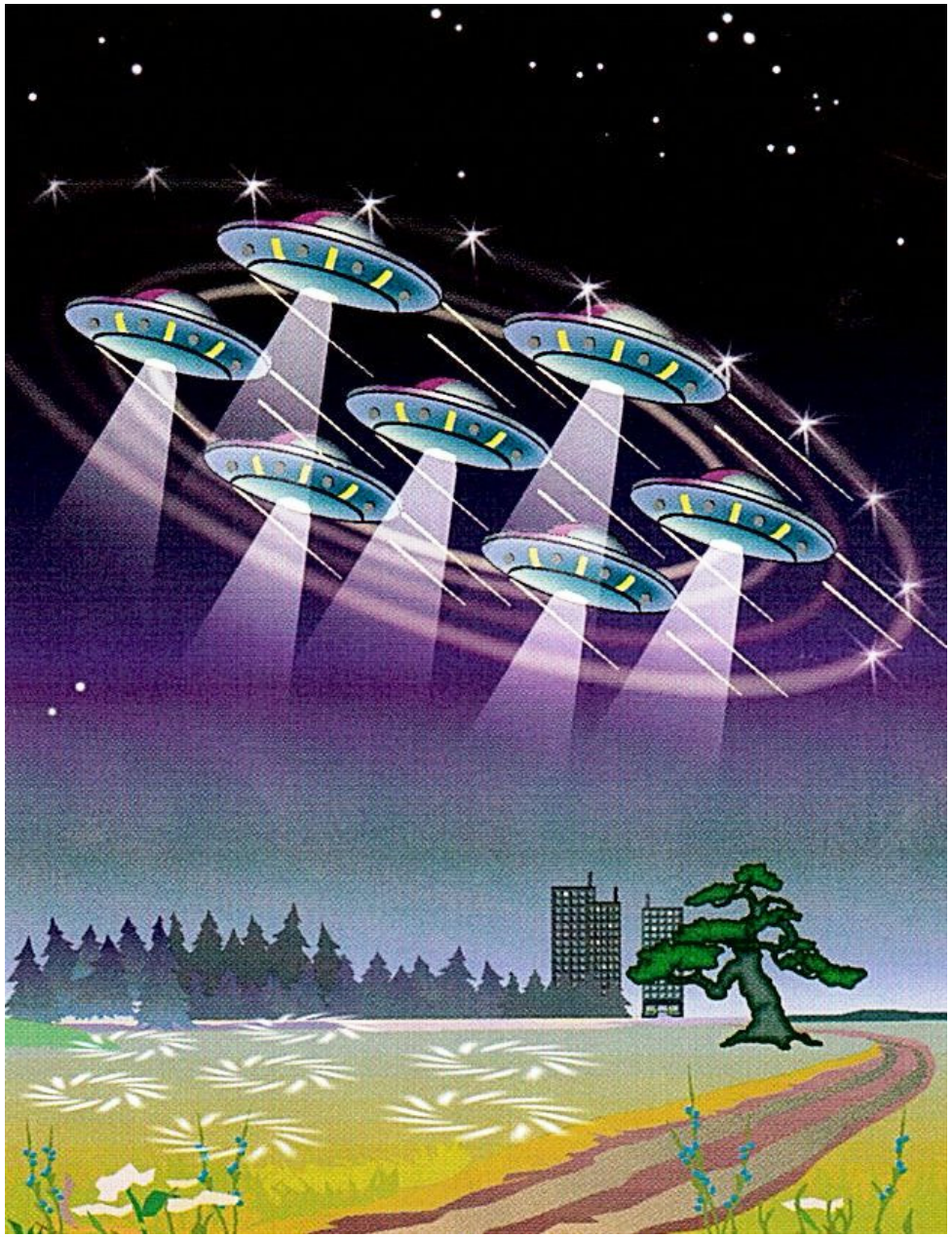
Our horizon and scale, from time back to Big Bang era



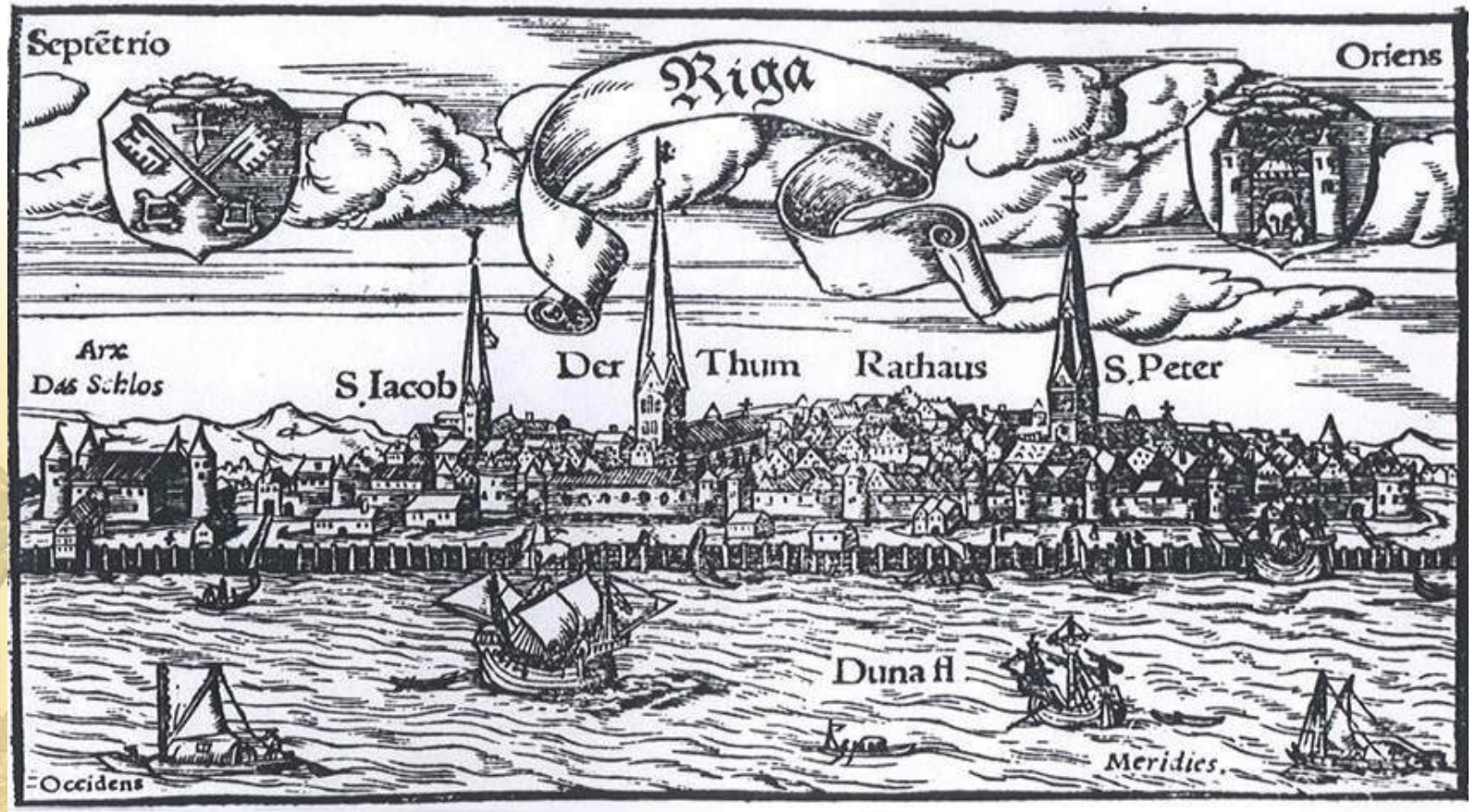
To help for our imagination we can use colors



We can say that our topic is enjoyable and attractive for all



Typical view of Riga city some hundreds years ago



Student works of the Geomatics department / RTU

- The aim and the task of the bachelor work **"Galileo – European satellite navigation system"** is to make the acquaintance with Galileo system, summarize information and performed researches about Galileo interoperability with another GNSS, compare Galileo with the others satellite navigation systems, evaluate instant process of development and future aspects.
- In this bachelor work, while making comparison, is taken notice to Galileo technical parameters – signals, frequencies, time basis, sources of errors, and are inspected planned economical benefits. In this work is also carried out summarization about Galileo current events.

Student works of the Geomatics department / RTU

- The title of the Bachelor work is **„The capability of use of machine control systems in construction”**. The aim of the work is to overlook different types of machine control systems and divide them into groups depending on system's type, structure, accuracy, efficiency and usage. The accuracy of different machine control systems was also compared to valid road construction normative - „Ceļu specifikācijas 2010” and the most efficient machine control system's products were determined.

- The title of the Engineer Project is **„The capability of use of machine control systems in construction”**. The Project contains two parts. In the first part, the installation of laser system for bulldozer and the calibration of the system is described. In the second part, the preparation of 3D Project for the machine control systems is described.

- The aim and the main task of the bachelor work **"Global Navigation Satellite Systems (GNSS) Application in Maritime Navigation"** is to make the acquaintance with using GNSS in maritime navigation, and also with other systems that are used for water transport's navigation, summarize the information and performed researches.
- In this bachelor work is summarized information about the global navigation satellite systems, their subsidiary systems for improving the accuracy, radio navigation systems and their connection with water transport's navigation. Also is taken notice to traditional maritime navigation instruments and their use.

Student works of the Geomatics department / RTU

- This work is written about theme **„Auto navigation systems”**. Bachelor work is decomposed in two departments: basic and project.
- Basic department explains an auto navigation action and auto navigation possible kinds. Basic department gives information about possibilities of auto navigation usage in Latvia. The TomTom navigation devices in Latvia are most popular, therefore in the first department of this work is minutely described action and possibilities of TomTom and development possibilities of the navigation systems in the future. The first department explains possibilities of built-in navigation systems in Latvia.
- A project department theoretical foresees possibility to build own auto navigation system. A project department is written so, that it can be used by everyone, who is interested in computer building in a car.

Student works of the Geomatics department / RTU

- The aim of the master work **"Analysis of optimal GNSS sensor application in geodesy"** is to make the acquaintance and analysis of in Latvia's market available optimal GNSS sensor application in geodesy. The task of the master work is to make the acquaintance with operation principles of GNSS sensors; evaluate GNSS sensor perspectives of application in geodesy; summarize information about recent models of in Latvia's market available GNSS sensors; perform experimental measurements of established points using available GNSS sensors and both LatPos, and EUPOS®-RIGA RTK correction data; perform analysis of GNSS sensors, analyse acquired results by determining mean values, draw conclusions.
- In this master work, while making analysis, are considered currently outstanding satellite navigation systems, real time kinematic systems in Latvia, main concept of GNSS sensors, possible development of GNSS software sensors, according to manufacturers technical data compared in Latvia's market available GNSS sensors for geodesy requirements and practically tested single and dual frequency sensors.

Student works of the Geomatics department / RTU

- **LATPOS GPS BASE STATION INVOLVEMENT IN EUREF NETWORK**
- Subject of the work is to see EUREF working and its purposes, as well as using in internet free of charge available resources, experimentally adjust VZD base stations from international GPS permanent network stations.
- In this work was also insight into satellite navigation principle, general signal error sources, in geodesy used surveying methods and geodetical supporting systems, as well as data exchange standard RINEX, to obtain necessary knowledge base, who use in practical part of the work.

The main tasks of the work are:

- 1. Obtain, investigate and analyze literature about EUREF permanent network stations and obtain knowledge about data exchange format RINEX.
- 2. Do data selection to obtain specific time period EUREF network data.
- 3. Do data selection to obtain specific time period LATPOS network data.
- 4. Appraise possibility to adjust acquired data
- 5. To carry out conclusions about done work

Student works of the Geomatics department / RTU

- More and more the number of ships increases, hence the number of accidents, which are mainly 80% of cases caused by human factor. To increase the safety of navigation are being developed systems that improve and facilitate marine navigation.
- In this work I studied what accuracy it is possible to achieve in the sea, emerging GALILEO system's effects on **maritime navigation**, as well as in ports and inland waters, studied Automatic identification system, both terrestrial and satellite segments. Examined the logistics of shipping, listing advantages and disadvantages, as well as investigated the performance of Latvian ports in recent years.

Student works of the Geomatics department / RTU

- Bachelor thesis **The influence of troposphere to GNSS measurements** describes Global Navigation Satellite Systems (GNSS), the history of GNSS and errors of GNSS measurements. One of the most disturbing factors for signals of GNSS (radio signals) is atmosphere. Atmosphere is divided in a number of layers, but two of them are influencing GNSS signals: ionosphere and troposphere. This thesis are written to study the lowest atmospheric layer – troposphere. Troposphere consists of dry gasses (dry component) and water vapour (wet component). Dry component gives the most impact to radio signals, but it is also comparatively stabile and can be calculated precisely using tropospheric modelling methods. But there are difficulties with predicting wet component because it is changing unpredictably in time. The wet component is also object of interest of meteorologists because of importance of water vapour parameters in weather forecasting. Also elimination of tropospheric errors are described in this thesis.
- Two kind of tropospheric models (Saastamoinen and Hopfield) in two time periods (5.- 11.07.2009 and 10.-16.01.2010) with different weather conditions are studied in practical part of this thesis. For calculations of used EUPOS-Rīga and EUREF station and IGS (International GNSS Service) data, GNSS software Bernese v5.0 was used.

Let to look what students say/think about GNSS, examples

For average people GNSS makes it all easier, more down to Earth. It opens gate to space not only for astronauts but for average students as well.

Let to look what students say/think about GNSS, examples

- GNNS knowledge has great advantages in labour market, especially when student is familiar with GNSS based applications in mobile devices
- For example, Foursquare and Endomondo are widely known applications which are using GPS

- Acquired GNSS knowledge should be used in new and efficient service building

endomondo

Let to look what students say/think about GNSS, examples

- GNSS is the future as a connecting thread among many other industries
- And it will enable many to education, to improve themselves
- This is a study of the engine, and some new courses. In the new opportunities and challenges

- If the person is educated with GNSS use/ applications, then we can say that he or she like able to read
- Or like in Georgia colleagues said that good cadastre starts with precise coordinates (CRS)

Thank you for your attention!

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