



RIGA TECHNICAL
UNIVERSITY

Fundamental element of the geodetic infrastructure – Struve Arc

Coordinating Committee meeting of the STRUVE Geodetic ARC

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Asoc.Prof., Head of Geomatics department

Tallinn, September 7, 2016

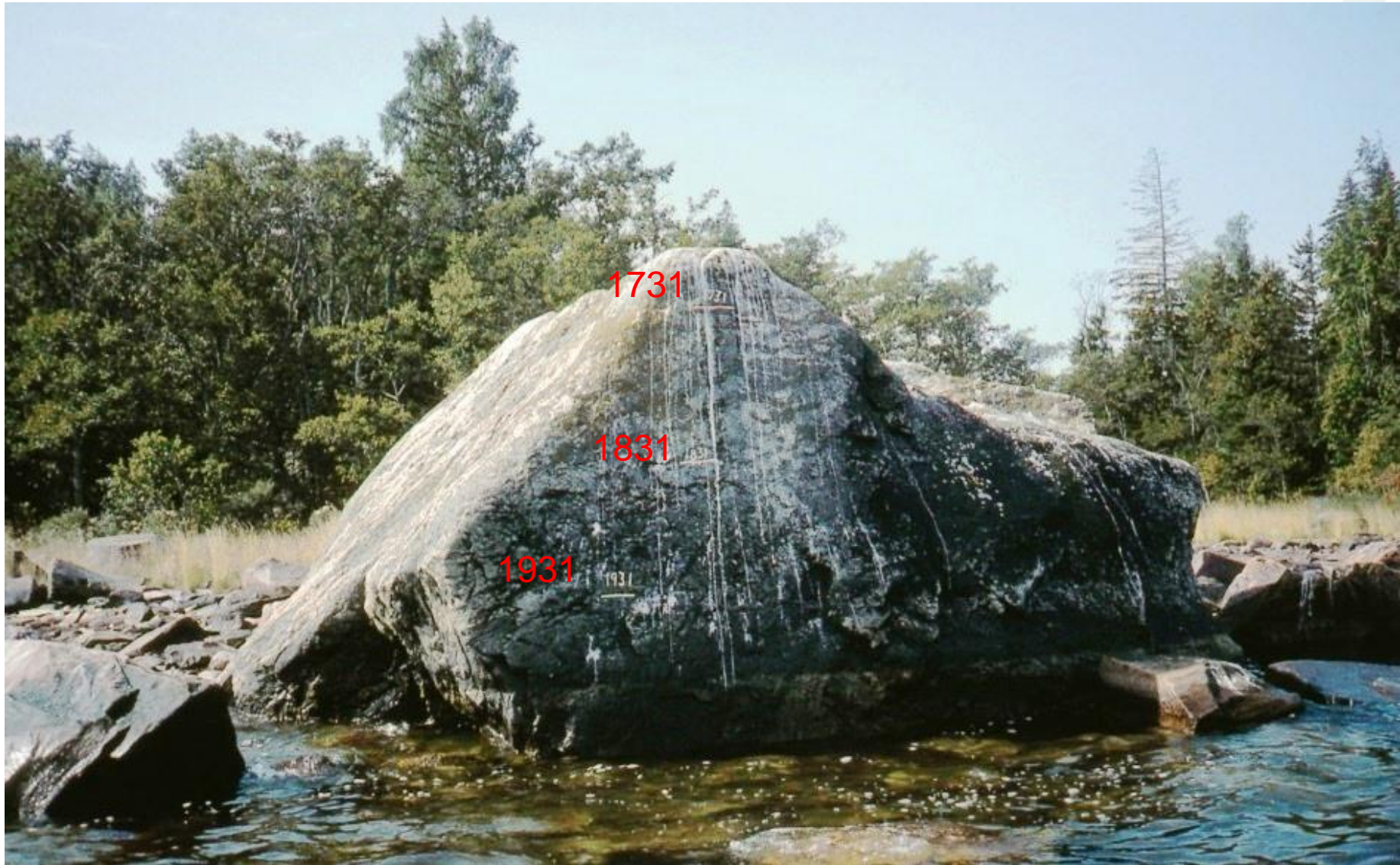


Introduction - infrastructure

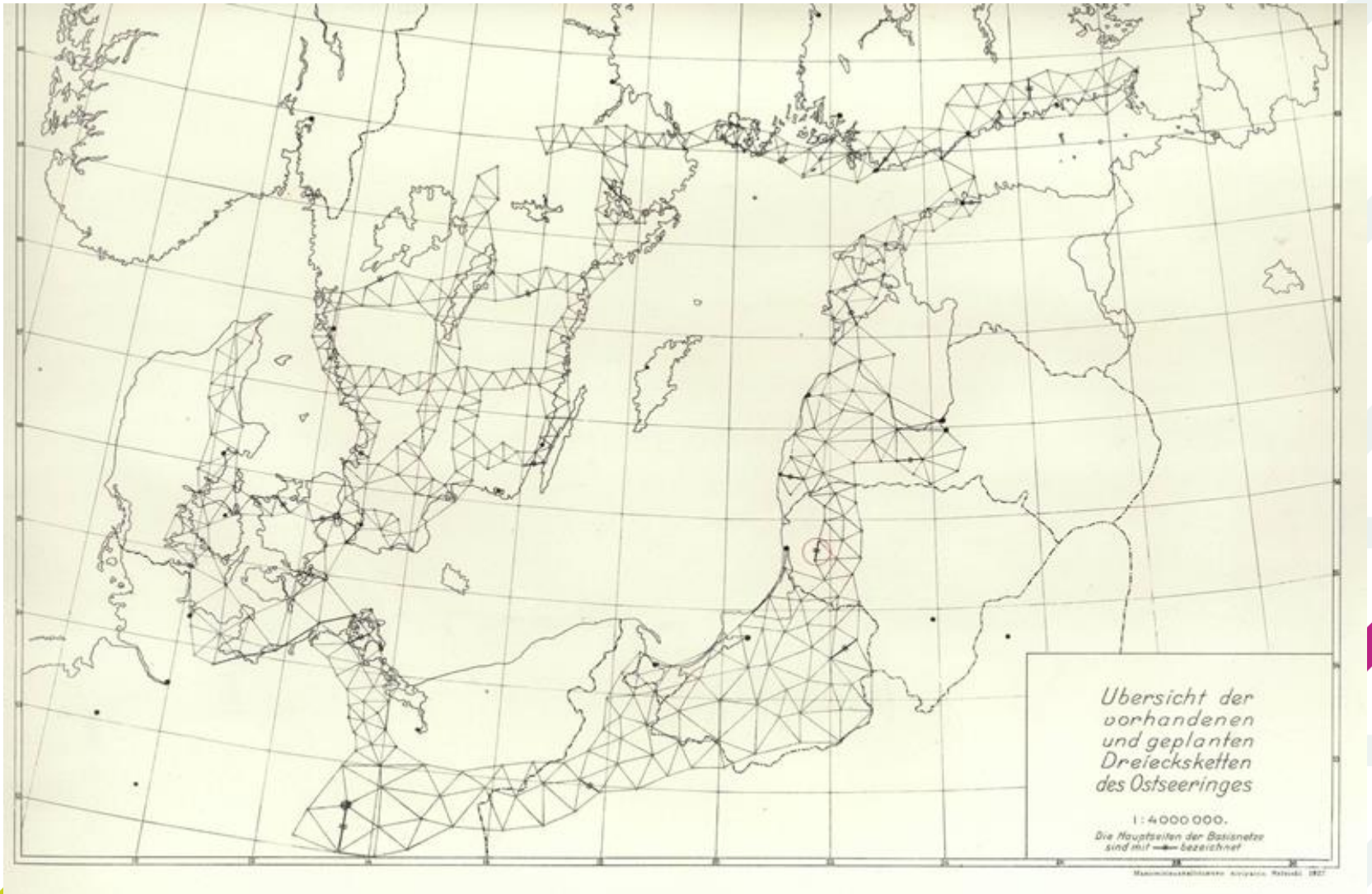
Geodetic benchmarks as at least one of crucial infrastructure elements for precise geodesy we do recognize in our region since 19th century with the Struve geodetic arc. We are still practically using them for current geodetic reference network after 200 years or since 1816.

Nowadays we have many more accurate geodetic observation facilities available, such as VLBI, SLR, GNSS and gravity measurements that are correlating to all those mentioned natural changes. All precise geodetic observations give us detailed information, like if we would put our “finger” under microscope. However, in same time we must know all global relations to be sure about behavior of our “body” – Earth – impacting life of all forms on the planet.

Celsius stone more than 300 years ago



Baltic Ring 1927

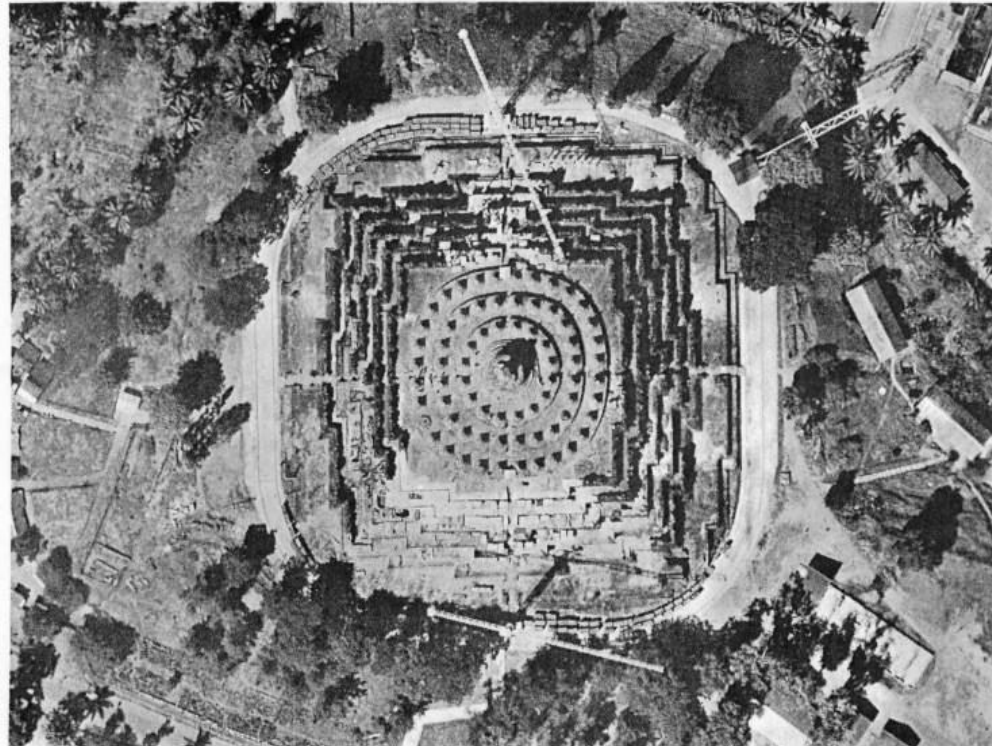


Proceedings from 1977 at the FGI

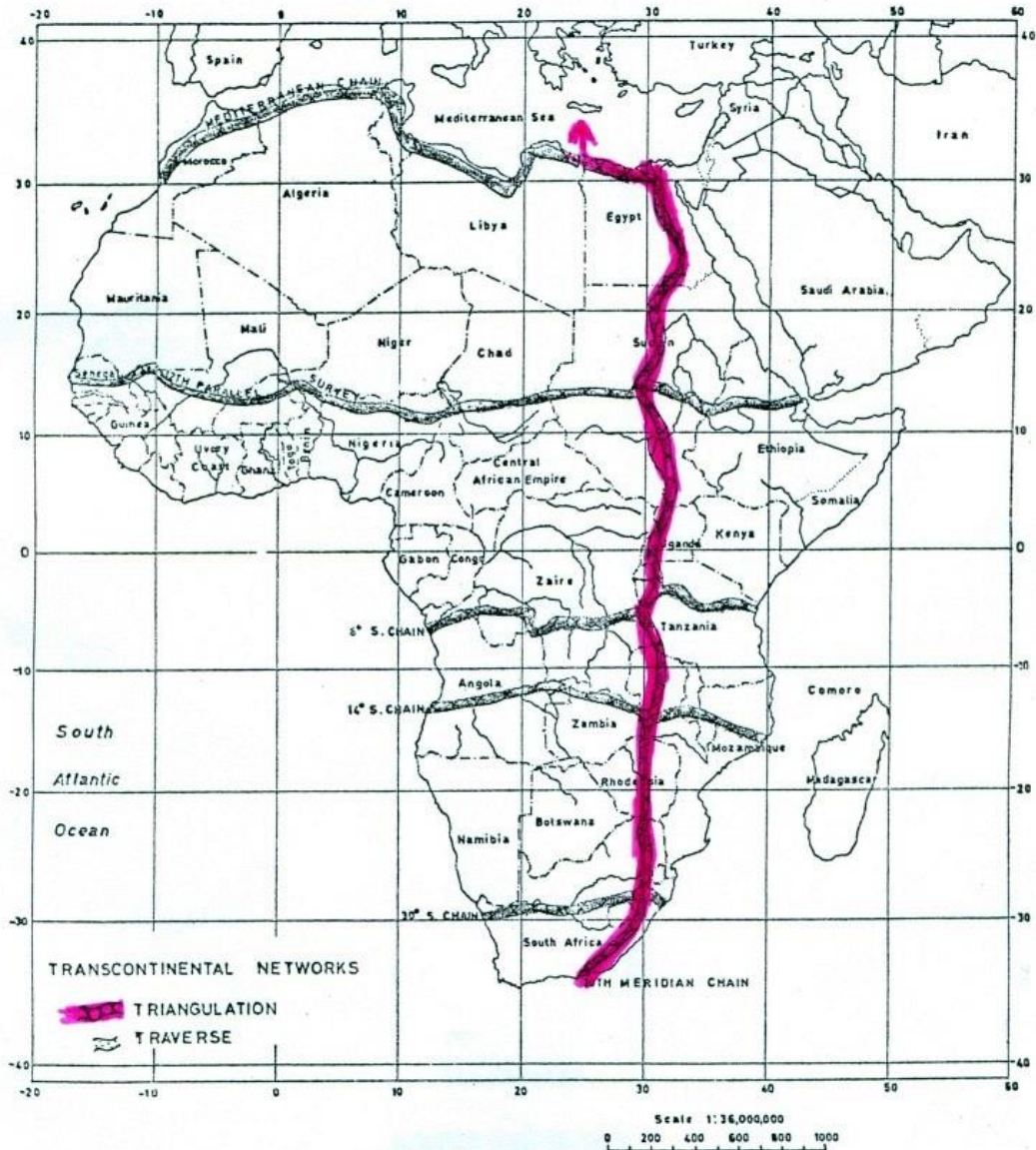
Proceedings
of the
International Geodetic Symposium
on

REGIONAL GEODETIC NETWORKS FOR THE YEAR 2000

BANDUNG (Indonesia), October 3 – 4, 1977.



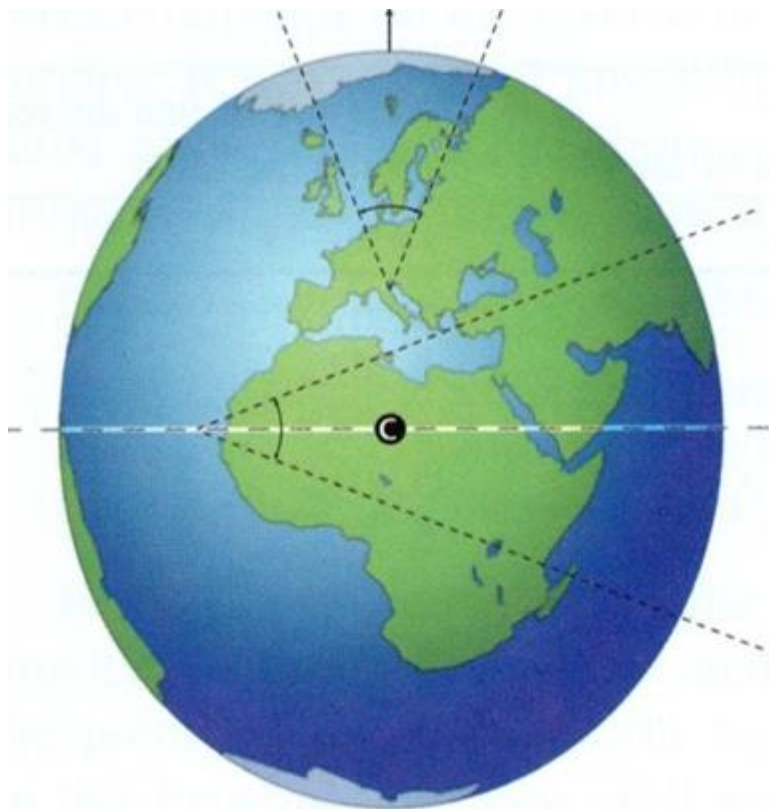
Display of Struve Arc on the African Geodetic Networks from 1977



Problems before or still

- ❖ Traditionally each country has its own geodetic reference system resulting in non compatible Coordinates systems between countries;
- ❖ Maps in neighboring countries do not match at the national boundaries;
- ❖ Very important is cooperation in new situation of technical development

Two different positions about age old question

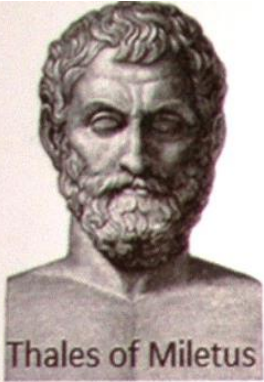


Dž.Kasīni
(1625 – 1712)



Ī.Nūtons
(1643 – 1727)

Geodesy – one of the oldest sciences



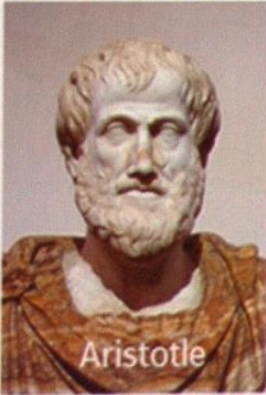
Thales of Miletus

624–546 BC *Thales of Miletus*: **Geometry** (Earth measurement)

“The Earth is floating on the ocean”

Prediction of the solar eclipse on May 28, 585 BC

580–500 BC *Pythagoras of Samos*: The **Earth is a sphere**
levitating in space (for esthetical reasons)



Aristotle

384–322 BC *Aristotle*: **Geodesy** (Earth division, partitioning)

“Application of geometry in practice”

310–230 BC *Aristarchus of Samos*: **Heliocentric system**

“The Sun in the centre of a very large universe”



276–195 BC *Eratosthenes of Cyrene*: **Measurement of the Earth’s radius** (astronomic-geodetic method)

Geodesy – one of the oldest sciences



Pythagoras



Eratosthenes



Ptolemy

(wikipedia.org)

624–546 BC *Thales of Miletus*: **Geometry** (Earth measurement)
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100–160 AD *Claudius Ptolemy*: **Geocentric coordinates**
of ~1000 stars and ~8000 locations on Earth

This system is valid until the end of the Middle Ages.

IAG / IUGG for GGOS portal

**Global Geodetic Observing System
GGOS Portal**

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The Global Geodetic Observing System Portal (GGOS Portal)

GGOS is the Observing System of the International Association of Geodesy (IAG). GGOS works with the IAG components to provide the geodetic infrastructure necessary for monitoring the Earth system and for global change research.

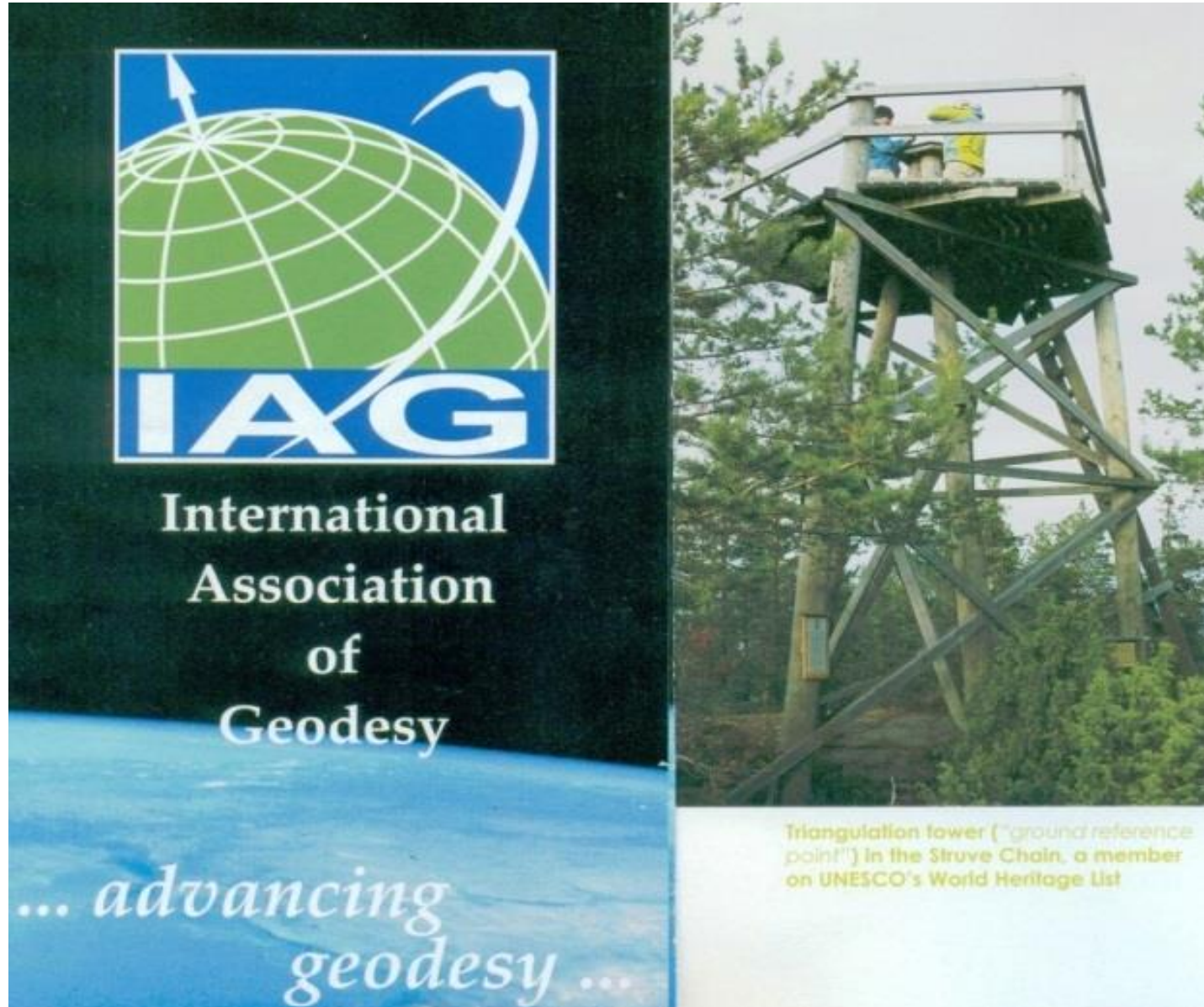
The GGOS Portal provides a unique access point to all geodetic products. Thus, the Portal will emphasize Geodesy's contribution to Earth Observation for assessing geohazards and reducing disaster. The Portal consists of information to GGOS topics, a metadata catalog including a search engine and an editor, a map viewer, and a list of GGOS products.

News GGOS Portal

- The Global Geodetic Core Network: new version of "Call for Participation"
- GGOS Themes and Template for Proposals under Theme 3
- Pages Topics - Services - ILRS and Topics - Services - IDS updated
- More

Web: www.ggos.org

From our surveying roots to nowadays



Web: <http://iag-aig.org/>

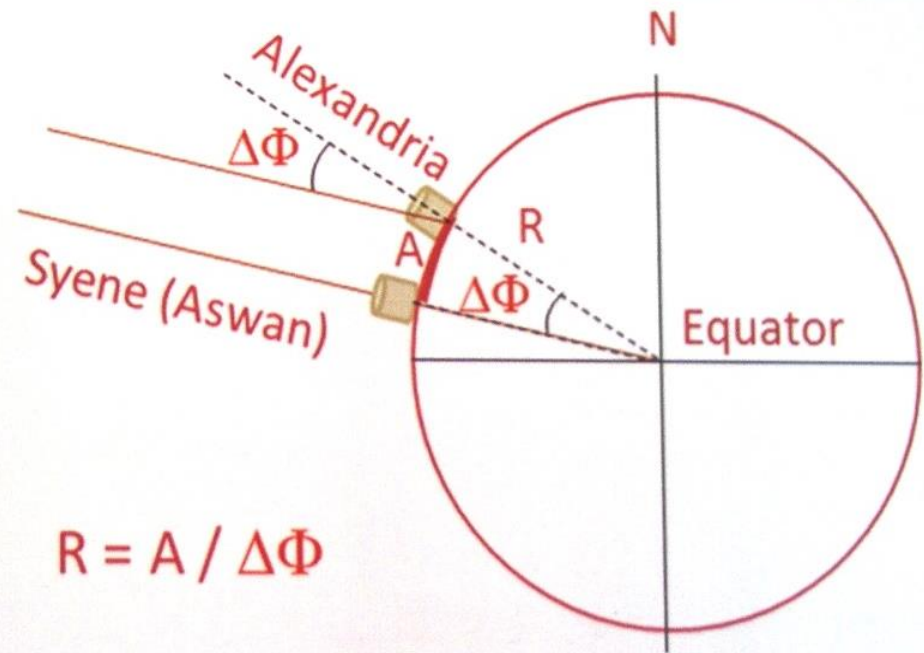
Geodesy for the determination of Earth's radius

Astronomic-geodetic method of Eratosthenes: At summer solstices (June 21) the sun is mirrored in a well in Syene (latitude $\Phi = 23.4^\circ$ N, today's Aswan High Dam), but in Alexandria ($\Phi = 31.1^\circ$ N) the sun is casting a shadow with a length corresponding to an angle $\Delta\Phi = 7.7^\circ$.



The angle of the shadow is identical with the latitude difference Alexandria-Syene:

$$R = A / \Delta\Phi$$





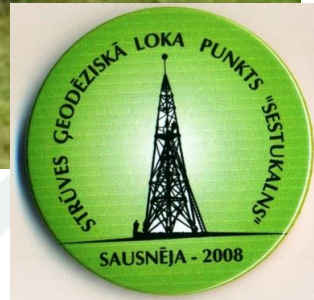
Meridian of Tartu



Struve conference in Jekabpils, August 22, 2008



Struve conference in Sestukalns, August 23, 2008





<http://www.failiem.lv/list.php?i=gfzuwx>



Kortenhof



25/07/2011

ИТОГИ

Завершилась экспедиция «Миссия Струве»

Экспедиция на трех внедорожниках стартовала 19 июля 2011 г. из Одессы и пройдя 245 км в 17 ч 32 мин по московскому времени достигла южного пункта Геодезической дуги Струве «Старо-Некрасовка/STARONEKRASSOWKA», в селе Старая Некрасовка (Украина). Далее маршрут экспедиции проходил по территории Молдавии (пункт «Водолуй/Wodolui»), Украины («Кременец/Kremenetz»), Белоруссии («Белин/Belin»), Латвии («Немеж/Nemesch», «Якобштадт/JACOBSTADT»), Эстонии («Дерпт/DORPAT Tartu Observatory»), Финляндии («Торнио/TORNEA Alatomion kirkko»), Швеции («Авасакса/AVASAKSA», «Пуллинки/PULLINKI»), Норвегии («Бельяц-ваара/BALJATZ-VAARA», «Фугленес/FUGLENAES»). «Фугленес» — самый северный пункт «Геодезической дуги Струве», расположенный в городе Гаммерфест на берегу Норвежского моря, экспедиция достигла 31 июля 2011 г. в 20 ч 30 мин по московскому времени.

Пройдет немного времени, эмоции поутихнут, мысли выстроятся в ряд и обязательно появится подробный рассказ и фотоотчет о путешествии. А пока хотим поблагодарить всех тех, кто оказал помощь и поддержку на различных этапах подготовки и проведения экспедиции:

Санкт-Петербургское общество геодезии и картографии и его секретаря В.Б.Капцюга (Россия , Санкт-Петербург)

ЗАО «Геостройизыскания» (Россия , Москва)

Группу компаний «М2М Телематика» (Россия , Москва)

ОАО «Мобильные ТелеСистемы» (Россия , Москва)

ООО «Лентерра» (Россия , Москва)

Дилерский центр «Ниссан на Таганке» (Россия , Москва)

КБ Панорама (Россия , Москва)

ГК «Геотехнологии» (Россия , Москва)

Интерактивный канал TV2.0 (Россия , Москва)

Итоги

О проекте

Цели экспедиции

Маршрут экспедиции

Уникальность

Историческая справка

Пресс-релиз

Справка

Маршрут

Никому не известная Дуга, повесть в 11 частях. Том 1

Никому не известная Дуга, повесть в 11 частях. Том 2

Другие проекты



25 апреля 2014

Грузия

Двухнедельная экспедиция в Грузию. Общий маршрут - 5200 км. Сотни километров городских трасс, пересеченной местности и горных перевалов. Каждая точка на карте пробега связана с богатым историческим наследием страны.

<http://itoc.su/rus/items/missiya-struve/itogi.phtml>



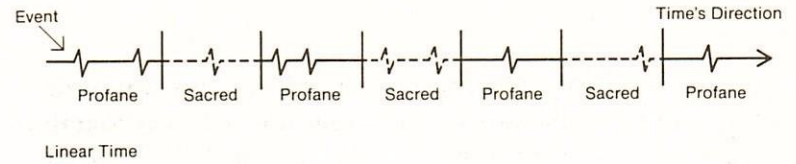
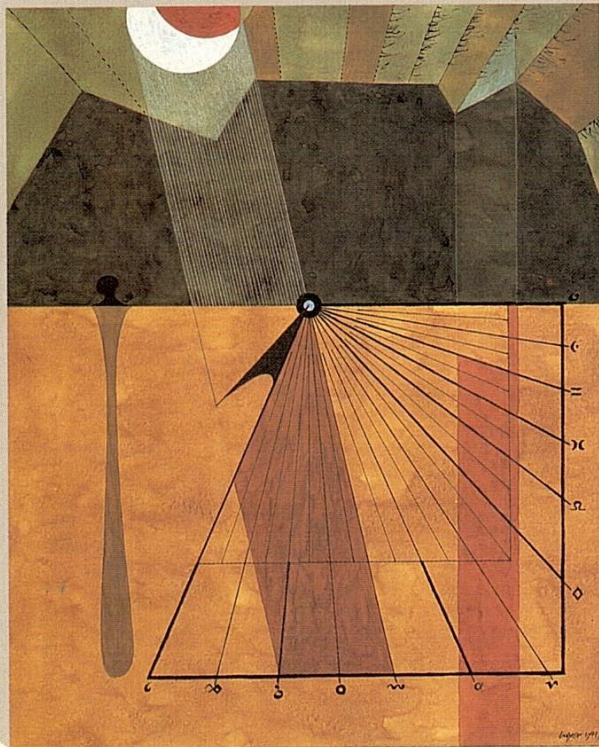


**Roots from 16th
century in Latvia**

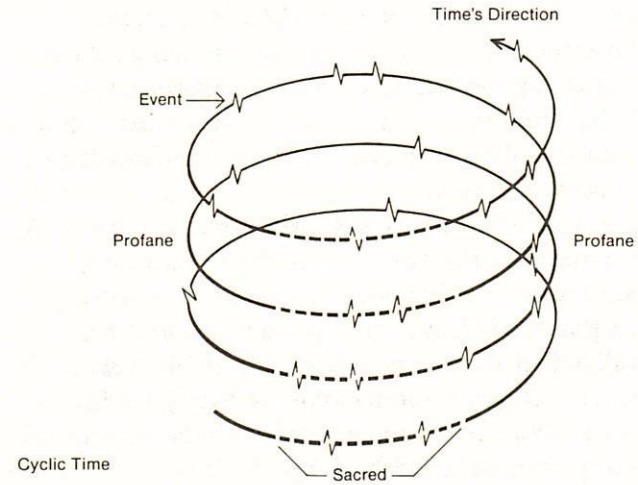
"A fascinating book about what makes time tick." —A.L.A. Booklist

EMPIRES OF TIME

Calendars, Clocks, and Cultures



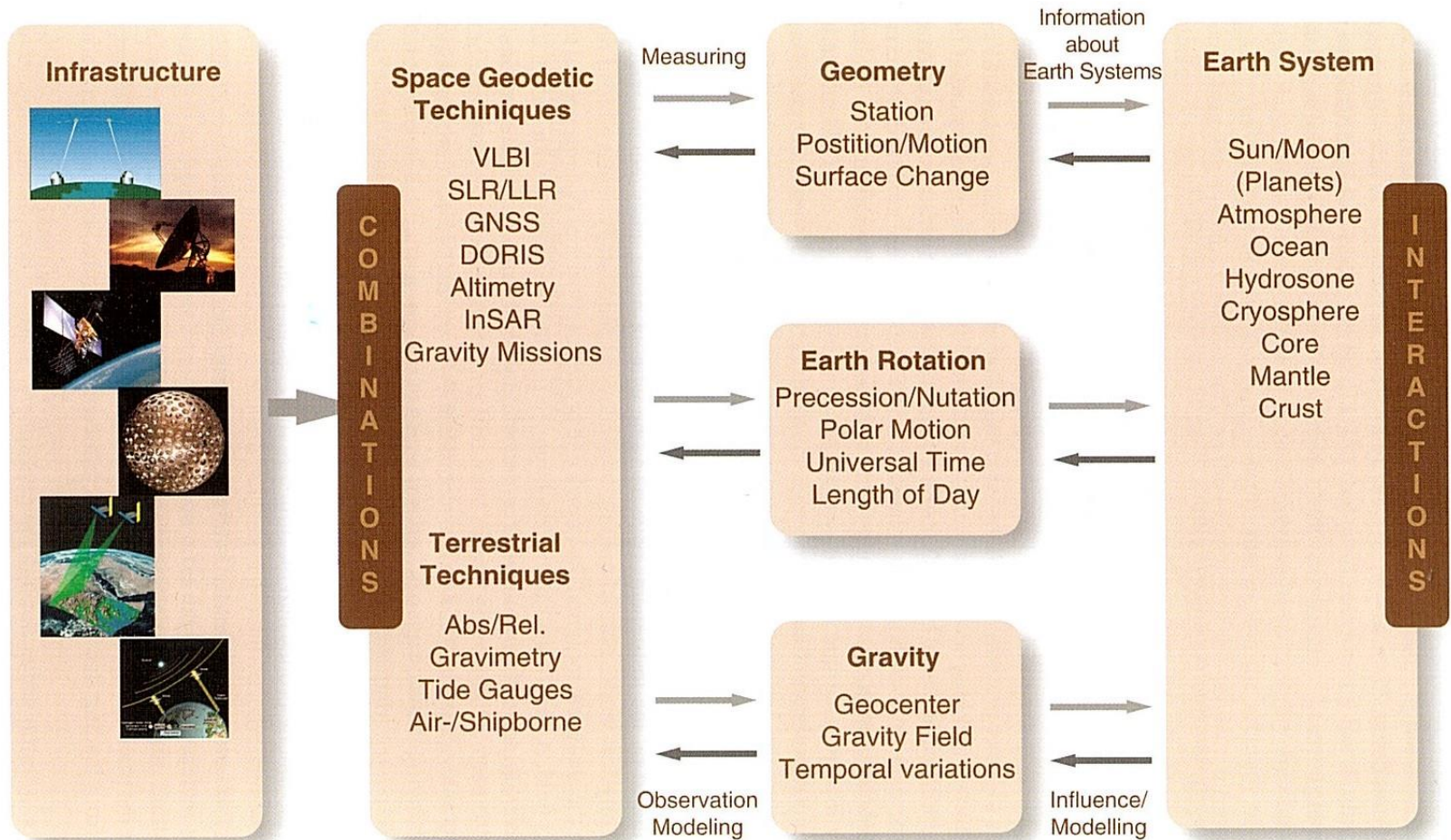
A



B

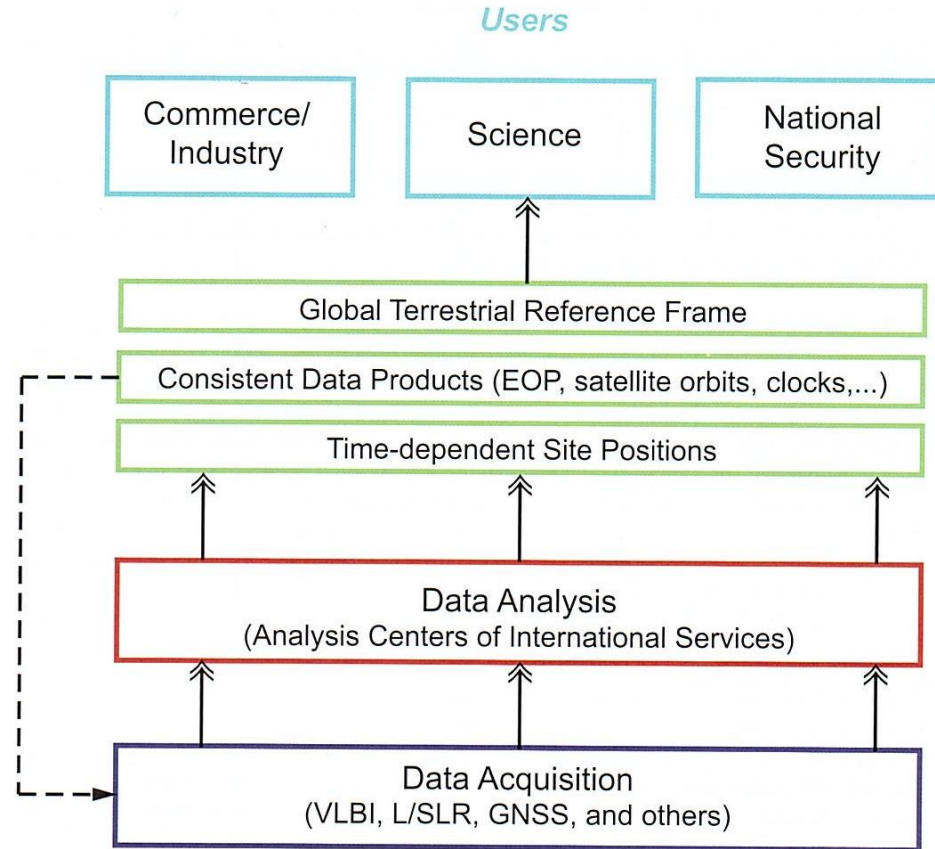
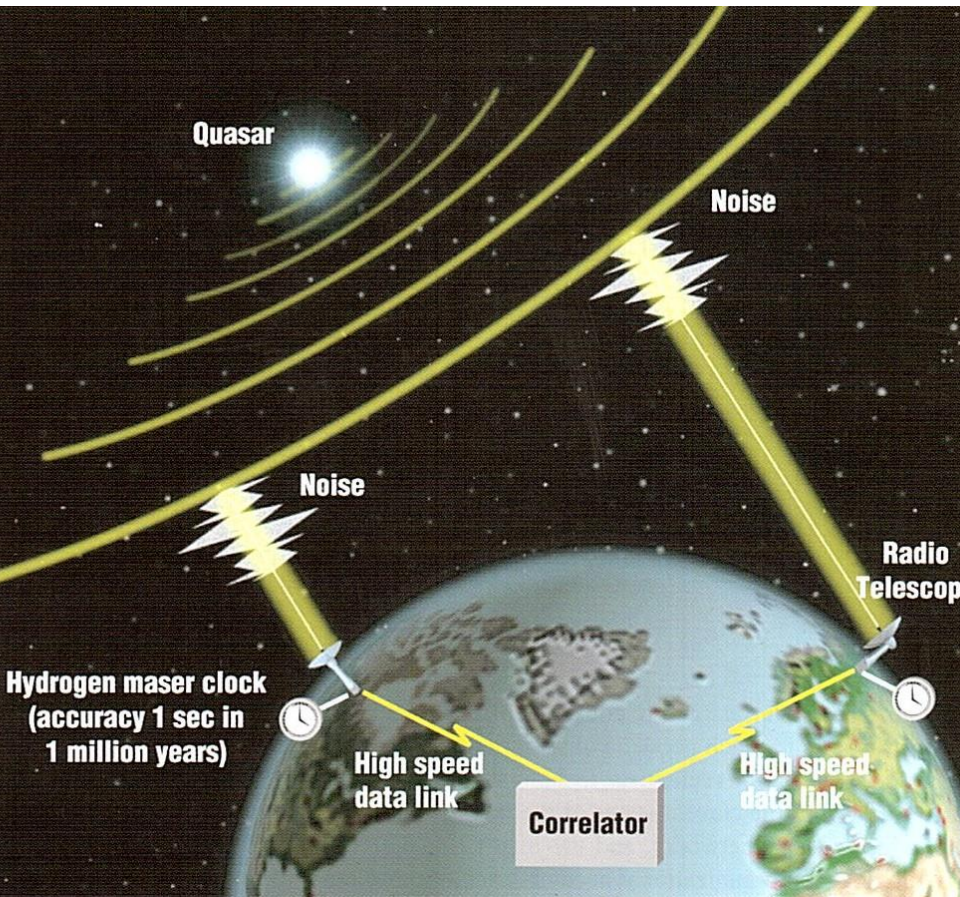
Cyclic time: profane or sacred; with events

Geodetic infrastructure



All time-dependent elements, also triangulation

Geodetic infrastructure for users



Also in «deep» space with quasars (like C273)

Our opinion about Earth in space age



Monument in Struve's park, Jekabpils



The evocative comparison with mission on Mars





Welcome on board

Thank You for Your attention!



«Struve Geodetic Arc – 11 Years in UNESCO World Heritage List»

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