

The IAG and its Global Geodetic Observing System GGOS



Robert Heinkelmann¹ on behalf of Harald Schuh^{1,2}

Potsdam, October 10th, 2016

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² Technische Universität Berlin, Institute of Geodesy and Geoinformation Science

International Council for Science (ICSU): 142 Countries, 31 Unions

IAU

IGU

ISPRS

IUGG

IUGS

...

other Unions

International Union of Geodesy and Geophysics (IUGG)

IACS

IAG

IAGA

IAHS

IAMAS

IAPSO

IASPEI

IAVCEI

International Association of Geodesy (IAG)

Commissions

1 Reference Frames

2 Gravity Field

3 Earth Rotation
and Geodynamics

4 Positioning and
Applications

Inter-Commission Committee on Theory

Scientific Services

Geometry:

IERS

IDS

Gravity:

IGFS

BGI

Combining:

BIPM

IGS

ILRS

IVS

ICGEM

IDEMS

ISG

IGETS

PSMSL

Global Geodetic Observing System (GGOS)

IAG Executive Committee, 2015 – 2019 term

- President: H. Schuh (Germany)
- Vice-President: Z. Altamimi (France)
- Secretary General: H. Drewes (Germany)
- Immediate Past President: Ch. Rizos (Australia)
- Comm. 1 - Reference Frames: G. Blewitt (USA)
- Comm. 2 - Gravity Field: R. Pail (Germany)
- Comm. 3 - Earth Rotation & Geodynamics: M. Hashimoto (Japan)
- Comm. 4 - Positioning & Applications: M. Santos (Canada)
- Inter-Commission Committee on Theory: P. Novák (Czech Republic)
- Communication and Outreach Branch: J. Ádám (Hungary)
- Service Representatives (3): R. Barzaghi (Italy),
R. Neilan (USA), A. Nothnagel (Germany)
- Members at Large (2): L. Combrinck (S. Africa), C. Pacino (Argentina)
- Chair of GGOS: H. Kutterer (Germany)

GGOS - definition

IAG Bylaws 1(d)

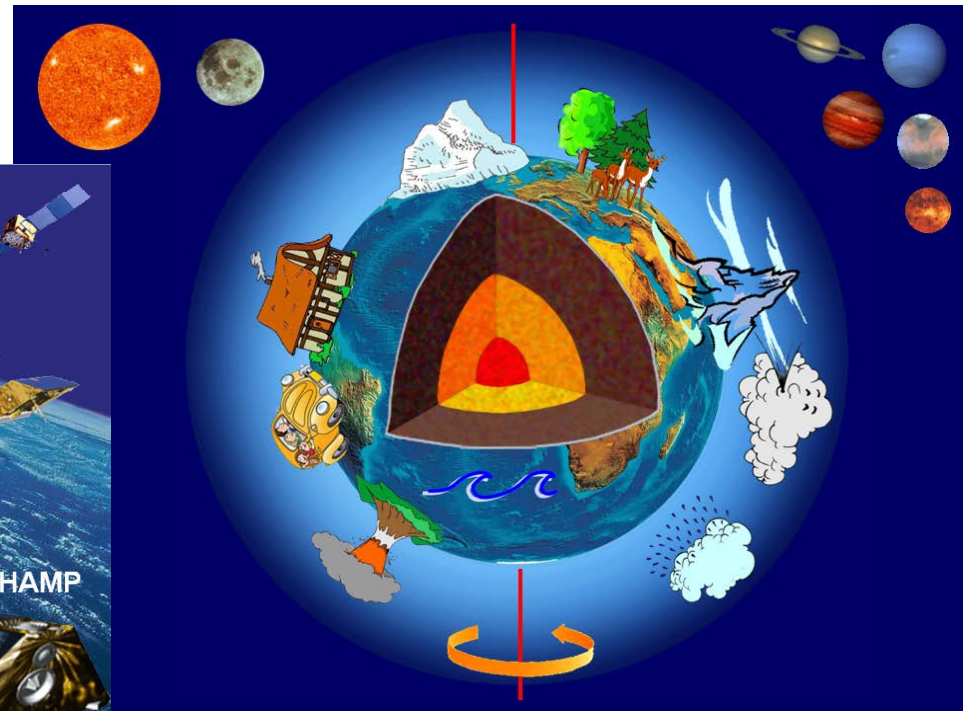
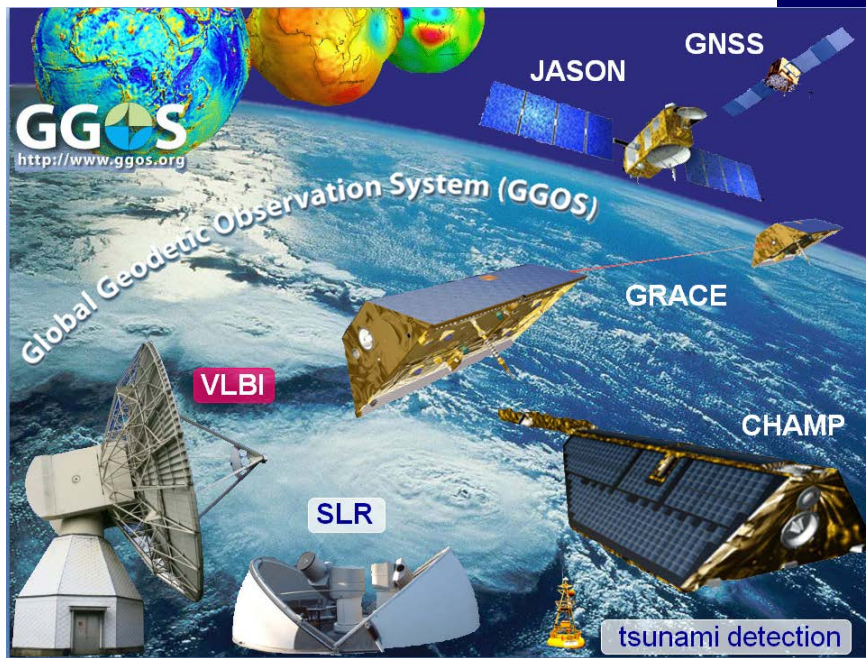
*“The **Global Geodetic Observing System** works with the IAG components to provide the geodetic infrastructure necessary for monitoring the Earth system and global change research.”*

The vision of GGOS is

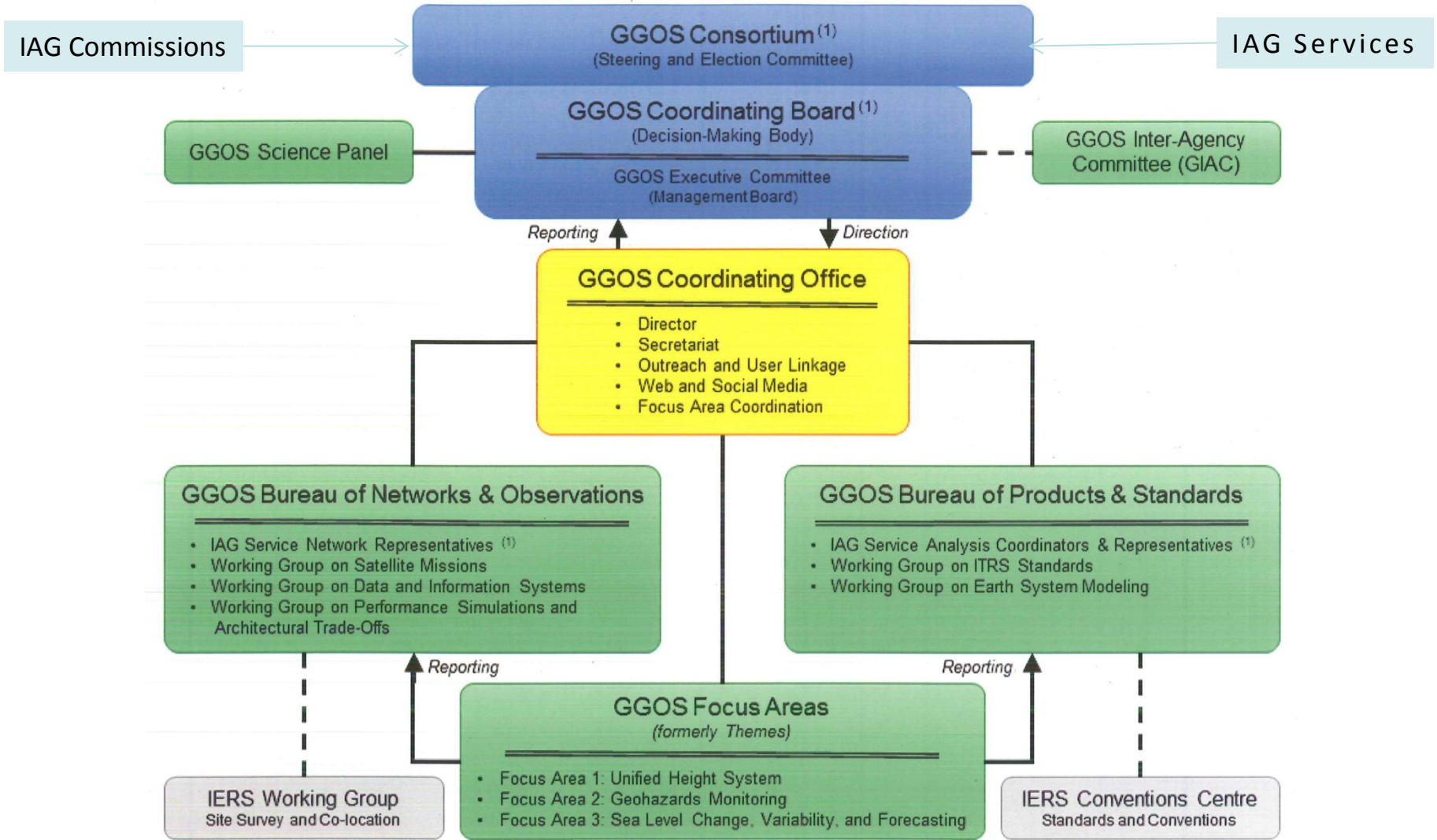
*“Advancing our understanding of the dynamic Earth system by **quantifying** our planet’s changes in space and time.”*

GGOS – two main approaches

- Combination of all available observations in the sense of GGOS
- Improvement of our understanding of the "System Earth"



GGOS – new structure



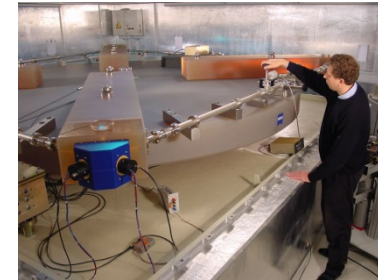
GGOS – some highlights: tie research

GGOS Bureau of Networks & Observations

- IAG Service Network Representatives ⁽¹⁾
- Working Group on Satellite Missions
- Working Group on Data and Information Systems
- Working Group on Performance Simulations and Architectural Trade-Offs

- **IAG WG 1.1.1 „Co-location using Clocks and New Sensors”**

Chair: U. Schreiber



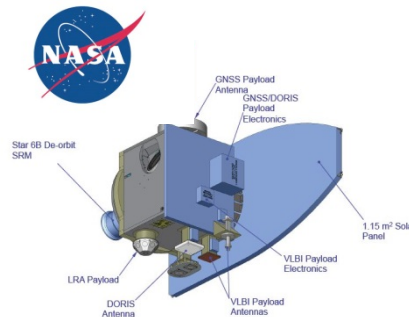
- now: **GGOS Committee**

Chair: D. Thaller



Satellite based co-location

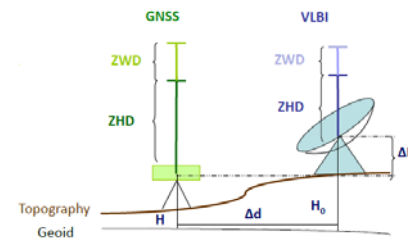
- GRASP (NASA)
- E-GRASP (ESA)
- E-GRIP (Swiss)
- ...



YES, July 2012

- **IAG JWG 1.3 „Tropospheric ties”**

Chair: R. Heinkelmann



GGOS – latest publications

- **Global Geodetic Observing System (GGOS)**

Chair of the GGOS Coordinating Board: **H. Kutterer** (Germany)

Vice-Chair of the GGOS Coordinating Board: **R. Neilan** (USA)

<http://www.ggos.org>

GGOS Bureau of Products & Standards

- IAG Service Analysis Coordinators & Representatives ⁽¹⁾
- Working Group on ITRS Standards
- Working Group on Earth System Modeling

- **GGOS Bureau of Products and Standards**

Inventory of Standards and Conventions used for the Generation of IAG Products

D. Angermann¹ · T. Gruber² · M. Gerstl¹ · R. Heinkelmann³

U. Hugentobler² · L. Sánchez¹ · P. Steigenberger⁴



International
Association of
Geodesy

The Geodesist's Handbook 2016

Journal of
Geodesy



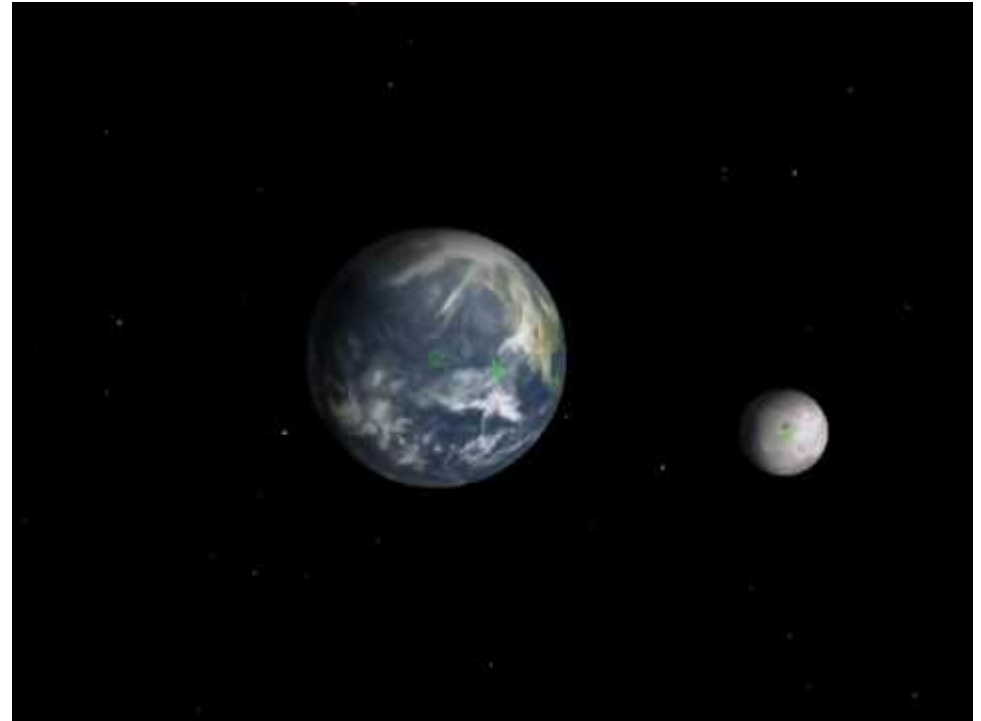
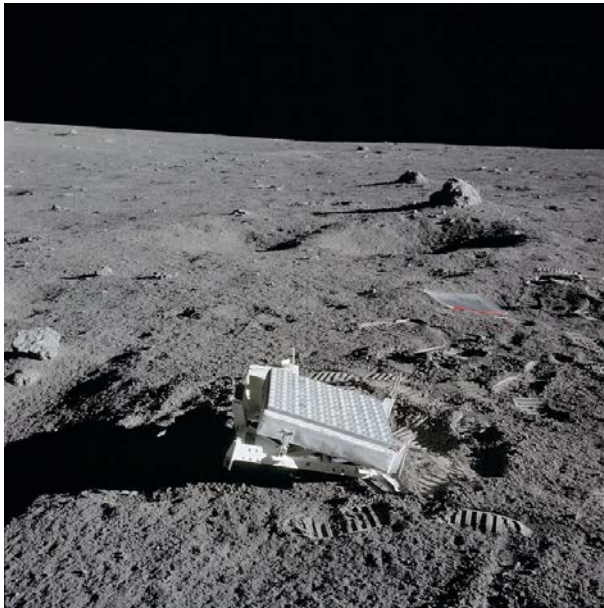
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open access

<http://link.springer.com/article/10.1007/s00190-016-0948-z>

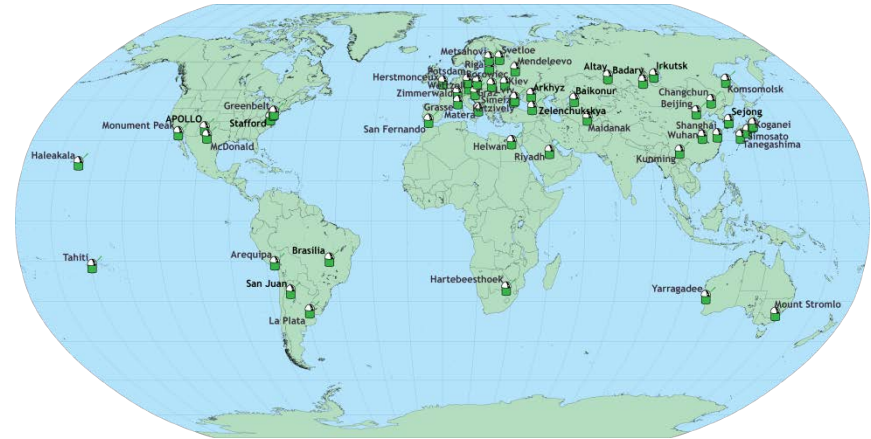
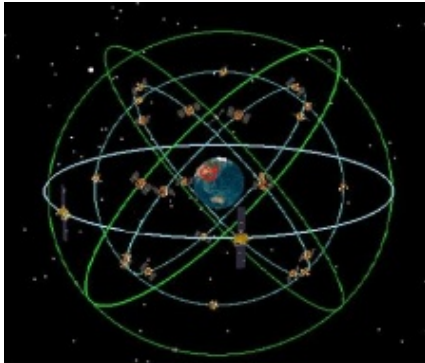
The role of LLR for GGOS

- Realization of the Earth-Moon barycentre and alignment of the Lunar ephemerides to geodetic frames



The role of SLR for GGOS

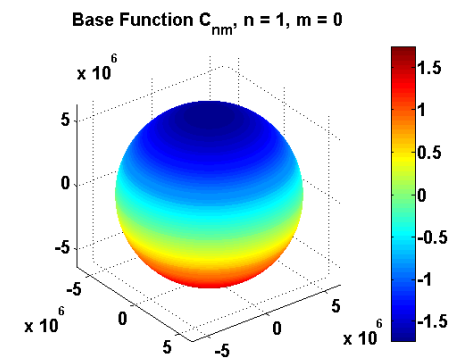
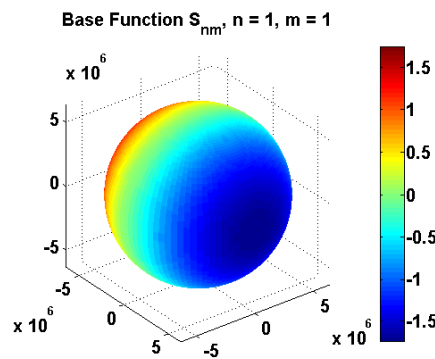
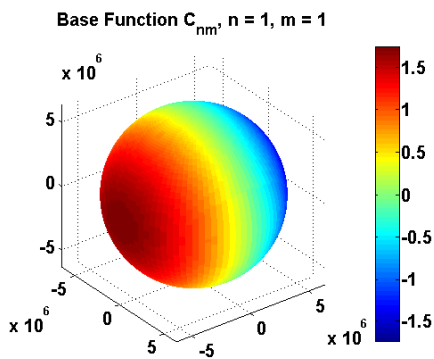
- Realization of the Earth centre of mass and tie to the surface network centre



Base function C_{11} = „x translation“

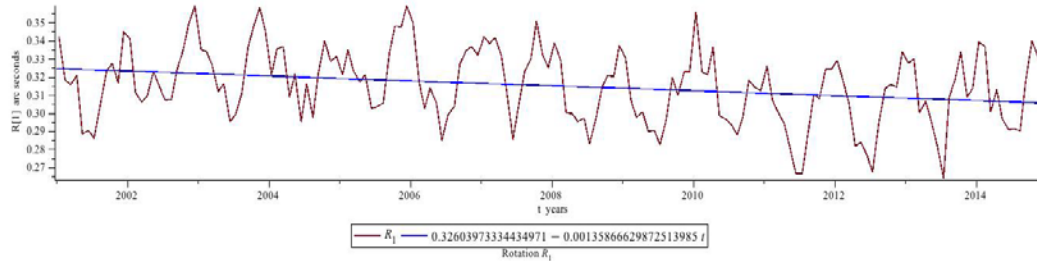
S_{11} = „y translation“

C_{10} = „z translation“

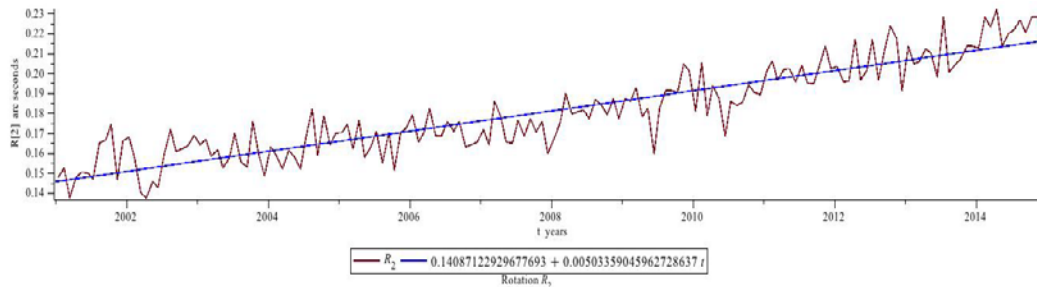


The role of SLR for GGOS

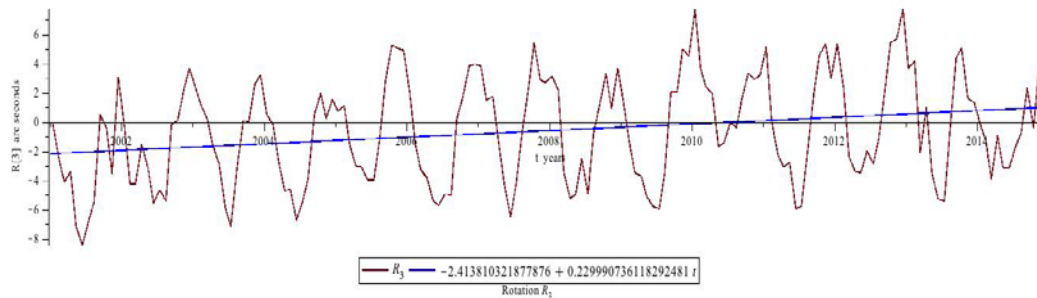
- Monitoring the principal axes (inertia) vs. the ITRF axes (surface geometry)



$$R_1 = - \frac{\Delta S_{21}}{2 C_{22}^O + C_{20}^O}$$



$$R_2 = - \frac{\Delta C_{21}}{2 C_{22}^O - C_{20}^O}$$

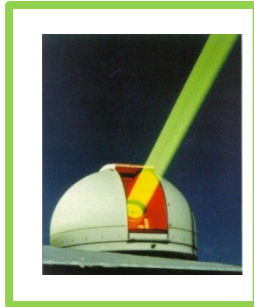


$$R_3 = \frac{1}{2} \frac{\Delta S_{22}}{C_{22}^O}$$

(Ferrandiz, et al., 2015 EGU)

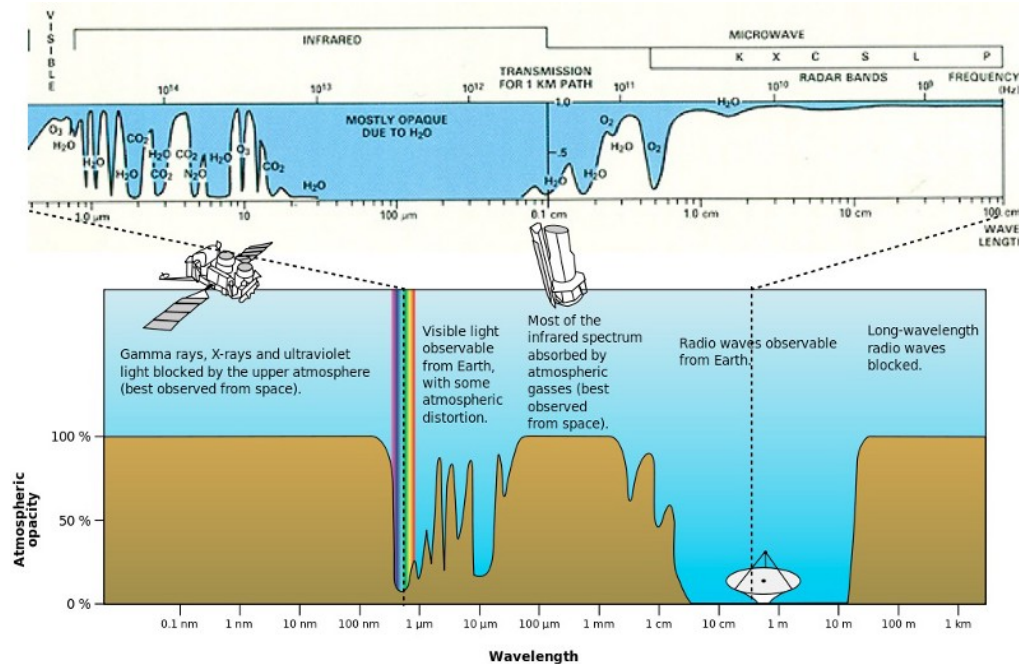
The role of SLR for GGOS

- The space geodetic technique observing at optical wavelengths



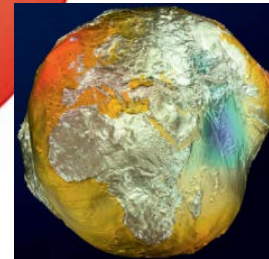
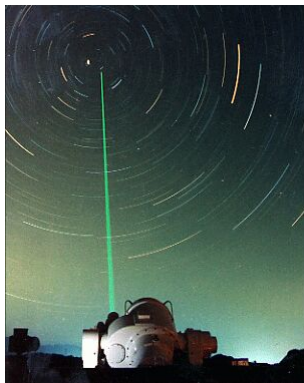
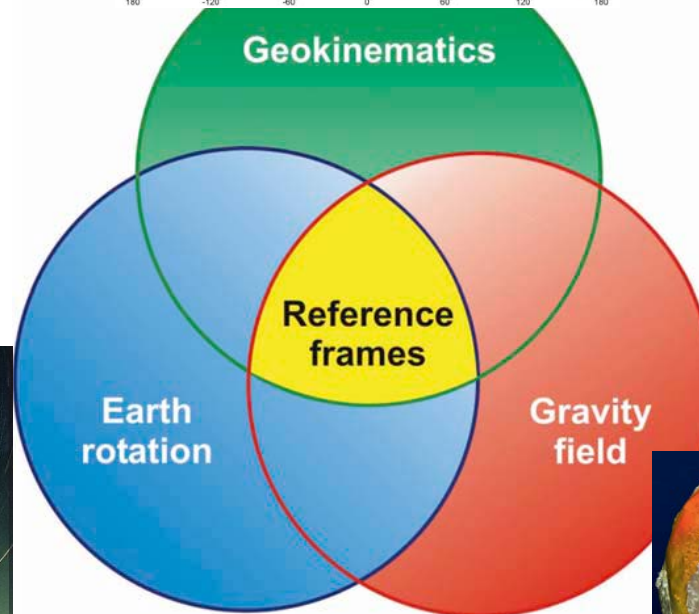
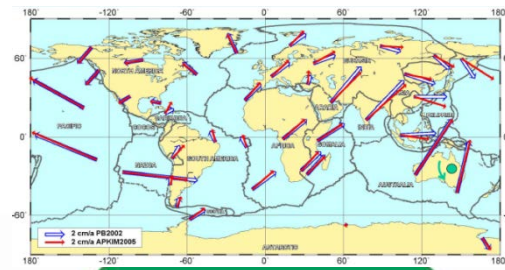
optical technique

microwave techniques



The role of SLR for GGOS

- All three pillars of global geodesy within one space geodetic technique



The role of GGOS

Welcome to GFZ Potsdam and welcome to the ...



20th Int. Workshop on Laser Ranging



October 9-14, 2016 Potsdam, Germany



<http://iwslr2016.gfz-potsdam.de/>

Prof. Harald Schuh
IAG President

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