IUGG
IAG AIG
International Association of Geodesy

Newsletter
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The *IAG Newsletter* is under the editorial responsibility of the *Communication and Outreach Branch* (COB) of the IAG.

It is an open forum and contributors are welcome to send material (preferably in electronic form) to the IAG COB (newsletter@iag-aig.org). These contributions should complement information sent by IAG officials or by IAG symposia organizers (reports and announcements). The *IAG Newsletter* is published monthly. It is available in different formats from the IAG new internet site: http://www.iag-aig.org

Each *IAG Newsletter* includes several of the following topics:

I. news from the Bureau Members
II. general information
III. reports of IAG symposia
IV. reports by commissions, special commissions or study groups
V. symposia announcements
VI. book reviews
VII. fast bibliography

General Announcements

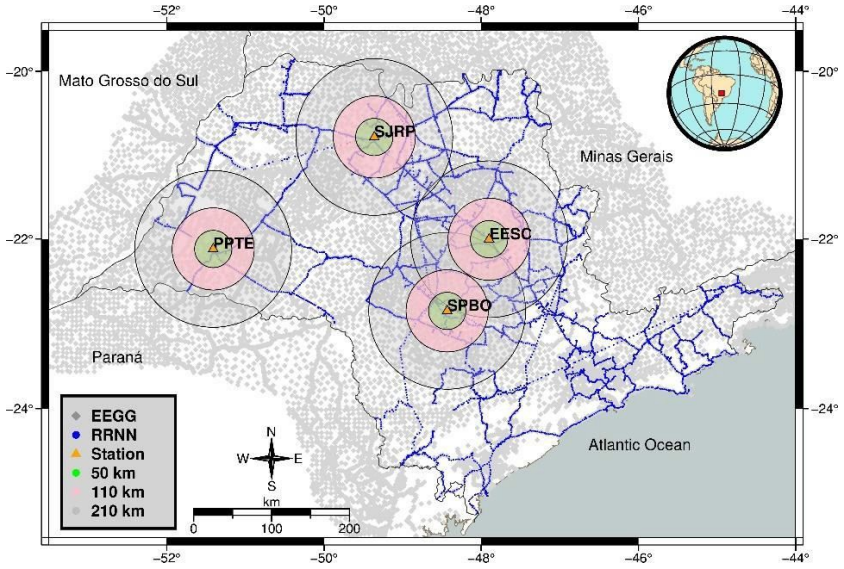
The disturbing gravity potential at four IHRF stations in São Paulo state

In order to collaborate with the establishment of the International Height Reference Frame (IHRF), the Polytechnic School of the University of São Paulo, Department of Engineering Transportation (EPUSP-PTR) addressed an effort to estimate the disturbing and the gravity potential at four stations in the São Paulo state.

The study was performed considering the radius of 110 and 210 km around the computation point, aiming to evaluate the convergence of the results for both cases. The Residual Terrain Model (RTM) technique has been applied for the estimation of the short wave length component.

The selected stations (Figure 1) have a good gravity coverage and they are part of the Brazilian Network for Continuous GNSS Monitoring (RBMC). Absolute gravity value was also measured in the points with A-10 Micro-g LaCoste absolute gravitymeter. Then station of Presidente Prudente (PPTE), is proposed for the global network and the other three, Botucatu (SOBO), São Carlos (EESC) and São José do Rio Preto (SJRP) are part of a local network.

Figure 1- São Paulo IHRF stations.



The computation has been carried out solving the second geodetic boundary value problem using the numerical integration. The program, developed at EPUSP, named HOTINE_5MIN, uses the modified Hotine integral to compute the short wavelength component of the disturbing potential (T_P).

The geopotential model GOCO05S was used as the reference field with degree and order 100 and 200, according to the integration radius. For the RTM the version SRTM15_PLUS was used. The disturbing potential values are shown in Table 1.

Table 1 – T_P computed (m^2s^{-2}).

GOCO05S	***nmax*: 100**	***nmax*: 200**
Botucatu	-48.60	-49.83
Presidente Prudente	-52.05	-47.04
São Carlos	-56.31	-60.57
São José do Rio Preto	-65.30	-65.28

The results, as expected, have shown a high dependence on the long wavelength components in the disturbing potential, but not homogeneously. The MGG T_P values used in the restore procedure have a difference between order and degree 100 and 200 of 4.98 and -3.82 m^2s^{-2} in Presidente Prudente and São Carlos stations, respectively. While, Botucatu and São José do Rio Preto this difference is -1.50 and 0.54 m^2s^{-2}. On the other hand, the T_P values of the São José do Rio Preto station (line 5 of Table 1) showed the proximity of the results of T_P with nmax: 100 and 200. The values for gravity potential are shown in Table 2.

Table 2 – Gravity potential of IHRF stations (m^2s^{-2}).

GOCO05S	nmax: 100	nmax: 200
SPBO	62,628,902.20	62,628,900.98
EESC	62,628,676.70	62,628,672.44
PPTE	62,632,537.93	62,632,542.94
SJRP	62,631,486.70	62,631,486.72

The RTM technique showed the importance of considering the high frequencies of the gravity field for the reduction of residues and the convergence of results between achievements in a radius of 110 and 210 km. Some further studies will be carried out with high spatial resolution DTMs, as well as different MGGs models. An attention will be addressed to least square collocation to compare with numerical integration.

VALÉRIA CRISTINA SILVA

DENIZAR BLITZKOW

ANA CRISTINA CANCORO OLIVEIRA DE MATOS

25 years of continuous measurements of gravity in Membach

On August 4, 2020, the superconducting (or cryogenic) gravimeter has been measuring for 25 years the variations of gravity with a precision of one-hundredth of a billionth (10^{-11}) of g (g = 9.81 m/s²).

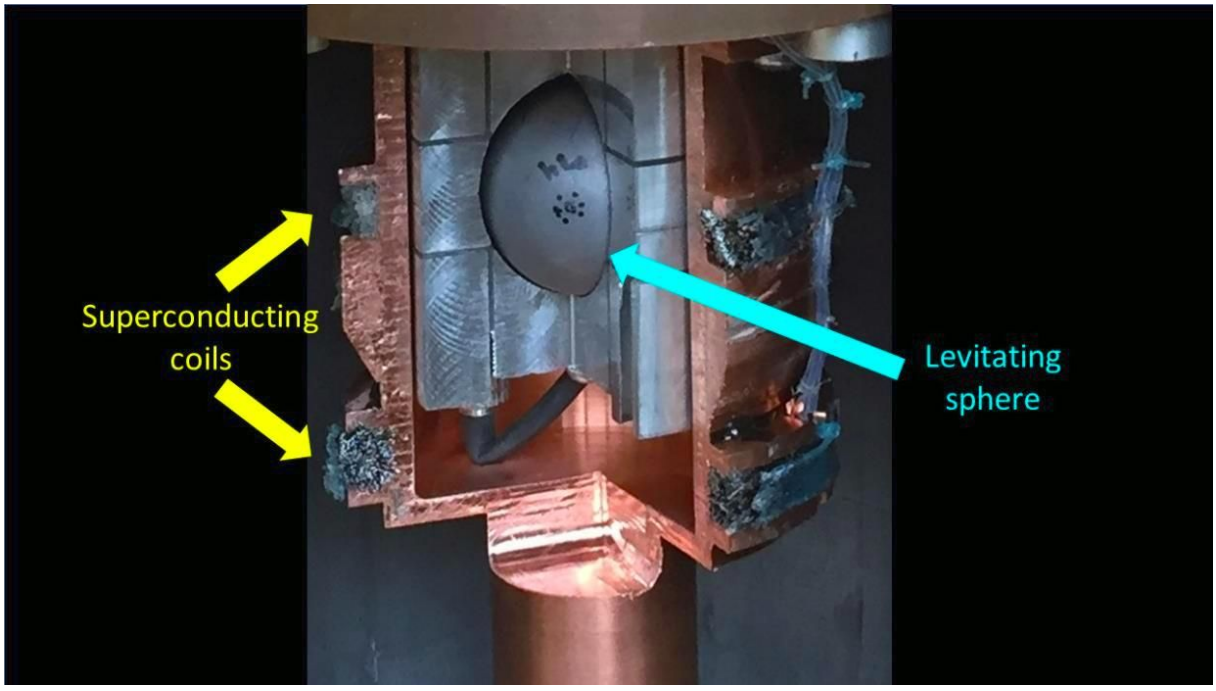
Since September 18, 2017, this instrument holds a double world record, in gravimetry and physics:

1. Record of the cryogenic gravimeter that has operated the longest at a given location;
2. It is also, as far as we know, the longest levitation of a superconducting artefact in a magnetic field. This field is generated by persistent currents, which were injected in 1995 into superconducting coils, where they circulate since then without any resistance and therefore, without ever having been dissipated. Although this record does not contradict what physicists specializing in persistent currents expect – in theory, a superconducting current can flow forever –, it is at least worthy of a place in a "cabinet of curiosities".

In the field of geophysical research at the Observatory, these measurements are important, among other things because they provide insight in long-term variations in gravity, still poorly understood, caused by slow tectonic movements or climatic variations. It is also important for the study of the water cycle whose varying masses influence gravity.

To date, this gravimeter participates in many research projects and the Royal Observatory of Belgium hopes to be able to perform this type of measurement for many years to come.

The superconducting gravimeter is located at the end of a 132 m – long gallery, 48 meters underneath the surface, in Membach (city of Baelen, eastern Belgium). The instrument sensor is immersed in liquid helium in which the temperature is held at -269°C, in other words 4 degrees above absolute zero, allowing superconductivity. *Photo credits: E. Coveliers (gravimeter & gallery); B. Frederick (Sensor)*



Exploded view of the sensor of a superconducting gravimeter: the 4-gram hollow sphere levitates in a magnetic field generated by currents flowing through the pair of coils. Photo of the sensor from the old instrument of Uccle, today on display at the Planetarium. *Photo credit: E. Coveliers & ORB-KSB. Copy authorized with mention of the source.*

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Meeting Announcements

Meetings Calendar

IAG Sponsored Meetings

2nd International Symposium of Commission 4: Positioning and Applications

September 7 –11, 2020, Potsdam, Germany
URL: https://iag-commission4-symposium2020.net/

International Autumn School "NEROGRAV"

October 5 – 9, 2020, Bad Neuenahr, Germany
URL: https://www.bgu.tum.de/iapg/nerograv/

International Workshop on GNSS Ionosphere (IWGI2020)

October 19 –21, 2020, Shanghai, China
URL: http://202.127.29.4/geodesy/iwgi2020/index.html

International DORIS Service Workshop (Virtual Workshop)

October 19 –21, 2020, Venice, Italy
URL: http://ostst-altimetry-2020.com/home/

22nd International Workshop on Laser Ranging

November 2 – 6, 2020, Kunming, China
URL: https://ilrs.cddis.eosdis.nasa.gov/about/meetings.html

43rd COSPAR Scientific Assembly

January 28 – February 4, 2021, Sydney, Australia
URL: http://www.cospar2020.org/

EUREF 2021 Symposium

May 26 –28, 2021, Ljubljana, Slovenia
URL: https://euref2020.si/

19th International Symposium on Geodynamics and Earth Tides (G-ET Symposium 2020)

June 22 –26, 2021, Wuhan, China
URL: http://get2020.csp.escience.cn/

IAG Scientific Assembly

June 28 – July 3, 2021, Beijing, China
URL: http://www.iugg.org/meetings/assemblies.php

IGS Workshop "IGS 2021: Science from Earth to Space"

September 27 – October 1, 2021, Boulder, CO, USA
URL: https://www.igscb.org/workshop2021/

IAG Related Meetings

International Symposium on Satellite Navigation (ISSN 2020)

October 21 – 24, 2020, Nanjing, China
URL: http://issn2020.csp.escience.cn/dct/page/1

22nd meeting of the Consultative Committee for Time and Frequency (CCTF)

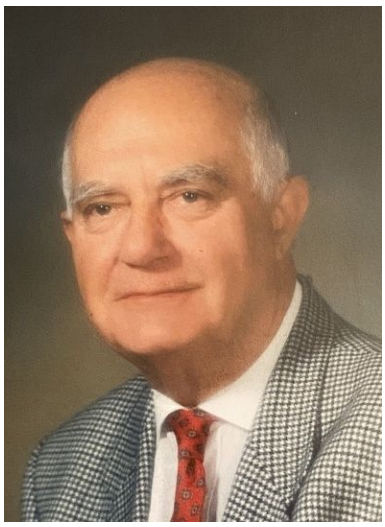
October 26 –30, 2020, Sèvres, France
URL: https://www.bipm.org/en/committees/cc/cctf/

AOGS Annual 18th Meeting

August 1-6, 2021, Singapore
URL: http://www.asiaoceania.org/society/public.asp?view=up_coming

Obituary

Adam Chrzanowski (1932 – 2020)



Professor emeritus Adam Chrzanowski died on Friday, June 12, 2020.

Adam was born in 1932 in Kraków Poland, the city where he grew up and obtained a bachelor's, a master's, and a doctoral degree from the Academy of Mining and Metallurgy (now the AGH University of Science and Technology). He served as faculty member of AGH from 1956 until 1964, when he moved to Canada to take over an NRC postdoctoral fellowship at the then Department of Surveying Engineering at the University of New Brunswick (UNB). Two years later, he was appointed as a faculty member of the department and he never left us. He remained active until his last breath, a full 56 years in various capacities. Adam served as chair of the Department of Surveying Engineering at UNB between 1990 and 1992, leading the process that led its renaming to Department of Geodesy and Geomatics Engineering. He has also served as Director of the Canadian Centre for Geodetic Engineering at UNB since 2011 and Vice- President of Monitoring Systems, Ltd. since 2006.

Adam was a leading expert in mining and engineering surveys and his contributions have touched many individuals and institutions around the world. Among his major accomplishments were participation in the Mt. Kennedy mapping expedition in 1965, implementation of emerging laser technology in new surveying techniques of high precision, pioneering application of GPS in ground subsidence studies in the 1980s, development of a generalized method of geometrical analysis of structural and ground deformations, development of fully automated deformation monitoring systems, and development of integrated analysis of structural and rock mass deformations. Highlights of his contributions to engineering and mining surveying include subsidence studies in the oil fields of Venezuela; monitoring of tectonic movements in Peru; design of geodetic control and tunnelling surveys for the Superconducting Super Collider in Texas; monitoring and analysis of dam deformations in Canada, Pakistan, and the U.S.; and monitoring of slope stability in open pit mines in Canada, Chile, and Poland.

Adam co-founded the International Society of Mine Surveying and authored or co-authored over 300 papers and seven books on geodetic, engineering, urban, and mining surveys, including the very influential *Urban Surveying and Mapping*. He also held visiting appointments at several universities around the world and received honorary degrees from the Technical University of Mining and Metallurgy in Kraków, the University of Warmia and Mazury in Olsztyn, and the Technical University of Surveying and Mapping in Wuhan.

In addition to his teaching and mentoring duties, Adam was a foreign member of both the Polish Academy of Sciences and the Polish Academy of Arts and Sciences. He also won many other national and international awards, including the Knight's Cross of the Order of Merit (awarded by the president of Poland) in 1995 and the Gold Medal of Merit from the Ministry of Resources (Poland) in 2000, among others.

In 2014, Adam Chrzanowski delivered a lecture during an event celebrating his 50 years of professional life at UNB. A video of this lecture can be found on YouTube (www.youtube.com/watch?v=GbnU7oWcyxo).

MARCELO SANTOS