European Geosciences Union

Geodesy Division Meeting

Wednesday 10.4.2013

Markku Poutanen and Michael Schmidt

Agenda

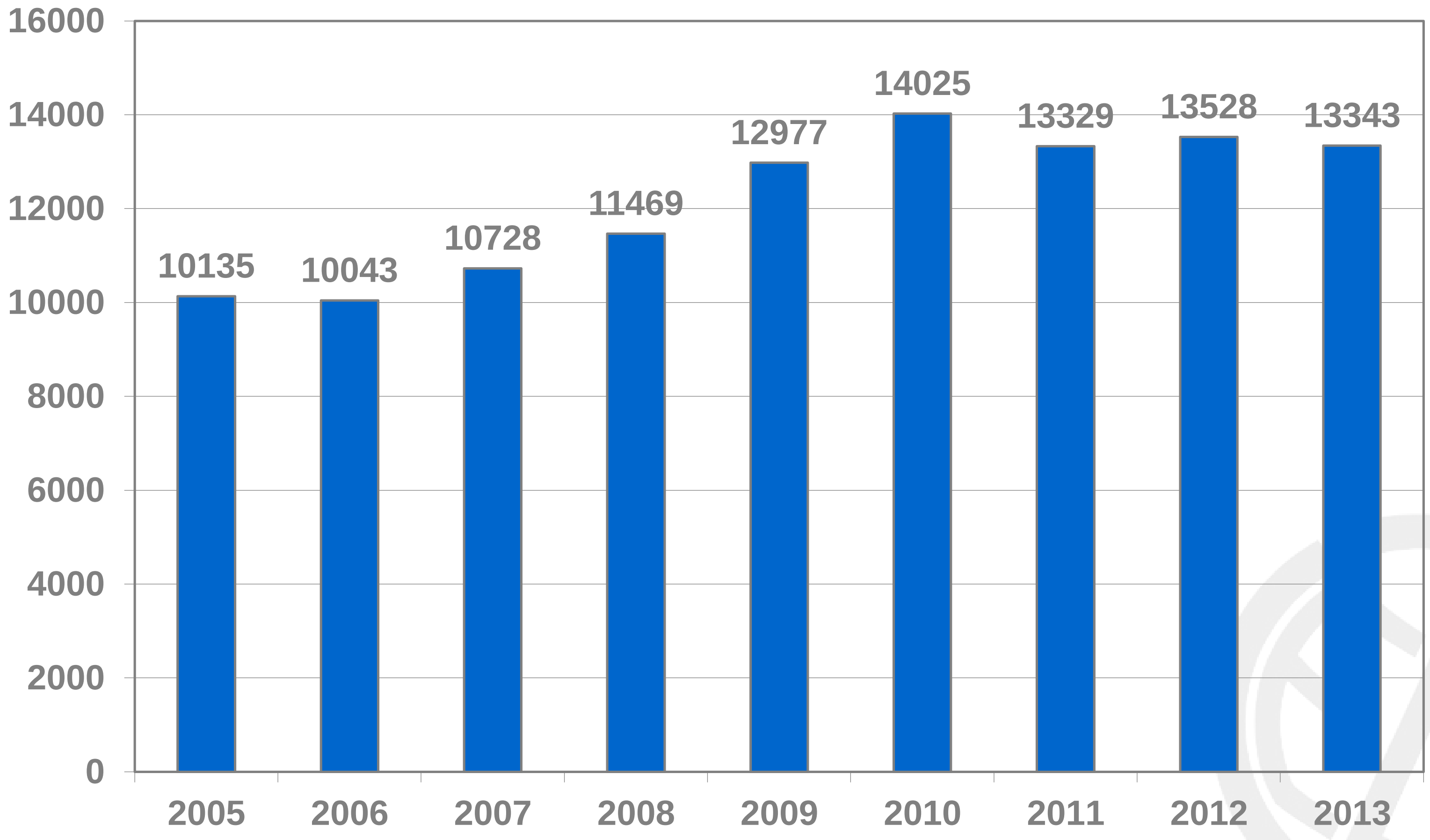
- EGU 2013, Geodesy statistics
- Sessions 2013, call for sessions 2014
- Vening-Meinesz medal
- EGU Outstanding Student Poster Award in Geodesy
- Organization of G Division; elections
- Miscellenaneous
- AOB

EGU General Assembly 2013 Facts

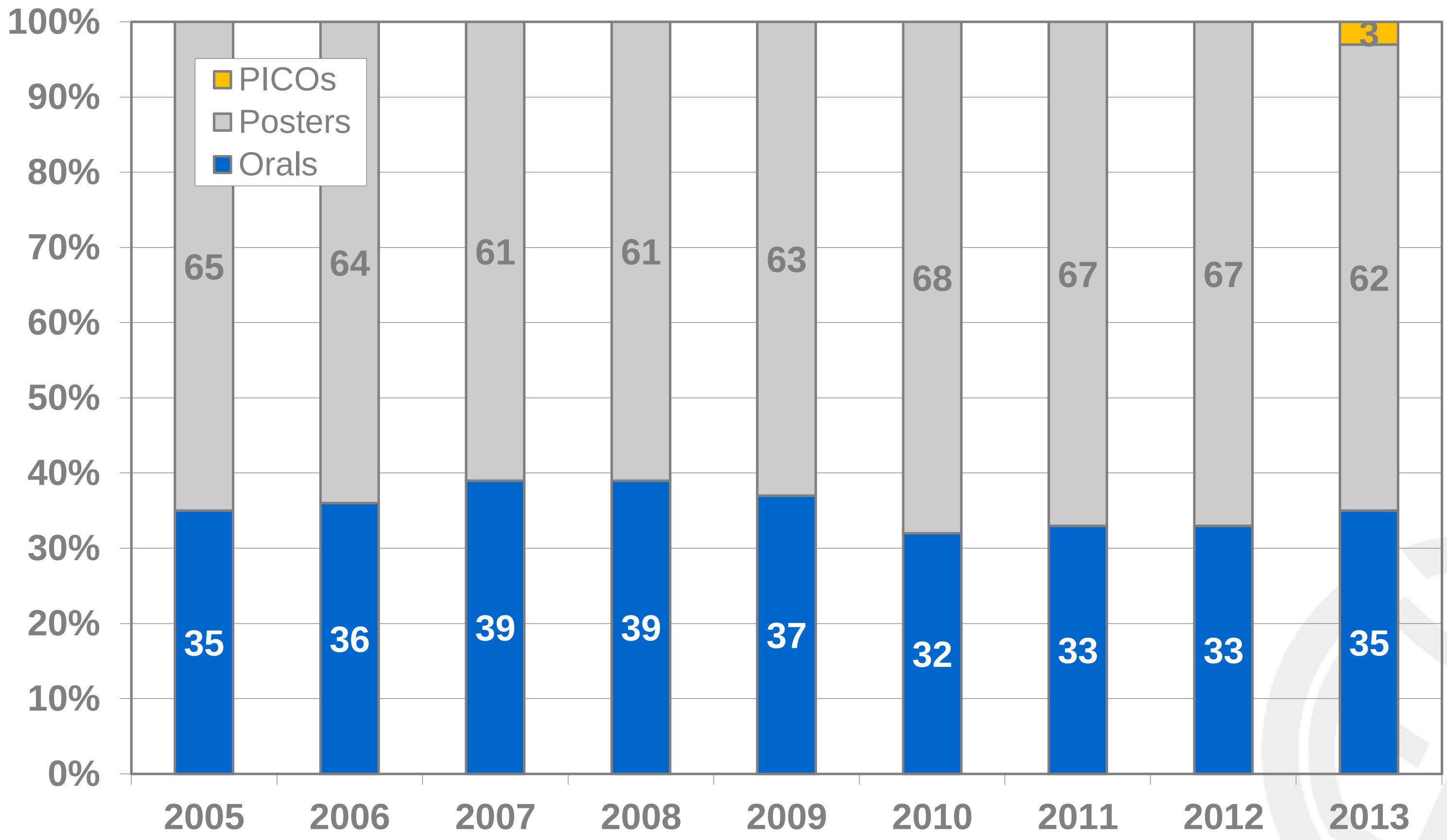
As of 04 April (before opening), the Assembly 2013 provides:

- 13,343 Papers in Programme | -1.4% (2012)
- 4,684 Orals | 8,207 Posters | 452 PICOs | Ratio 35 / 62 / 3
- 448 unique scientific Sessions | 96 PSD Sessions | 143 Side Events*
- 9,876 Registrations in Advance (thereof 8,631 already paid) | +13.0% (2012)

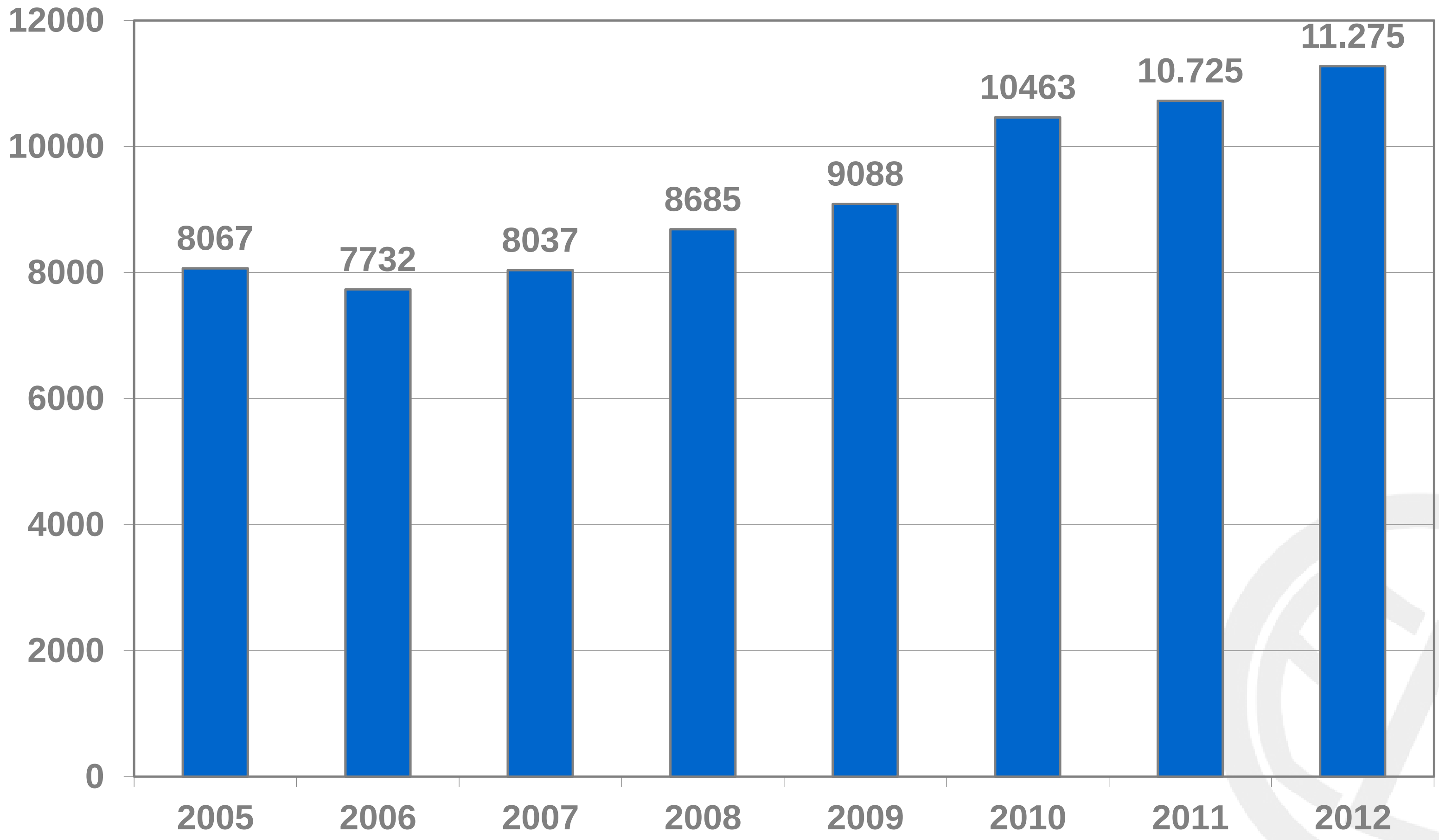
Papers in Programme 2005–2013



Presentation Ratio 2005–2013



Participants at EGU Assemblies 2005–2012

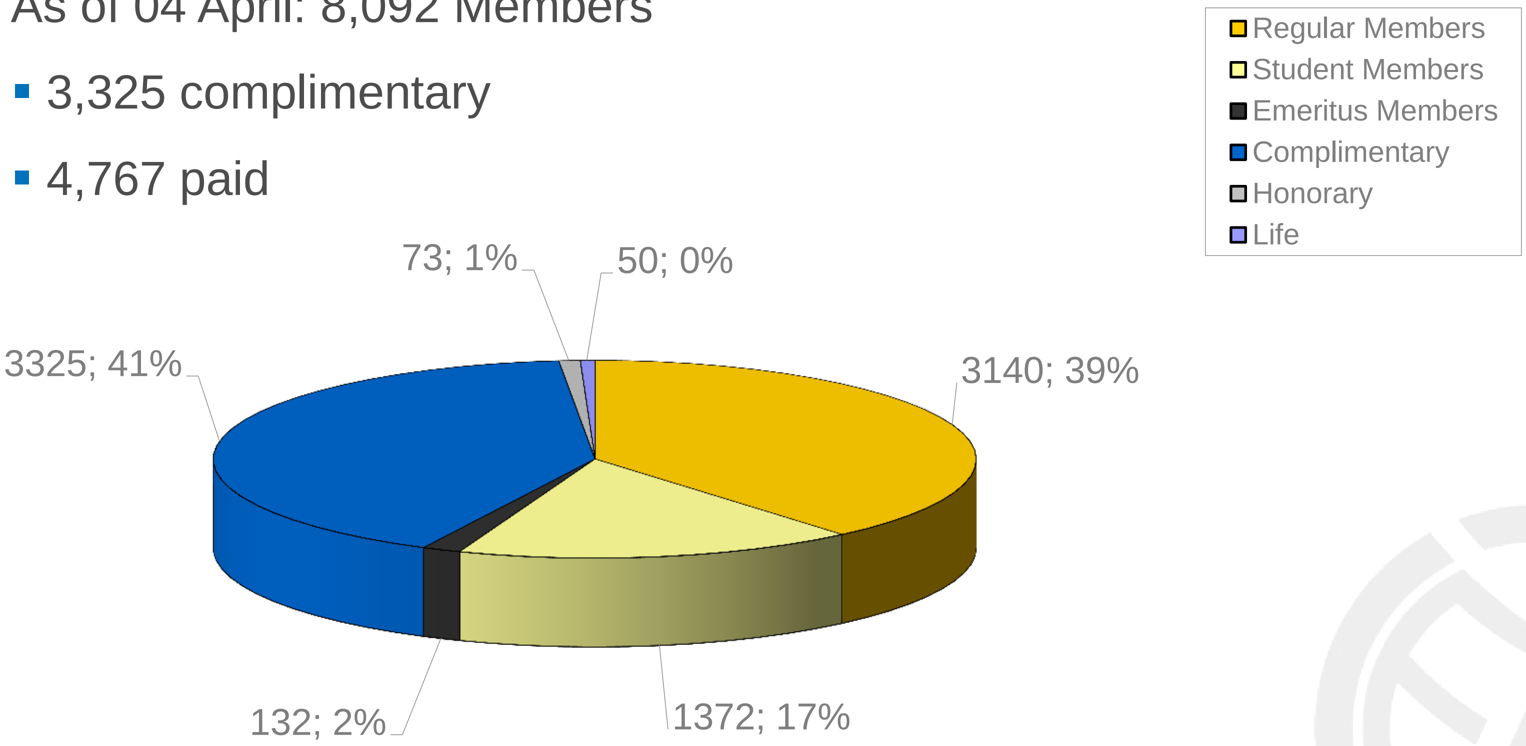


European Geosciences Union

EGU Memberships 2013

As of 04 April: 8,092 Members

- 3,325 complimentary
- 4,767 paid



PG	Pref. Oral	Pref. Oral %	Pref. Poster	Pref. Poster %	Total 2013	Total 2012	Growth	M
US								
EG								
EOS	39	35%	72	65%	111	107	4%	
AS*	855	60%	580	40%	1435	1178	22%	
BG	448	64%	248	36%	696	659	6%	
CL	634	59%	447	41%	1081	1153	-6%	
CR*	234	57%	173	43%	407	422	-4%	
EMRP	104	59%	71	41%	175	216	-19%	
ERE	242	58%	172	42%	414	442	-6%	
ESSI	178	71%	72	29%	251	200	[illegible]	
G	210	55%	171	45%	381	367	4%	
GD	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
GI	217	63%	128	37%	345	267	29%	
GM*	307	58%	222	42%	529	544	-3%	
GMPV	214	57%	159	43%	373	664	-44%	
HS	1022	58%	754	42%	1776	1799	-1%	
IG	61	46%	73	54%	134	148	-9%	
NH	585	61%	367	39%	952	1067	-11%	
NP	245	65%	132	35%	377	438	-14%	
OS	384	64%	219	36%	603	543	11%	
PS	259	63%	150	37%	409	473	-14%	
SM	250	50%	255	50%	505	490	3%	
SSP	88	49%	90	51%	178	249	-29%	
SSS	534	54%	463	46%	997	958	4%	
ST*	266	59%	186	41%	452	360	26%	
TS	487	56%	377	44%	864	836	3%	
					13794	13999		

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[illegible]	[illegible]	[illegible]	[illegible]	37%	409	473	-14%	
[illegible]	[illegible]	[illegible]	[illegible]	50%	505	490	3%	
[illegible]	[illegible]	[illegible]	[illegible]	51%	178	249	-29%	
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					13794	13999		

15th position

G1.1	Recent Developments in Geodetic Theory
G1.2	Mathematical methods in the analysis and interpretation of potential field data …
G1.3	High-Precision GNSS Algorithms and Applications in Geosciences
G2.1	The Global Geodetic Observing System: Next Generation Systems, Science and …
G2.2	The International Terrestrial Reference Frame: Preparation for the next Release …
G3.1	Glacial Isostatic Adjustment, Mantle Viscosity and Ice Sheet Fluctuations
G3.2	Determination of Mass Transport and Distribution in the Earth System
G3.3	Observing and understanding Earth rotation variability and its geophysical excitation
G4.1	Gravity field research - data acquisition - processing and – interpretation
G4.2	Satellite Gravimetry: GRACE, GOCE and Future Gravity Missions
G5.1	Monitoring and modelling of the ionosphere from space-geodetic techniques
G5.2	Atmospheric Water Vapour Retrieval by Space Geodetic Techniques …
G5.3	Time dependent geodetic motions at convergent margins
G6.1	Geodetic and Geodynamic Programmes of the Central Europe
G6.2	Geodynamics of Eurasia: The Contribution of the Geodetic Community to EPOS
G6.3	Geodesy in Antarctica

	abstracts	oral slots	orals	posters	ratio
G1.1	22	1	6	16	0.27
G1.2	15	1	6	9	0.40
G1.3	28	2	12	16	0.43
G2.1	28	2	12	16	0.43
G2.2	36	2	12	24	0.33
G3.1	26	1	7	19	0.27
G3.2	24	1	7	17	0.29
G3.3	18	1	6	12	0.33
G4.1	48	3	18	30	0.38
G4.2	45	3	18	27	0.40
G5.1	16	1	6	10	0.38
G5.2	21	1	6	15	0.29
G5.3	3	0	0	3	0.00
G6.1	21	1	6	15	0.29
G6.2	22	1	6	16	0.27
G6.3	6	0	0	6	0.00
	379	**21**	**128**	**251**	**0.34**

- 14 abstracts necessary for one oral slot
- For selected slots 7 instead of 6 oral presentations have been placed

Session plan

	mo	tu	we	th			fr		
8:30-10	6.1	2.2	2.1	4.1	1.3		4.2	5.1	
10:30-12	1.1	2.2	2.1	4.1	1.3		4.2	5.2	*6.2*
12:15-13:15			BM						
13:30-15	1.2	3.2	Meet EGU?	4.1		PICO		6.2	*5.1, 5.2*
15:30-17	3.3	3.1		4.2		6.3			
17:30-19	*6.1 ,1.1, 1.2,3.3*	*2.2, 3.2, 3.1, 5.3*	*2.1, 1.3*	*4.1, 4.2*					
19-20				VM medal					

- R13: 133 seats (green)
- R1: 670 seats (yellow)
- R14: 55 seats (blue)
- posters (pink)
- PICO (teal)

Call for sessions 2014

- Skeleton could be based on successful sessions at EGU 2013
- Proposals by mid-September 2013
  - No overlapping or similar topics; to be merged
  - Up-to-date topics
  - Realistic topics to attract enough contributions
  - Number of sessions reasonable?
- Programme committee: division president, vice presidents + 1-2 others to cover the whole field of geodesy

Vening Meinesz Medal

This medal has been established by the Division on Geodesy in recognition of the scientific achievements of Vening Meinesz.

It will be awarded by the EGU for distinguished research in Geodesy.

Previous Vening Meinesz medallists

Vening Meinesz Medallists

	2012 Che-Kwan Shum		2011 Harald Schuh		2010 Philip L. Woodworth
	2009 Susanna Zerbini		2008 Carl-Christian Tscherning		2007 Thomas Herring
	2006 Gerhard Beutler		2005 Martine Feissel-Vernier		2004 John Wahr

2013 Vening Meinesz Medal:
Zuheir Altamimi

The 2013 Vening Meinesz Medal is awarded to Zuheir Altamimi for his invaluable research in the development and continuous improvement of the International Terrestrial Reference Frame (ITRF) and for his important contribution to space geodetic research.

Division Medal Ceremony and the Medal Lecture will be on Thursday, 11.4.2013, 19:00-20:00 Room R1.

WELCOME

Title: **The International Terrestrial Reference Frame: current status and future challenges**

Division Outstanding Young Scientists Award

- The Division Outstanding Young Scientist Award recognizes scientific achievements in the field covered by the related Division, made by a young scientist.

Division Outstanding Young Scientists Award

- In 2012 Xavier Collilieux won the award.
- In 2013 no awardee

Please nominate candidates for this very important Award!

Call for nominations

- Nominations for all the medals and Union Service Award are to be sent to the e-mail address awards.medals@egu.eu by **15 June** of each year (absolute deadline) in pdf format. Only EGU members can submit nominations.
- Nominations for the Outstanding Young Scientist Award are to be sent to the e-mail address awards.medals@egu.eu by **15 June** of each year (absolute deadline).
- See http://www.egu.eu/awards-medals/proposal-and-selection-of-candidates.html for details
- (reminder will be send by me end of May)

EGU Outstanding Student Poster (OSP) Award

"… to further improve the overall quality of poster presentations and, most importantly, to foster the excitement of younger colleagues in presenting their work in form of a poster."

Awarded in Divisions, based on evaluation of Judges during the poster sessions.

The **awardees receive** a conference fee waiver for the next EGU General Assembly and are invited to submit a paper free of publication costs to one of the EGU journals. At the Division meeting of the respective division held at the next General Assembly, each awardee receives an award certificate.

EGU2012 OSP Award Winners G

Eszter Szücs

The 2012 Union Outstanding Student Poster (OSP) Award is awarded to Eszter Szücs for the poster entitled:

Effect of the difference between surface and terrain models on gravity field related quantities

(E. Szücs and G. Papp)

European Geosciences Union
General Assembly 2012
Vienna | Austria | 22 – 27 April 2012

EFFECT OF THE DIFFERENCE BETWEEN SURFACE AND TERRAIN MODELS ON GRAVITY FIELD RELATED QUANTITIES

Eszter Szűcs*, Gábor Papp

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Abstract

Topographic masses have a strong impact at the medium and short wavelengths of the gravitational signal generated by the mass of the Earth, thus in gravity field modelling digital terrain models (DTM) data are routinely involved. In this study the verification of the Shuttle Radar Topographic Mission (SRTM, Jarvis et al. 2008) and the Advanced Spaceborne Thermal Emission and Reflection Radiometer Global Digital Elevation Model (ASTER GDEM) which is a product of METI and NASA has been done by comparing them to the national horizontal and vertical control networks of Hungary. SRTM data fits better to geodetic ground control points than ASTER GDEM, since some artefacts have been found in ASTER elevation set which impede further use of ASTER without any pre-processing. Since SRTM is an "unclassified" surface model including all those points which reflected to the scanning radar signal thus tree canopy height has been compared to SRTM minus DTM differences in a hilly test area where a local and accurate DTM having 20 m × 20 m horizontal resolution was available. Considerable agreement has been found between forest height and model differences. Model differences have been evaluated to determine their effect on gravity related quantities. Their influence on geoid height has been found insignificant, but the change in the investigated second derivatives of the potential is considerable.

Surface models and evaluation their vertical accuracy for Hungary

Tabl. 1. Overview of the investigated elevation models

features	ASTER GDEM	SRTM3 DEM
data sources	stereo pair of images	radar interferometry
resolution	1 arc sec (~30 m)	3 arc sec (~90 m)
data acquisition period	2000- 2007	2000 (February 11 day-long campaign)
vertical accuracy	± 20 m (95% confidence)	± 16 m (90% confidence)
coverage	~ 83N- 83S	~ 60N- 56S
missing data	cloud cover	topographically steep areas, water bodies

To validate SRTM3 and ASTER GDEM (Tabl. 1.) quality the surface models have been compared to about 5k and 27 thousand control points of the Unified National Horizontal Network (EOVA) and the Unified National Height System (EOMA) of Hungary respectively (Tabl. 2), using bilinear interpolation method.

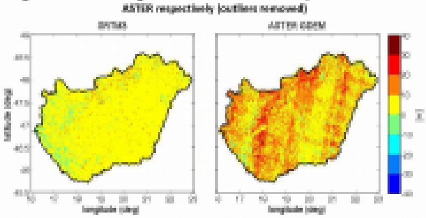
Tabl. 2. Statistics of model comparison with geodetic network points (units in m)

statistics	Horizontal Network		Vertical Network	
	ASTER	SRTM3	ASTER	SRTM3
Minimum	-58.9	-40.4	-179.2	-184.4
Maximum	201.3	187.4	217.6	205.9
Mean	10.4	3.8	7.1	1.2
Standard dev.	± 8.8	± 5.4	± 8.1	± 5.9

Disregarding large discrepancies in some individual points the differences between horizontal control points and SRTM3 are rather small (Fig. 1, left side). Beyond the statistics ASTER differences (Fig. 1, right side) display a strange stripe-like pattern. These step anomalies are caused from the different swath-orientated stack number zones. Stack numbers shows the number of ASTER DEMs (a DEM is a result one flight over the same area) contributing to the final ASTER GDEM, step anomalies cause an offset in the ASTER GDEM tiles.

The difference among vertical network points and the surface models shows a similar pattern (not shown here), indicating that SRTM3 fits better to ground data than ASTER GDEM.

Fig. 1. Differences the heights of horizontal control network points and SRTM3 and ASTER respectively (outliers removed)



Comparison of terrain and surface models in a local test area using tree canopy height map

The investigated area was chosen in the south part of the country and has an area of approximately 7.5 km × 5 km and is located in a hilly region of the Mecsek Mountains. The elevation of the topography varies between 130 and 380 meters; the south part of the area is covered by forests. The digital terrain model (DTM) was generated by scanning the 1:10,000 topographic maps of this region. DTM was derived by bilinear interpolation from the points of the digitized topographic contour lines onto the grid of SRTM3 heights for point wise comparison.

For the investigation of model differences only the SRTM3 elevations have been used, because of the artefacts related to ASTER GDEM discussed in the previous section.

The difference

$$\delta H = H_{SRTM} - H_{DTM} \tag{1}$$

should agree with the tree canopy height. For its investigation a forest height model was used. It was produced using the tree canopy height data bank valid for the epoch 2001 and maps showing the boundaries of the woods classified by species and ages of trees.

Fig. 2. and 3. show that elevation models differences are in agreement with the forest height, for example in the southwest, in the south or in the east part of the forestry area.

Fig. 2. Differences SRTM minus DTM in forest-clad regions. Black lines indicate the boundaries of woods

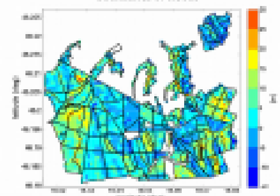
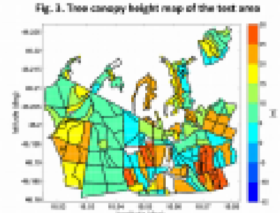
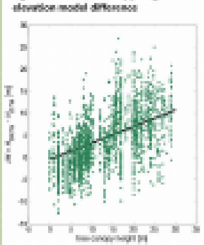


Fig. 3. Tree canopy height map of the test area



Taking the scatter plot (Fig. 4.) of the canopy height and the SRTM minus DTM differences given by Eq. (1) it can be noticed that there is a moderate relation between them characterized by r = 0.65 correlation coefficient. ΔH model differences in forest-clad regions with respect to different vegetation height intervals are given in Tabl. 3. It can be seen that these are consistent with the height of vegetation.

Fig. 4. Correlation canopy height with elevation model difference



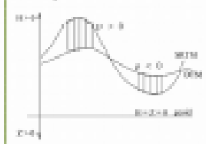
Tabl. 3. Eq (1) differences in forest-clad regions as a function of tree canopy height intervals

tree canopy height intervals [m]	$\Delta H \geq 0$ [%]	$\Delta H < 0$ [%]
0 – 5	29	71
5 – 10	62	38
10 – 15	77	23
15 – 20	90	10
20 – 25	92	8
25 – 30	91	9

Calculating gravitational effect of elevation model differences

ΔH model differences have been analysed in order to compute their effect on the disturbing potential and on its derivatives using the prism-integration forward modelling method. In planar approximation rectangular prisms have been utilized for the discretization of the ΔH differences in a right rectangular coordinate system having a Z axis pointing downward. A constant densities of ρ = 2 gcm^{-3} and ρ = -2 gcm^{-3} were applied when SRTM surface was above and below the DTM topography, respectively. This way the density model represents the elevation differences as mass surplus and mass deficiency (Fig. 5). The density distribution map shows (Fig. 6) that SRTM elevations are higher in the southern forest-clad part of the test area. The computations have been carried out on geoid surface (i.e. H = 0 m) using rectangular prisms having uniform horizontal size of 90 × 60 meters, which is approximately equal to the resolution of SRTM3 at the latitude of the test site.

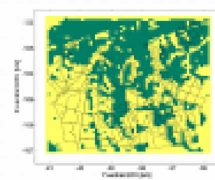
Fig. 5. Explanation of density model (mass surplus and mass deficiency) and the orientation of vertical coordinate axes used for elevation and prism modelling



$H_{SRTM} > H_{DTM}$ → mass surplus

$H_{SRTM} < H_{DTM}$ → mass deficiency

Fig. 6. Prism model and density distribution for computation of its gravitational effect. Coordinates are given in central map projection system (EOV) of Hungary.



ρ = -2 gcm^{-3}

ρ = +2 gcm^{-3}

Gravitational effect of model differences on gravity related quantities

The gravitational effect of the ΔH differences has been determined on geoid height (N), gravity anomaly (Δg) and horizontal gradients of the vertical component of the gravity vector (T_{zx}, T_{zy}) (Tabl. 4).

Tabl. 4. Statistics of effects on gravity related quantities due to model differences

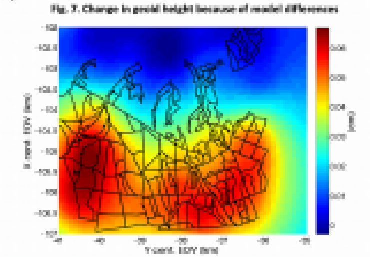
statistics	N [cm]	Δg [mGal]	T_{zx} [E]	T_{zy} [E]
Mean	0.03	-0.10	0.2	0.4
Standard dev.	0.02	0.21	3.6	2.9
Minimum	0.00	-0.89	-12.7	-9.4
Maximum	0.07	0.32	12.0	10.0

The change in geoid undulation (Fig. 7) due to the elevation model differences is small, the largest variation reaches only 0.07 cm in forestry region, which is negligible.

The first derivative of the disturbing potential (gravity anomaly) varies in a 1 mGal (1 mGal = 10^{-5} ms^{-2}) interval, from -0.89 mGal to 0.32 mGal (Fig. 8). The largest absolute values occur in regions covered by forests. Since the Z axis points downward, i.e. contrary to H, the negative sign indicates that mass surpluses ($H_{SRTM} > H_{DTM}$) are located above the computational point (geoid); consequently positive sign means mass deficiency above the geoid.

The effect of model differences on the investigated second derivatives (Fig. 9), on horizontal gradients is remarkable. The horizontal derivatives vary between ± 10 E (1 E = 10^{-9} s^{-2}).

Fig. 7. Change in geoid height because of model differences



Gravitational effect of model differences on gravity related quantities (cont.)

Fig. 8. Gravitational effect of model differences on g_z

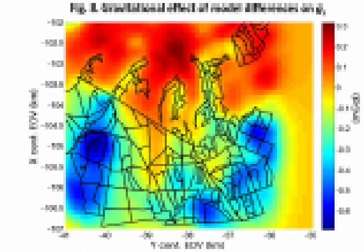
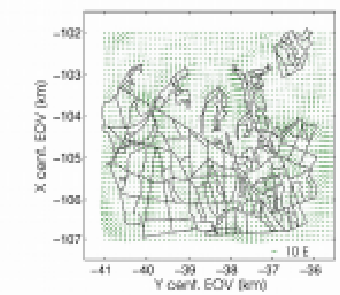


Fig. 9. Gravitational effect of model differences on T_{zx} and T_{zy} components of the Eötvös tensor



Conclusions

Gravity field modelling often take the advantage of the strong correlation between topography and the short wavelength parts of the gravity field. SRTM3 is a freely available global elevation model that could be applied for this purpose. However, SRTM3 is a surface model not a terrain one, thus SRTM3 heights are systematically higher in forest-clad and urban regions.

For a hilly test area located in the Mecsek Mountains, Hungary and covered by woods it has been shown that the model differences can be safely indicated and justified by the available tree canopy height data. Integrating the deviations between surface and terrain models as mass surplus and mass deficiency its gravitational effect on geoid height, gravity anomaly and some second derivatives of the potential was determined and analysed.

The effect on geoid height is negligible (< 1 mm), although the change of g_z on the geoid surface due to the differences is in the range of ± 0.5 mGal. Considerable effect was indicated in terms of the second derivatives (horizontal gradients), because these simulated "differential" quantities are close to the order of magnitude of the ones measured by Eötvös type torsion balance instruments all around in Hungary (± 10 E).

For local and regional gravity field determination high resolution national DTMs are preferred extending them with SRTM3 model beyond their borders to model remote masses. However in areas where no local terrain model is available SRTM could be used in geoid determination, since applying remove-restore procedure the gravitational effect of differences between surface and terrain models are supposed to be insignificant.

References

Jarvis A., H.I. Reuter, A. Nelson, E. Guevara (2008): Hole-filled seamless SRTM data V4, International Centre for Tropical Agriculture (CIAT), available from http://srtm.csi.cgiar.org.

METI/NASA 2009. ASTER Global Digital Elevation Model. Ministry of Economy, Trade and Industry of Japan (METI) and the National Aeronautics and Space Administration (NASA). Available at: http://www.ersdac.or.jp/GDEM/E/index.html

Nagy D., Papp G., Benedek J. (2000): The gravitational potential and its derivatives for the prism. Journal of Geodesy 74: 552-560.

Papp G., Szűcs E. (2011): Effect of the difference between surface and terrain models on gravity field related quantities. Acta Geod. Geoph. Hung. 46(4), 441-456. DOI: 10.1556/AGeod.46.2011.4.6

EGU2012 OSP Award Winners G

Grace Nield

The 2012 Union Outstanding Student Poster (OSP) Award is awarded to Grace Nield for the poster entitled:

The Effect of recent accumulation changes in the Antarctic Peninsula upon Glacial Isostatic Adjustment

(G.A. Nield, P.L. Whitehouse, M.A. King, P.J. Clarke, and M.J. Bentley).

Administration / Elections

President: Markku Poutanen (2009-2010, re-elected for 2011-2012)

Vice presidents:

- Michael Schmidt
- Johannes Bouman

President: Michael Schmidt (2013-2014)

Vice presidents:

- Johannes Böhm
- Johannes Bouman

Vice presidents approved unanimously by the Division meeting

Approval of the medal and award committees

- **Vening Meinesz medal committee**:

  four past medalist + *ex officio* Geodesy Division President and EGU Award committee chair (both non-voting). Second-year medalist chairing the committee.

  2014 committee: *Zuhier Altamimi* (1*), C.K. Shum* (2, chair), *Harald Schuh* (3), *Philip Woodworth* (4) [*Michael Schmidt, Alberto Montanari*].
- **Outstanding Young Scientist Award:**

  Division president + vice presidents + latest medalist
- **Outstanding Student Poster Award**:

  Division president + vice presidents

Committees approved unanimously by the Division meeting

European Geosciences Union

PICO – Presenting Interactive Content

- brings the advantages of both, **oral and poster**, together into an innovative type of presentation.
- A PICO session takes place at the **PICO Spot** which is a combination of an audience sitting in front of a screen together with a number of **Touch Screen Displays**.
- All authors present the essence of their work with **2 slides in 2 minutes**. Afterwards, the audience is using the touch screens spread in the PICO Spot to view again their PICO presentation(s) of interest.
- A PICO presentation might be a Power Point one, a movie, an animation, or simply a PDF showing your research on a display.

PICO Session G6.3:Geodesy in Antarctica

Thu, 11 Apr, 13:30–15:00 / Room PICO Spot 1

Please check the PICO presentation and send us your comments

Location of future EGU - GAs

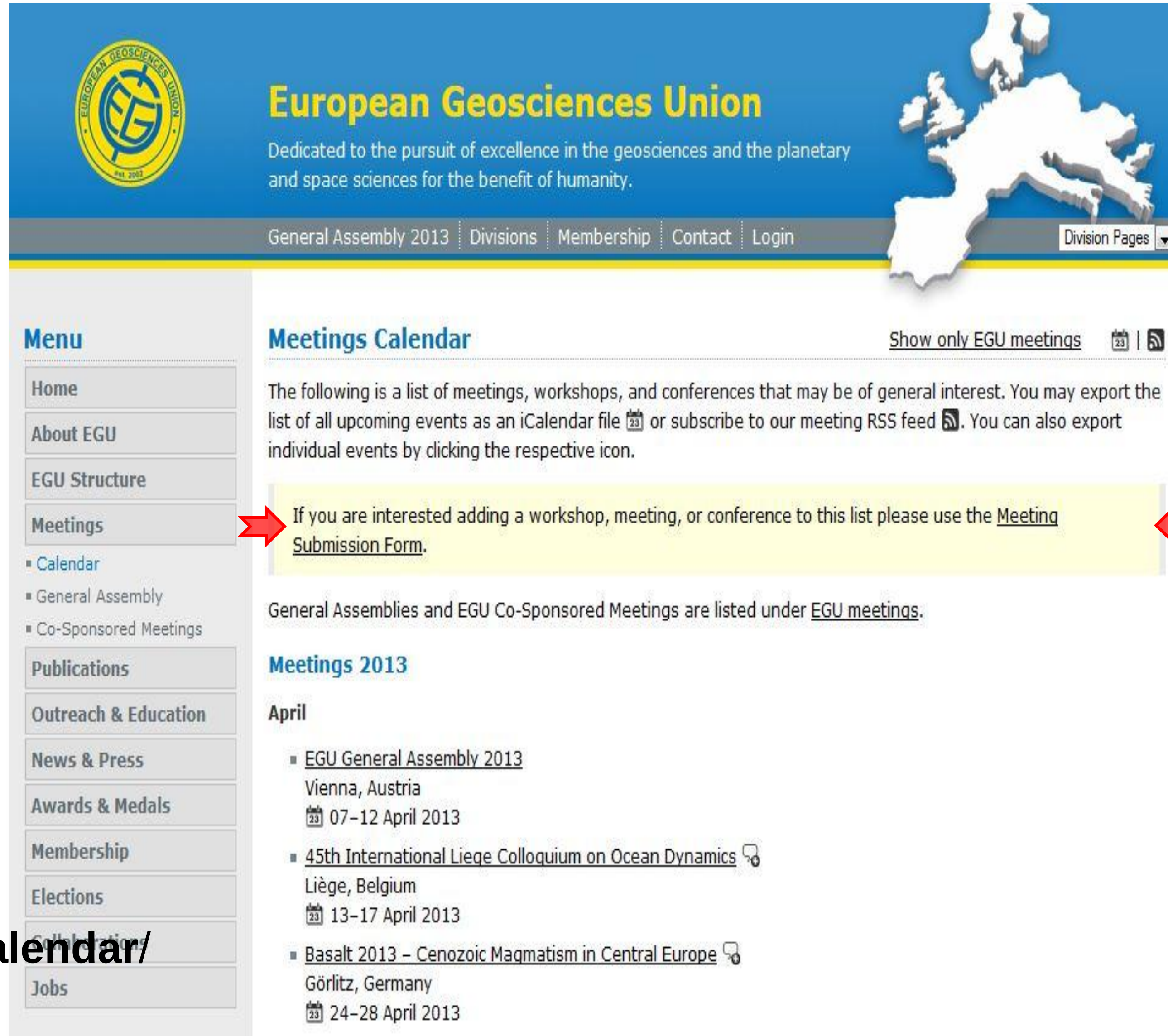
For the following dates, preliminary bookings have been made at the Austria Center Vienna:

13 – 17 April 2015
25 – 29 April 2016
08 – 12 May 2017
23 – 27 April 2018
15 – 19 April 2019

30 March – 03 April 2020
19 – 23 April 2021
04 – 08 April 2022
17 – 21 April 2023
15 – 19 April 2024

For the next 6 years EGU GA will take place in Vienna!

Why not advertising a meeting you are organising in the EGU meetings calendar



www.egu.eu/meetings/calendar/

Communication Activities at the Assembly

EGU Today

- EGU Today is a daily newsletter highlighting interesting workshops, lectures and films at GeoCinema, amongst activities at the Assembly
- Paper copies will be distributed daily and available to download

Blogs

- GeoLog & the EGU Blog Network will be sharing great sessions, research, interviews and more throughout the Assembly
- Follow them here: **geolog.egu.eu** and **blogs.egu.eu**

Social Media

- Sessions will be advertised on Twitter (**@EuroGeosciences**) and Facebook (**European Geosciences Union**)
- Participants can ask questions & keep updated by following **#egu2013**

AOB – any other business

Short discussions about the rooms and the schedule of the oral presentations