



MAGIC Science and Applications Workshop 2023
2-3 November 2023
Colle del Paradiso | Assisi, Italy

Programme



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1 November 2023	
17:00	Pre-Registration
20:00	
2 November 2023	
08:00	Registration and Welcome Coffee
09:10	<p>Welcome message / Introduction from NASA and ESA leadership</p> <p>Karen St. Germain Director of the Earth Science Division, Science Mission Directorate, NASA HQ</p> <p>Simonetta Cheli Director of Earth Observation Programmes, ESA</p>
09:30	<p>Welcome message from sponsoring space agencies</p> <p>Klaus Schmidt Deputy head of Earth Observation, DLR</p> <p>Francesco Longo Head of the Earth Observation Division, ASI</p> <p>Selma Cherchali (1), Felix Perosanz (2) (1) Head of Earth Observation, CNES (2) Head of Solid Earth Programme, Strategy Directorate, CNES</p>
09:45	<p>MAGIC introduction</p> <p>Lucia Tsaoussi Deputy Associate Director for Research and Program Scientist for GRACE-FO and Mass Change missions, Earth Science Division, Science Mission Directorate, NASA HQ</p> <p>Ilias Daras Geodesy and Solid Earth scientist - NGGM/MAGIC mission scientist, Earth Surfaces and Interior Section, Earth and Mission Sciences Division, Climate Action, Sustainability and Science Department, Directorate of EO Programmes, ESA</p>
Theme 1 - GRACE, GRACE-FO, MAGIC and beyond: Evolution of user needs	
Chairs: Annette Eicker, Carla Braitenberg, Felix Landerer, Shin-Chan Han	
10:00 10:12	<p>Arctic glacier mass balance from GRACE/GRACE-FO and their link to atmospheric drivers under climate change</p> <p>I. Sasgen (1) (1) Alfred Wegener Institute</p>
10:12 10:24	<p>Ocean mass change and its uncertainty from GRACE and GRACE-FO</p> <p>E.Schrama (1) (1) TU Delft</p>
10:24 10:36	<p>Drivers of the increasing Pacific inflow to the Arctic via the Bering Strait: Insights from GRACE OBP and altimetry DOT data and some possible reasons why models are getting the increasing inflow wrong.</p> <p>C. Peralta-Ferriz (1), R. Woodgate (1) (1) University Of Washington</p>

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10:36 10:48	The gain in spatial resolution from long-term monitoring of gravity changes: a case study of mass variations in West Antarctica <i>M. Willen (1), B. Wouters (1), T. Broerse (1), E. Buchta (2), M. Horwath (2)</i> (1) TU Delft (2) TU Dresden
10:48 11:00	Five-day Total Water Storage Product from GRACE/GRACE-FO <i>H. Save (1), M. Tamisiea (1), A. Sun (2), E. Hasan (2), A. Rateb et al. (3)</i> (1) Centre For Space Research, The University of Texas at Austin, (2) Texas Water Development Board, (3) Bureau of Economic Geology, The University of Texas at Austin
11:00 11:12	GRACE Contributions to Arid Land Hydrology <i>M. Sultan (1), K., Abdelmohsen (1), H. Save (2)</i> (1) Western Michigan University, Dept Of Geological And Environmental Sciences, (2) Centre For Space Research, The University of Texas at Austin
11:12 11:24	Feasibility of Satellite Gravimetry to Quantify Evolution of Climate-Induced Hazards <i>C.K. Shum (1), Y. Zhang (1), O. Akyilmaz (2), M. Uz (2), J. Ran et al. (3)</i> (1) Division of Geodetic Science, School of Earth Sciences, The Ohio State University, (2) Department of Geomatics Engineering, Istanbul Technical University, (3) Southern University of Science and Technology
11:24 11:36	Drift and Decadal Variation in the Earth's dynamic equatorial ellipticity from SLR and GRACE <i>M. Cheng (1)</i> (1) University Of Texas
11:36 11:48	The value and need of continuous global satellite gravimetry measurements for Earth system science <i>F. Landerer (1)</i> (1) Jet Propulsion Laboratory / Caltech
11:48 12:00	The Community Assessment Report for the Mass Change study <i>J. Reager (1), M. Rodell (2), M. Srinivasan (1), B. Doorn (3), C. Blackwood (1)</i> (1) NASA Jet Propulsion Laboratory, (2) NASA Goddard Space Flight Centre, (3) NASA headquarters
12:00 12:30	Theme 1 - Discussion
12:30 14:00	Lunch Break
Theme 2 – MAGIC Products <i>Chairs: Roland Pail, Sean Bruinsma, Jeanne Sauber-Rosenberg, Matt Rodell</i>	
14:00 14:12	Science support study for a Mass change And Geosciences International Constellation (MAGIC) <i>R. Pail (1), F. Flechtner (2), S. Bruinsma (3), P. Visser (4), A. Güntner et al. (2)</i> (1) Technical University of Munich, (2) GFZ Potsdam, (3) CNES, (4) Delft University Of Technology
14:12 14:24	Roadmap towards a MAGIC Processing Facility and Products <i>T. Gruber (1), S. Bruinsma (2), F. Flechtner (3), V. Müller (4), R. Pail (1)</i> (1) Technical University of Munich, (2) CNES, (3) GFZ Potsdam, (4) Max Planck Institute for Gravitational Physics Albert Einstein Institute

14:24 14:36	The space-wise approach based on least-squares collocation for II-SST mission data processing <i>L. Rossi (1), M. Reguzzoni (1), Ö. Koç (1), A. Albertella (1), K. Batsukh et al. (1)</i> (1) Politecnico di Milano
14:36 14:48	Improved de-aliasing capabilities of the MAGIC double-pair constellation <i>F. Flechtner (1), C. Dahle (1), M. Hauk (1), M. Murböck (1), N.Panafidina et al. (1)</i> (1) GFZ Potsdam
14:48 15:00	Stochastic modelling of AO background model errors <i>P. Abrykosov (1), R. Pail (1), L. Shihora (2), H. Dobsław (2)</i> (1) Technical University of Munich, (2) Helmholtz-Zentrum Potsdam
15:00 15:30	Coffee break
15:30 15:42	Accelerometer calibration by precise orbit determination for ESA's Next Generation Gravity Mission <i>P. Visser (1), S. Bruinsma (2), JC. Marty (2), J. Laurent- Varin (2)</i> (2) Centre National d'Etudes Spatiales, (1) Delft University Of Technology
15:42 15:54	Turning perturbations into signals: What data products can be derived from accelerometer measurements? <i>C. Siemes (1), J. van den IJssel (1), P. Visser (1), N. Hładczuk (1), S. Anton (1)</i> (1) Delft University Of Technology
15:54 16:06	International Combination Service for Time-Variable Gravity Fields (COST-G) – Overview of Current Activities and Future Perspectives for NGGM/MAGIC <i>A. Jäggi (1), J. Lemoine (2), S. Bourgogne (3), I. Koch (4) M. Duwe et al. (4)</i> (1) University of Bern, (2) Centre National d'Etudes Spatiales, (3) Stellar Space Studies, (4) Leibniz University Hannover
16:06 16:18	Near-real time gravity field retrieval concepts for NGGM <i>P. Abrykosov (1), R. Pail (1)</i> (1) Technical University of Munich
16:18 16:30	A proposal for new operational gravity data products for near real-time applications <i>S. Han (1), C. McCullough, H. Save (2)</i> (1) University of Newcastle, (2) Center For Space Research, The University of Texas at Austin
16:30 17:00	Theme 2 - Discussion
17:00 19:00	Poster Session
19:00	End of Day
19:30	Social Dinner offered by DLR

3 November 2023

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Theme 3 – MAGIC science and applications

Chairs: Luca Broca, Isabelle Panet, J.T. Reager, Cecilia Peralta-Ferriz

08:30 08:42	The Value of Continuous Satellite Gravimetry Measurements for Hydrology M. Rodell (1) (1) Nasa Goddard Space Flight Center
08:42 08:54	Assessing the potential of the MAGIC mission for hydrology and climate applications A. Eicker (1), A. Güntner (2), H. Dobslaw (3), L. Jansen (2) F. Flechtner et al. (2) (1) Hafencity University Hamburg, (2) GFZ Potsdam, (3) Helmholtz-Zentrum Potsdam
08:54 09:06	Simulated climate signals in continental hydrology — the benefits of MAGIC M. Schlaak (1), A. Eicker (2), R. Pail (1) (1) Technical University of Munich, (2) Hafencity University Hamburg,
09:06 09:18	Total Drainable Water Storage (TDWS): latent hydrological signal in the gravity mean field N. Sneeuw (1), M. Tourian (1), S. Yi (2) (1) University of Stuttgart, Institute of Geodesy, (2) University of Chinese Academy of Sciences, Beijing, China.
09:18 09:30	Interannual Terrestrial Water Storage Variations in the East-African Rift Region E. Boergens (1), A. Güntner, J. Wilms, M.Sips, C.Schwatke et al. (2) (1) GFZ Potsdam, (2) DGFI-TUM
09:30 09:42	Potential of NGGM MAGIC for global runoff estimation: the STREAM approach S. Camici (1), L. Brocca (1), C. Massari (1), A. Tarpanelli (1) N. Sneeuw et al. (2) (1) Research Institute for Geo-Hydrological Protection, (2) Institute of Geodesy, University of Stuttgart
09:42 09:54	Requirements and performance of the MAGIC mission with respect to fast-track products and hydrological extremes A. Güntner (1), A. Eicker (2), F. Flechtner (1), P. Abrykosov (3), B. Heller et al. (2) (1) GFZ Potsdam, (2) Hafencity University Hamburg, (3) Technical University of Munich
09:54 10:06	Intrinsic sampling constraints for extreme wet and dry conditions leading to floods and droughts J. Reager (1), M. Campbell (1) (1) Nasa Jet Propulsion Laboratory
10:06 10:18	The Prospects of the Dual-Pair MAGIC Mission for monitoring mass changes in the cryosphere B. Wouters (1), M. Willen (1) (1) Delft University of Technology
10:18 10:30	MAGIC contributions to the geoid and the IHRF from a static and time-variable perspective G. Vergos (1), D. Natsiopoulos (1) (1) Gravlab, Department Of Geodesy And Surveying, Aristotle University Of Thessaloniki

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10:30 11:00	Coffee break
11:00 11:12	<p>Detectability of co- and post-seismic deformations with the future gravity mission MAGIC</p> <p><i>V. Klemann (1), M. Bagge (1), A. Hampel (2), Y. Tanaka (3) C. Braitenberg et al. (3)</i></p> <p>(1) GFZ Potsdam, (2) Institute of Geology, Leibniz Universität Hannover Germany, (3) The University of Tokyo</p>
11:12 11:24	<p>Development of a viscoelastic postseismic deformation theory based on nonlinear rheology for advanced satellite gravity missions</p> <p><i>Y. Tanaka (1), K. Nakakoji (1), M. Bagge (2), H. Dobsław (2) V. Klemann et al. (2)</i></p> <p>(1) The University of Tokyo, (2) GFZ Potsdam</p>
11:24 11:36	<p>What is the magnitude limit for detecting earthquakes for the current and future satellite gravity missions and what can we learn: A new lesson from GRACE and GRACE Follow-On observations of intermediate-depth earthquakes in contrast to those of shallow events</p> <p><i>S. Han (1), J. Sauber (2), T. Broerse (3), F. Pollitz (4), E. Okal et al. (5)</i></p> <p>(1) The University of Newcastle, (2) NASA Goddard Space Flight Center, (3) Utrecht University, (4) U.S. Geological Survey, (5) Northwestern University</p>
11:36 11:48	<p>Monitoring the seismic cycle of large earthquakes at subduction zones from satellite gravity</p> <p><i>I. Panet (1), M. Bouih (2), S. Bonvalot (3), J.M Lemoine (4) L. Longuevergne et al. (5)</i></p> <p>(1) IPGP, IGN, Université Paris Cité, CNRS; ENSG Géomatique, (2) Magellium, (3) IRD, Géoscience Environnement Toulouse, CNRS, Université de Toulouse, (4) CNES, Géoscience Environnement Toulouse, CNRS, Université de Toulouse, (5) Univ Rennes, CNRS, Geosciences Rennes - UMR 6118</p>
11:48 12:00	<p>Underwater volcano growth detection with MAGIC: from Hunga Tonga to smaller eruptions globally</p> <p><i>C. Braitenberg (1) A. Pastorutti (1)</i></p> <p>(1) University of Trieste</p>
12:00 13:30	Lunch Break
13:30 13:42	<p>Towards Separating Oceanic Processes in Satellite Gravimetry: Tides, Wind-driven Variability, Barystatic Sea-Level Variations, and Western Boundary Pressures</p> <p><i>H. Dobsław (1), L. Shihora (1), R. Sulzbach (1), R. Dill (1) J. Wilms et al. (1)</i></p> <p>(1) Deutsches GeoForschungsZentrum (GFZ)</p>
	<p>Expected capabilities of MAGIC for small-scale ocean bottom pressure changes.</p> <p><i>C. Hughes (1)</i></p> <p>(1) University Of Liverpool</p>
13:42 13:54	<p>Observing Ocean Heat Uptake with MAGIC — Looking at Long-Term Trends in Ocean Mass Changes</p> <p><i>M. Schlaak (1), R. Pail (1), A. Blasquez (2), B. Meyssignac (2), J.M. Lemoine (3) et al.</i></p>

	(1) Technical University of Munich, (2) LEGOS, Université de Toulouse, CNES, CNRS, IRD, UPS, (3) GET, Université de Toulouse, CNES, CNRS, IRD, UPS
13:54 14:06	Monitoring the global ocean heat content from space geodetic observations <i>V. Rousseau (1), F. Marti (1), M. Ablain (1), R. Fraudea (1), B. Meyssignac (2) et al.</i> (1) Magellium, (2) LEGOS, Université de Toulouse, CNES, CNRS, UPS, IRD
14:06 14:18	The “NGGM-MAGIC: A breakthrough in the understanding of the dynamics of the Earth” project <i>A.M. Marotta (1), R. Barzaghi (2), C. Braitenberg (3), L. Brocca (4), G. Cambiotti (1) et al.</i> (1) Università degli Studi di Milano, Dipartimento di Scienze della Terra A. Desio, Milano, Italy (2) Politecnico di Milano, Dipartimento di Ingegneria Civile e Ambientale, Milano, Italy (3) University of Trieste (4) CNR - Istituto di Ricerca per la Protezione Idrogeologica di Perugia, Italy
14:18 14:30	Theme 3 – Discussion
15:00 15:30	Coffee Break
Theme 4 – Beyond MAGIC <i>Chairs: Chris Hughes, Carla Braitenberg, Felix Landerer, Jeanne Sauber-Rosenberg</i>	
15:30 15:42	ESA Activities and Perspectives on Quantum Space Gravimetry <i>O. Carraz (1), A. Strangfeld (1), I. Daras (1), A. Heliere (1), P. Silvestrin (1)</i> (1) ESA/ESTEC
15:42 15:54	Quantum gravity gradiometry for mass change studies – State of the art and outlook <i>S. Chiow (1), P. Ghuman (2), N. Yu (1), M. Lachmann (3), N. Lay (1) et al.</i> (1) Jet Propulsion Laboratory, (2) NASA Goddard Space Flight Center, (3) Airbus Defence and Space GmbH
15:54 16:06	Simulated mass change recovery for various implementations of a future atomic interferometer gravity gradiometer (AIGG) <i>B. Loomis (1), S. Luthcke (1), P. Brereton (1), H. Leopardi (1), D. Wiese (2)</i> (1) NASA GSFC, (2) Jet Propulsion Laboratory
16:06 16:18	Enabling Technologies for the Post-MAGIC Era <i>A. Koch (1)</i> (1) DLR Institute for Satellite Geodesy and Inertial Sensing
16:18 16:30	Quantum Pathways Institute - Harnessing Quantum 2.0 for Climate Sciences <i>S. Bettadpur (1)</i> (1) University of Texas
16:30 16:42	Future satellite gravity field missions – Impact of quantum sensors and extended satellite constellations <i>P. Zingerie (1), R. Pail (1), T. Gruber (1), P. Abrykosov (1)</i> (1) Technical University of Munich
16:42 16:54	Prospects for assimilating data from quantum missions into hydrological and land surface models <i>J. Kusche (1), C. Strohmeier (1), H. Gerdener (1), A. Springer (1), Y. Ewerdwalbesloh (1), et. al</i> (1) University of Bonn

16:54 17:06	A survey on user requirements for future satellite gravity missions <i>A. Eicker (1), C. Strohmeier (2), J. Kusche (2), C. Braitenberg (4), R. Pail (4)</i> (1) University of Hamburg, (2) University of Bonn, (3) University of Trieste, (4) Technical University of Munich
17:06 17:30	Theme 4 – Discussion
17:30	End of Day

POSTER LIST

1	Earth observation user needs to be addressed by the Quantum Pathfinder Mission CARIOQA-PMP and beyond <i>K. Lechner(1), T. Gruber(1), R. Pail(1), R. Forsberg, J. Müller</i> (1) Technical University of Munich
2	A new global crustal thickness model: ECM2023 <i>M. Van der Meijde(1), B. Lu(1), I. Fadel(1), M. Reguzzoni(2), D. Sampietro(3) et al.</i> (1) University Of Twente – ITC, (2) Politecnico di Milano, (3) GReD (Geomatics Research & Development)
3	GRACE/GRACE-FO surface mass modelling by spherical and ellipsoidal harmonics <i>M. Šprlák(1), K. Ghobadi-Far(2), S-C. Han(3), M. Pitoňák(1), P. Novák (1)</i> (1) NTIS - New Technologies for the Information Society, Faculty of Applied Sciences, University of West Bohemia, (2) Department of Geosciences, Virginia Polytechnic Institute and State University, (3) School of Engineering, Faculty of Engineering and Built Environment, University of Newcastle,
4	Optomechanical inertial sensors for geodesy <i>F. Guzman (1)</i> (1) Texas A&M University
5	Residual ocean tide signal in GRACE(-FO) range-rate post-fit residuals <i>I. Koch (1), M. Duwe (1), J. Flury (1)</i> (1) Institute of Geodesy, Leibniz University Hannover
6	From Bender to MAGIC <i>D. Wiese (1)</i> (1) JPL
7	Coastal Land Change due to Tectonic Processes and Implications for Relative Sea-level Rise in the Samoan Islands <i>J. Sauber(1), S-C. Han(2), S. Huang(1), R. Ray(1)</i> (1) Nasa Gsfc, (2) University of Newcastle Australia
8	CNES L2 and L3 products and their scientific applications <i>A. Blazquez(1), J. Lemoine(1), A. Couhert, B. Meyssignac, S. Bruinsma(1)</i> (1) CNES / LEGOS
9	Mitigating Temporal Aliasing in Future Gravity Missions by the Space-Wise Approach <i>Ö. Koç(1) M. Reguzzoni(1), L. Rossi(1), F. Migliaccio(1)</i>

	<i>(1) Politecnico di Milano</i>
10	Calibration and gravity field processing issues for NGGM/MAGIC J. Flury(1), A. Jäggi, U. Meyer, J. Lemoine(2) <i>(1) Leibniz Universität Hannover, (2) University of Bern, (3) CNES / LEGOS</i>
11	Storm surge detection using in-situ GRACE Follow-On alongtrack observations M. Weigelt(1), L. Timmen, H. Dobslaw(2), C. Voigt <i>(1) Leibniz University Hannover, (2) Deutsches GeoForschungsZentrum (GFZ)</i>
12	A New Knowledge Portal on Mass Transport Satellite Missions: www.globalwaterstorage.info P. Klinghammer (1), U. Sylla (1), A. Cozacu (1), F. Flechtner (1), H. Dobslaw (1), J. Haas (1), J. Zens (1), J. Krupa (1) <i>(1) GFZ Potsdam</i>
13	GUT for MAGIC science P. Knudsen(1), J. Benveniste(2), A. Ambrozio(2), M. Restano(2) <i>(1) DTU Space, (2) ESA/ESRIN</i>
14	Detectability Criteria of the Earth's Core Processes with MAGIC Gravity Field Level 2 Products H. Lecomte(1), S. Rosat, M. Maioara, M. Dumberry <i>(1) ITES, CNRS UMR7063</i>
15	Closed-loop simulation for recovering gravity signals related to mantle convection Y. Dilixiati(1), N. Sneeuw(1), B. Root <i>(1) University Of Stuttgart</i>
16	Analytical and numerical tools for MAGIC mass change studies at different scales D. Tsoulis(1), G. Gavriilidou(1), C. Moukoulis(1), P. Patlakis.(1), T. Papanikolaou(1) <i>(1) Aristotle University of Thessaloniki</i>
17	On the importance of basin storage observations for floods and droughts: opportunity from the NGGM MAGIC mission C. Massari(1), F. Avanzi, G. Bruno, D. Penna, F. Marra, C. Grace, M. Giroto <i>(1) National Research Council</i>
18	An assessment of the impact of Next Generation Gravity Missions on earthquake signal retrieval. Constructing a database of time-varying co-seismic and post-seismic gravity change and a detectability assessment strategy. A. Pastorutti(1), C. Braitenberg(1) <i>(1) University Of Trieste</i>
19	Line-of-sight gravity from inter-satellite laser ranging to monitor melt events in Greenland B. Jenny(1), R. Forsberg(1), T. Nagler(2), S. Simonsen(1) <i>(1) DTU Space, (2) ENVEO IT GmbH</i>
20	Application of Hill's equations in the scenario of the MAGIC constellation K. Batsukh(1), A. Albertella(1), M. Reguzzoni(1) <i>(1) Politecnico di Milano</i>
21	Time-wise analysis of satellite gravity data and hydrological modeling of a the Po watershed basin and the Alpine divide A. Vitti(1), B. Majone(1), F. Tesolin(1), R. Contu(1), A. Galletti (1)et al. <i>(1) University of Trento</i>

22	<p>4D Bayesian gravity inversion to study hydrological processes M. Capponi(1), D. Sampietro(1), L. Brocca(2) <i>(1) Geomatics Research & Development srl, (2) Research Institute for Geo-Hydrological Protection, National Research Council</i></p>
23	<p>Monitoring ice mass changes with satellite gravimetry measurements and high resolution stereo imagery J. Pfeffer(1), A. Blazquez, E. Berthier, M. Bouih(1), B. Couprie et al. <i>(1) Magellium</i></p>
24	<p>Monitoring the regional Ocean Heat Content change over the Atlantic Ocean with the space geodetic approach V. Rousseau(1), R. Fraudeau(1), M. Hammond(2), O. Houndegnonto(3), M. Ablain(1) <i>(1) Magellium, (2) NOC, Southampton, (3) Univ Brest, CNRS, Ifremer, IRD, LOPS, IUEM, F29280, JPL, ICPMA-UNESCO Chair</i></p>
25	<p>Upsampling GRACE in the Senegal River Valley using XG Boost regression model M. Geever(1), J. O'Farrell <i>(1) University Of Galway</i></p>
26	<p>Terrestrial water storage - discharge modeling for catchments with GRACE observations: insights and applications K. Douch(1) <i>(1) ESA/ESRIN</i></p>
27	<p>Beyond MAGIC: evaluation of novel sensors and satellite formation flights for future gravimetry missions A. Kupriyanov(1), A. Reis, M. Schilling, A. Knabe, N. Fletling <i>(1) Leibniz University Hannover</i></p>
28	<p>Investigating the benefit of quantum gravity missions for sea level budget studies C. Strohmeier(1), B. Uebbing(1), J. Kusche(1), R. Pail(2), P. Zingerie(2) <i>(1) University of Bonn, (2) Technical University of Munich</i></p>
29	<p>Studies of the thermal long-term bias processing of electrostatic accelerometers N. Portier(1), J. Bergé(1), B. Christophe(1), K. Maquaire(1), M. Rodrigues(1) <i>(1) Onera</i></p>
30	<p>A Simplified Gravitational Reference Sensor for Future Geodesy Missions J. Conklin(1), S. Apple(1), L. Bischof(1), J. Conroy(1), A. Dávila Álvarez(1) <i>(1) University Of Florida</i></p>
31	<p>Capabilities of multi-satellite constellations for the co-estimation of ocean tide constituents on different time scales N. Pfaffenzeller(1), R. Pail(1) <i>(1) Technical University of Munich</i></p>
32	<p>An alternative satellite gravimetry mission concept using transplant accelerometer data and laser ranging J. Sebera(1), A. Bezděk(1) <i>(1) Czech Acad Sci, Astron Inst</i></p>