

Symposium 6: ICC symposium

Organizers: Pavel Novák, Annette Eicker, YY Yang, Jürgen Müller (ICC presidents)

Abstract

Inter-Commission Committees (ICCs) of the International Association of Geodesy (IAG) are responsible for well-defined, important and permanent tasks involving all commissions. There are three ICCs in the current structure (2019-2023) of the IAG. The mission of the Inter-Commission Committee on Theory (ICCT) established in 2003 is to interact and collaborate with IAG's Commissions and GGOS in order to encourage and initiate activities to further geodetic theory in all branches of geodesy. At the IUGG General Assembly 2019 in Montreal the IAG Executive Committee established the ICC on Geodesy for Climate Research (ICCC) and ICC on Marine Geodesy (ICCM). While ICCC shall enhance the use of geodetic observations for climate studies with the main goal to establish a systematic and comprehensive approach among the various geodetic communities, ICCM will stimulate applications of ocean surveying, mapping and remote sensing to parts of the Earth's surface covered by oceans. The IAG project Novel Sensors and Quantum Technology for Geodesy (QuGe) then exploits the high potential of quantum technology and novel measurement concepts for various innovative applications in geodesy.

The focus of this symposium lies on recent activities of the four IAG components including their interactions with the IAG commissions and GGOS. Contributions are welcome which address (1) advances in the geodetic theory, (2) applications of geodetic data and methods in climate studies, (3) research activities in marine geodesy, and (4) developments of novel sensors and their applications in geodesy.

Symposium 6, Session 1. Geodetic Theory

Convener: Pavel Novák, University of West Bohemia, panovak@kam.zcu.cz
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Abstract:

Observing systems in all branches of geodesy have advanced to such an extent that geodetic measurements are now of unprecedented accuracy and quality, can readily cover a region of any scale up to tens of thousands of kilometres, yield non-conventional data types, and can be provided continuously. Consequently, advanced mathematical modelling is required in order to obtain the maximum benefit of such technological advances. We invite contributions aligned with main objectives of ICCT and related to activities of its joint study groups. Contributions, which concern topics related to possible interactions and mutual benefits between geodetic theory and methodology as well as other initiatives and projects involving Earth and planetary sciences, are also welcome.

This session solicits contributions focusing on aspects of (3-6 items):

- Advances in theoretical geodesy
- Developments in geodetic modelling and data processing due to new geodetic sensors
- Connections and contribution exchanges between geodesy and other Earth sciences

Keywords: Theoretical geodesy, modelling, tools and methods, advanced signal processing

Symposium 6, Session 2. Geodesy for Climate Research

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Abstract:

The growing data record from numerous geodetic observation techniques provides a new quantitative view on various variables that are relevant for climate research such as tropospheric water vapor, thermospheric neutral density, terrestrial water storage in ice sheet and mountain glacier mass, sea level, sea surface winds, ocean waves, subsurface and surface currents, or sea ice extent and thickness. Geodetic observables are often compared with geophysical models, which helps to explain observations, evaluate simulations, and may potentially be used to improve simulations through techniques such as data assimilation.

This session intends to showcase climate related studies which have made use of geodetic observations such as altimetry, gravimetry (CHAMP, GRACE, GOCE and GRACE-FO), navigation satellite systems (GNSS and DORIS) or remote sensing techniques that are based on both passive (e.g. optical and multi/hyperspectral) and active (i.e., SAR) instruments. New approaches helping to separate and interpret the variety of geophysical signals present in observations are equally appreciated.

This session solicits contributions focusing on aspects of (3-6 items):

- Detection of climate signals in geodetic time series
- Climate model evaluation
- Data assimilation for climate research
- Signal separation

Keywords: climate research, cryosphere, sea level, hydrology, climate model evaluation

Symposium 6, Session 3. Seafloor geodesy, marine positioning and undersea navigation

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Abstract:

The ICCM (Inter-Commission Committee on Marine Geodesy) session calls for abstracts that report theoretical and technical advances, new results and new models in marine geodesy field. New developments in establishing and maintaining a local or a worldwide seafloor geodetic network, and technical advances in the GNSS/acoustic positioning technique and undersea multi-sensor integration PNT (positioning, navigation and timing) are both highly focused in this session. The datum connection problem between the ITRF (The International Terrestrial Reference Frame) and the seafloor geodetic reference frame, and the discussions on the underdeveloped models and conventions for developing the seafloor geodetic reference frame are both concerned in this session. This session also collects new results, approaches and technical advances in ocean tide modelling, acoustic velocity field modeling, and marine vertical datum refinement. Besides the research topics on ocean tide observatory, satellite altimetry, GNSS-R, seafloor remote sensing and topography inversion, some of frontier research topics on monitoring changes of the ocean and seafloor are desired to be presented, such as sea level change, seafloor tectonic motion and seismological events, steric and mass oceanic variations, changes of the surface and subsurface currents. Abstracts that report marine geodetic tools and ocean data fusion approaches are also welcomed.

This session solicits contributions focusing on aspects of (3-6 items):

- Seafloor geodesy and marine geodetic applications
- Ocean tide modelling and vertical datum
- Fusion of multi marine gravity data and ocean geoid refinement
- GNSS/Acoustic positioning and undersea multi-sensor navigation
- Ocean remote sensing and topography survey
- Seafloor monitoring and ocean disaster monitoring

Keywords: seafloor geodesy; ocean tide; vertical datum; GNSS/Acoustic positioning; undersea navigation

Symposium 6, Session 4. Novel Sensors and Quantum Technology for Geodesy

Convener: Jürgen Müller, Leibniz University Hannover, mueller@ife.uni-hannover.de

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Wenbin Shen (China)

Abstract:

Current developments in quantum physics and the application of general relativity opens up enhanced prospects for satellite geodesy, gravimetric Earth observation and reference systems. These novel concepts include the application of atom interferometry for realizing quantum gravimetry/radiometry in space and on ground, the enhanced use of laser interferometry for inter-satellite tracking and accelerometry at future gravity field missions, and relativistic geodesy with clocks for the determination of physical heights via gravitational redshift measurements. In close collaboration between physics and geodesy, this new IAG project exploits the high potential of quantum technology and novel measurement concepts for various innovative applications in geodesy.

We invite presentations to illustrate the principles and state of the art of those novel techniques and the application of the new methods for terrestrial and satellite geodesy, navigation and fundamental physics. We also welcome papers for further applications and invite contributions covering the theoretical description of the new methods, introducing novel theoretical concepts as well as new modelling schemes.

This session solicits contributions focusing on aspects of (3-6 items):

- Quantum gravimetry in space and on ground
- Laser interferometry for gravity field missions
- Relativistic geodesy with clocks
- Modelling and applications in geodesy

Keywords: Quantum gravimetry, height determination with clocks, next generation gravity field missions, novel measurement concepts for geodetic applications