Inter-Commission Committee on Marine Geodesy (ICCM)

President: **Yuanxi Yang** (China)
Vice President: **Heidrun Kopp** (Germany)

Terms of Reference

The Inter-Commission Committee on Marine Geodesy (ICCM) was first proposed by the Chinese National Committee to the IAG Executive Committee (EC) in Kobe, Japan in 2017 and then passed at the Sixth/Seven Meetings of the IAG EC, 2018. The Inter-Commission Committee on Marine Geodesy (ICCM) was formally approved and established following the IUGG General Assembly in Montreal, Canada, 2019.

With over seventy percent of the planet's surface and the most important zones of crustal formation and destruction covered by the oceans, monitoring and understanding the oceans and the seafloor is of highest relevance to secure the human sustainable development. The oceans provide enormous biological and mineral resources while at the same time modulate the climate and weather patterns and serve as an important sink for atmospheric carbon. The oceans and seafloor are crucial to the evolution not only of life, but of the Earth system, yet 80% of marine realm remain unexplored [*NOAA*]. The research foci of the discipline *Marine Geodesy* have enormous economic and scientific potential, however, at present large gaps in ocean surveys, seafloor mapping and remote sensing exist which necessitate IAG's immediate attention.

Research contributions to Marine Geodesy have advanced tremendously during the last two decades:

(i) seafloor geodetic networks have been initiated and established by countries or regions including North and Central America, Europe, New Zealand and Japan, and in the near future more coastal countries may start seafloor observatory plans,

(ii) advanced GNSS/acoustic GPS-A techniques have achieved centimeter accuracy in seafloor geodetic positioning, crucial to marine geohazard monitoring, including undersea earthquakes volcanic eruptions, and submarine landslides as well as monitoring of seafloor infrastructure;

(iii) multi-ocean environment monitoring data are available to potentially improve seafloor geodetic positioning or monitoring of steric sea level and circulations, including temperature and salinity profiles of the Array for Real-time Geostrophic Oceanography (Argo), expendable bathythermograph (XBT) data, ocean-bottom pressure (OBP) data and surface and subsurface ocean current observations.

ICCM strongly encourages research to:

(1) develop and implement a precise seafloor reference frame to enhance marine positioning, navigation and timing (PNT) techniques, and promotes international cooperations to bridge scientific research gaps including the component of the international terrestrial reference frame (ITRF) in the coastal and the deep ocean;

(2) enhance frontier research topics on monitoring changes of the ocean and seafloor, such as sea level change, seafloor tectonic motion and seismological events, steric and mass oceanic variations, changes of the surface and subsurface currents, and changes of waves and wind patterns;

(3) refine a series of marine geodetic models, including barotropic and baroclinic ocean tide models, marine geoid models, dynamic topography models, and coastal reference models such as the mean high water (MHW) and the high-water line (HWL); and

(4) improve the accuracy and resolution of the global seafloor topography particularly in the coastal regions by advancing new seafloor geodetic data acquisitions, innovative data processing, and exploring new topography inversion tools.

Objectives

The overall objectives of the ICCM are

- to shorten the gaps between theory and applications in marine geodesy, and to encourage transdisciplinary integration of the contemporary geodetic sensors, including marine geophysical sensors, oceanic sonar and physical oceanography instrumentation;
- to improve the global realization of the International Terrestrial Reference Frame (ITRF) by connecting the seafloor geodetic network component with the ITRF, and to improve current marine geodetic models by including the space, surface and subsurface geodetic observations;
- to encourage development of marine geodetic methodology, especially for the fusion methods of multi-marine geodetic observations;
- to promote international collaborations in regional marine geodetic surveys, and to develop and establish international conventions for marine geodetic data processing, the seafloor reference frame, and other standards.

To achieve these aims, ICCM will interact and collaborate with the IAG Commissions, GGOS and other IAG related entities (services, projects).

ICCM Activities

The anticipated ICCM activities include:

- service as (co-)conveners of geodesy sessions at major conferences such as IAG, EGU, AGU, AOGS, IUGG, etc.
- organization of marine geodesy symposia, and publication of special issues of international journals such as Marine Geodesy, Journal of Geodesy, and Advanced Space Research.
- creation and maintenance of a website for the dissemination of ICCM related information and data products.

Structure

The general structure of Inter-Commission Committees is specified in the IAG By-laws (§17). The Steering Committee includes the president, the vice-president, the past president, one representative appointed by each Commission, and two representatives of the IAG services. The ICCM activities will be structured in study groups. Due to the inter-commission character of the ICCM, these study groups are always joint study groups, affiliated to one or more of the Commissions, GGOS and/or IAG services. The Joint Study Groups will be established during the first period of the ICCM.

Steering Committee

President: *Yuanxi Yang* (China)
Vice President: *Heidrun Kopp* (Germany)

Representatives
Commission 1: *Geoffrey Blewitt* (USA)
Commission 2: *Roland Pail* (Germany)
Commission 3: *Manabu Hashimoto* (Japan)
Commission 4: *Marcelo Santos* (Canada)
GGOS: *Hansjörg Kutterer* (Germany)
IGFS: *Riccardo Barzaghi* (Italy)
IERS: *Jürgen Müller* (Germany)

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