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Commission I – Terms of Reference

- Design and realization of digital aerial and spaceborne missions for Earth observation
- Design, construction, characterization, and installation of imaging and non-imaging sensors (including Optical, IR, SAR, IFSAR, lidar, etc.)
- Standardization of definitions and measurements of sensor parameters
- Integration of imaging and non-imaging sensors with other relevant systems
- Geometric and radiometric properties, quality standards, and factors affecting data quality
- Testing, calibration and evaluation of sensors (including laboratory, in-flight, inter-calibration and test fields)
- Integrated platform guidance, navigation, positioning and orientation
- Data reception and pre-processing
- On-board pre-processing of data and autonomous systems
- Systems and media for recording sensor data, auxiliary data (time,

position, attitude, etc.) and film scanners

- Image and non-image data transfer standards

WG I/1: Standardization of Airborne Platform Interface

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WG I/1 Terms of Reference

- Coordinate a forum for discussion between the international airborne science communities
- Develop airborne sensor interface format standards in coordination with other working groups to promote maximum sensor portability between aircrafts increasing science yield from the sensors
- Develop airborne satellite data relay systems use for science research programs between aircraft and ground in coordination with other working groups
- Develop an airborne science literature search to identify peer reviewed published papers and citations and make a available in a data base
- Support the regulatory agencies in supporting airborne science sensor certification and approval requirements for Lidar, Dropsonde

and electromagnetic spectrum emissions

- Maintain an inventory of the international airborne science capabilities and report annually
- Develop a forum to discuss transnational access system(s) for airborne users
- Support the use of UAS vehicle activity for science observations in civil and restricted airspace on an international basis and engage the ICAO
- Promote the education and outreach on an international basis of airborne based science activity
- Develop a forum to coordinate expert international workshops in categories of airborne science sensors for both
- Remote Sensing and in situ systems.

WG I/2: LIDAR, SAR and Optical Sensors for Airborne and Spaceborne Platforms

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WG I/2 Terms of Reference

- Evaluation and assessment of systems for processing and integrating SAR, lidar and optical data
- Address challenges in low-frequency spaceborne SAR system design and data processing
- Address challenges and applications of high-resolution spaceborne SAR systems (e.g. TerraSAR-X, Cosmo Skymed)
- Evaluation of Systems for generation DEMs (Resolution I.3)
- Evaluation of Multi-frequency SAR, polarimetric InSAR systems
- Evaluation of Multi-pulse and full-waveform lidar
- Evaluation of Range imaging with array sensor systems
- Data quality and performance validation of SAR, lidar and optical systems
- Liaison with external groups such as CEOS, IGARSS and EuroSDR

WG I/3: Multi-Platform Multi-Sensor Inter-Calibration**Chair****Ayman Habib**

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WG I/3 Terms of Reference

- Multi-platform data acquisition and inter-calibration
- Investigate multi-source data quality control and quality assurance methods for land-, air-, and spaceborne imaging and ranging systems – collaborate with WG II/4
- Develop workflow guidelines for system calibration (sensors and inter-sensors)
- Collaborate and liaise with EuroSDR (Comm I) in the development of commonly accepted standards procedures for the inter-calibration and testing of Multi-Platform Multi-Sensor systems

WG I/4: Geometric and Radiometric Modelling of Optical Spaceborne Sensors**Chair****Peter Reinartz**

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WG I/4 Terms of Reference

- Geometric / radiometric calibration/evaluation of optical space sensors including laboratory (including long-term stability) and in-flight calibration activities (connections to CEOS working group IVOS)
- Comparison of existing and evolving algorithms for geometrical modelling of optical space images
- Analysis of available direct sensor orientation and modelling changes during satellite lifetime
- Evaluation of line sensors for DEM generation (cooperation with WG VII/2 Digital Elevation Models by Radar)

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WG I/5 Terms of Reference

- Algorithmic aspects of direct georeferencing of active and passive sensors used in marine, land, airborne, and spaceborne environments
- Navigation technology and the methods of sensor orientation in urban, indoor and forested environments
- Co-registration of heterogeneous data sets for integrated sensor navigation, orientation and calibration
- Georeferencing by integrated sensor orientation: models and adjustment procedures
- Investigate challenges and implementation issues of real-time georeferencing
- Navigation redundancy, robustness and reliability: impact of system integration
- Standards and protocols in direct georeferencing and sensor orientation

WG I/6: Small Satellites for Earth Observation**Chair****ZhenGe Qiu**

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WG I/6 Terms of Reference

- User requirements for designing and realizing small satellite missions, including constellations, for Earth observation.
- Inventory of small satellite missions for Earth observation and system performances
- Assessment of the benefits of small satellites compared to other sources of information
- Implementation of a forum for industrial and developing countries to share their results, experiences and recommendations
- Cooperation with other ISPRS WGs in Commissions III, IV and VII

IC WG I/V: Unmanned Vehicle Systems (UVS) for Mapping and Monitoring Applications**Chair****Jurgen Everaerts**

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IC WG I/V Terms of Reference

- UVS specific issues related to navigation and position/orientation determination
- UVS platforms & instruments for photogrammetry and remote sensing, especially low-cost, consumer-type
- UVS as a tool for remote sensing instrument prototyping
- UVS as a tool for teaching all aspects of photogrammetry & remote sensing
- Document and compare UVS systems in photogrammetry and remote sensing, in terms of cost, performance, application and quality
- Liaison with Com III, VIII and EuroSDR

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Commission II – Terms of Reference

- Fundamentals of spatial database design, spatial data structures, spatial analysis and geostatistics, spatial querying, spatial reasoning, spatial and temporal modelling

- Aggregation, generalization, abstraction and rendering of image and vector data
- Spatial decision support systems
- Processing, analysis and modelling of multi-dimensional geospatial data
- System integration and modelling aspects for data and geoinformation processing
- Interoperability of heterogeneous spatial information systems
- Semantic and geometric integration of heterogeneous spatial information
- Communication and visualization of spatial data
- Data mining, filtering, retrieval and dissemination
- Spatial data quality and spatial model quality

WG II/1: Cognition and Modelling of Space and Time

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WG II/1 Terms of Reference

- Concept and theory of Modelling space and time
- Cognition of space and time
- Spatial and spatio-temporal data models and structures

- Spatial and spatio-temporal topology and relationships
- Spatio-temporal data indexing and query for vector-based spatial data
- Computational geometry for spatio-temporal Modelling

WG II/2: Multi-Scale Representation of Spatial Data

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WG II/2 Terms of Reference

- Generalization and abstraction of vector and raster data
- Semantic generalization of data models
- Development of open standard services for generalization operations
- Quality-based generalization: control and evaluation
- Context interpretation: important structures in the data have to be interpreted before they can be generalized
- Development of multiscale and multiple representation analysis tools to exploit the existing hierarchies and relationships especially in the context distributed data, e.g. in geosensor networks
- Generalization of spatio-temporal information
- Multiple representation Modelling, storage and analysis of city models (e.g. CityGML)

- Continuous generalization: incremental streaming of multi-scale data
- Information aggregation from multi-scale spatial data

WG II/3: Spatial Analysis and Data Mining

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WG II/3 Terms of Reference

- Theory of spatial analysis
- Spatial reasoning processes
- Information discovery in spatial databases
- Spatial analysis models and methods
- Spatial data mining models
- Intelligent computation in spatial analysis
- Spatial analysis and data mining applications

WG II/4: Uncertainty Modelling and Quality Control for Spatial Data

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WG II/4 Terms of Reference

- Understanding uncertainties in spatial data
- Quality control for spatio-temporal data
- Modelling error propagation in spatial analysis
- Presentation of quality information by metadata in GIS
- Quality of spatio-temporal model

WG II/5: Multidimensional and Mobile Data Models

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WG II/5 Terms of Reference

- Data modelling and computational algorithms for multidimensional GIS
- Dynamic GIS with applications, such as for the marine environment
- Methodology and algorithms for dynamic operations in GIS
- Design and development of databases for dynamic and multi-dimensional GIS
- Data model and methods for information representation for GIS on mobile devices
- Collaborate with other communities, such as location-based services, computational geometry

WG II/7: Geo-Visualization and Virtual Reality

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WG II/6 Terms of Reference

- Enhanced communication of geographical data, information, and knowledge
- Geovisualization (including the Web)
- Novel methods and tools for exploring geographical decision spaces
- Exploration of tools and techniques for visualizing space and time
- Usability testing of geographical visualization and virtual reality
- Development and application of Immersive and semi-immersive virtual reality
- Enchantment of Geo-communication by Geo-visualization and Virtual Reality

WG II/7: Spatial Decision Support and Location-Based Services

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WG II/7 Terms of Reference

- Theory, concepts, design and development of Spatial Planning Support Systems (SPSS)

- Model integration, component based modelling, Community/participatory modelling (bio-physical and socioeconomic models)
- Theory, concepts, design and development of Spatial Decision Support Systems (SDSS)
- Theory concepts and application of Spatial Multiple Criteria Decision Analysis (SMCDA) in single and group environment
- Theories and concepts of decision supports using vague information
- Design and development of Collaborative Spatial Decision Support Systems, (CSDSS), considering various modelling techniques, and requirements of different user-groups (style, functionality, etc.)
- Theory, concepts, design and development of Integrated Planning and Decision Support Systems (IPDSS)
- Concepts, theory and application of Location Based technology
- Clarifying technical and social principles of location-based services (LBS)
- Designing a prototype of future society based on LBS which will serve as both urban infrastructure and the media

**Inter-Commission (IC) WG II/IV:
Semantic Data Interoperability and
Ontology for Geospatial Information**

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IC WG II/IV Terms of Reference

- Assess ontologies and geo-semantics as they relate to the integration and harmonisation of heterogeneous data
- Discuss and develop methods for semantic and geospatial data(base) interoperability
- Continue developments on geo-spatiotemporal knowledge representation
- Focus on data interoperability for applications in Interactive Transportation Systems (ITS)

Commission III –Photogrammetric Computer Vision and Image Analysis

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**Commission III – Terms of
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- Algorithms for geometric analysis of image data regardless of scale
- Geometric analyses of IR, SAR, IFSAR and lidar
- Automated feature and attribute extraction techniques and methodologies from multi-sensor, multi-resolution, multispectral, hyperspectral, and multi-temporal imagery
- Fundamental research into image understanding for object detection, recognition, identification and reconstruction
- DEM generation and integration of three-dimensional modelling concepts into image analysis processes
- Integration of spatial information systems and object models for object recognition
- Sensor pose determination (including auxiliary information)
- Projective and multi-view geometry
- Image sequence analysis
- Algorithms for including features in the orientation processes

- Spatial, spectral and temporal properties of natural and human-formed objects

**WG III/1: Pose Estimation and
Surface Reconstruction from Image
and/or Range Data**

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WG III/1 Terms of Reference

- Investigating different camera models (perspective, projective, generic, non-linear distortions, frame and line sensors)
- Developing robust self-calibration methods (without markers)
- Developing robust orientation methods without markers
- Using different features: points, lines, conics, silhouettes, etc for image calibration/orientation
- Bundle-block adjustment
- Studying multi-view image matching and surface reconstruction techniques
- Studying optimization-based image matching and surface reconstruction techniques
- Studying the combination of images and other sensors (GPS/INS, terrestrial/aerial laser-scanners) for calibration, orientation and surface reconstruction
- Real-time calibration, orientation and surface reconstruction
- Management of huge image blocks
- Comparison and benchmarking of calibration, orientation, and surface reconstruction techniques

WG III/2: 3D Point Cloud Processing**Chair****Frédéric Bretar**

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WG III/2 Terms of Reference

- Information extraction from point clouds and surface models
- Registration of point clouds and surface models
- Classification/segmentation of natural and urban areas from point clouds
- Analysis of full-waveform lidar data
- Data management systems
- Feature extraction and 3D modelling
- Quality analysis of the data

WG III/3: Image Analysis for Indexation and Image Retrieval**Chair****Matthieu Cord**

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WG III/3 Terms of Reference

- Information mining in large satellite, aerial and street view image archives
- Satellite, aerial and street-view image indexing and retrieval
- Machine learning and context aware image understanding
- Image semantics and knowledge representation
- Integration of heterogeneous features: textural, spectral and geometrical attributes
- Integration of low and high level features (points, segments, regions, graphs, etc) in the indexation and retrieval processes
- Integration of 3D information and spatial relations between the features
- Multi-resolution image indexing
- Image retrieval for georeferencing and pose estimation
- Management of huge heterogeneous data sets

WG III/4: Complex Scene Analysis and 3D Reconstruction**Chair****Franz Rottensteiner**

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WG III/4 Terms of Reference

- Extraction of buildings, roads, vehicles, vegetation, and other objects for the generation and update of high-resolution 3D city models and road databases from aerial, spaceborne and terrestrial data
- Automatic and semi-automatic urban models with various levels of detail
- Interpreting the image data, by itself and together with information from urban GIS data, CAD models, etc.
- Developing analysis tools and models required to integrate information about multiple object classes and their interconnections within complex scenes
- Study of trade-off between geometry and radiometry/texture for visualization
- Efficiency and quality assessment and dependency on the quality of the input data

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WG III/5 Terms of Reference

- Studying camera and camera network calibration from image sequences including cameras with non-standard
- geometry and variable frame rates
- Studying ego-motion determination for navigation, georeferencing and object reconstruction
- Studying detection, reconstruction, classification and tracking of single and multiple objects in image sequences
- Studying event reconstruction from image sequences as well as single and multiple video streams
- Investigating the quality assessment of calibration, orientation and object detection using image sequences
- Benchmarking of calibration, orientation and object detection techniques using image sequences

IC WG III/VII: Pattern Recognition in Remote Sensing**Chair****Wolfgang Förstner**

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IC WG III/VII Terms of Reference

- Statistical and non-statistical methods for pattern recognition
- Pixel-based and object-based methods
- Graphical models (random fields, Bayesian nets) and stochastic grammars
- Scale space methods
- Data fusion
- Quality and uncertainty in pattern recognition
- Benchmarking

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Commission IV - Terms of Reference

- Development, access and management of spatio-temporal databases
- Spatial data infrastructures
- Image-based geospatial databases

- Data libraries, data clearinghouses, data warehouses, distributed archives and access to remote data sources, including metadata and digital data standards
- Web based access, retrieval and dissemination of spatial data, including web-based location-based services
- Integration of spatial information systems and image analysis for database-driven change detection, data capture and updating
- Dynamic spatial information systems, spatial data revision and versioning

- Interfacing 3D models with facility management systems
- Database generation for digital topographic and thematic mapping (including Ortho-images and digital terrain models)
- Digital landscape modelling and visualisation, and large scale urban models
- Global environmental databases and mapping
- Extraterrestrial mapping and spatial information systems
- Analysis of systems and their components for automated and semi-automated digital mapping and geoinformation systems
- Analysis of industry needs and design of systems for production and update of geoinformation

WG IV/1: Geospatial Data Infrastructure

Chair

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WG IV/1 Terms of Reference

- Development and management of multi-level (national, regional and global) geospatial databases
- Synchronization of disparate geospatial resources to provide a useful, usable, and enabling framework that can be integrated with environmental and socio-economic data for research, discovery and web services characterized by broad access and "end-to-end" coordination
- Further development of high performance networks and communication technologies for efficient data handling, distributed and federated repositories, human-centred visualization, and applications to improve web-based geospatial services and analysis
- Contribution towards open source principles, metadata and open standards of service, system architectures, and geospatial information
- Cooperation and liaison with international efforts (GEOSS, Digital Earth, UNSDI, INSPIRE and GMES), and organizations (GSDI, WGISS, ICA, OGC, W3C, ISO and EuroSDR)

WG IV/2: Automatic Geospatial Data Acquisition and Image-Based Databases

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WG IV/2 Terms of Reference

- Research using multi-modal images for dynamic updating of geodatabases linked to sensor networks
- Characteristics of multi-dimensional, multi-scale, spatio-temporal image databases
- Use of innovative methods for creating, accessing, indexing, and analyzing spatio-temporal image databases
- Evaluation and use of semi-automated and automated algorithms for update, change detection and quality control using image-based databases
- Facilitation of the integration of these algorithms into digital photogrammetric and GIS workstations, enterprise and web-based photogrammetric systems
- Collaboration with ISPRS TC II, TCIII, TC IV WGs, IC WG IV/VIII and EuroSDR

WG IV/3: Mapping From High Resolution Data

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WG IV/3 Terms of Reference

- To investigate the update of topographic vector datasets, digital terrain models, orthoimages and thematic (landcover) datasets from high-resolution satellite and airborne imagery with emphasis on mapping in a production environment
- To assess links between high resolution images and mapping tools, developed through research and their implementation in mapping agencies
- To investigate how synergy may be achieved between the various sensors (high resolution and other), for topographic and thematic mapping
- To determine optimum methodologies for the integration of mapping data with high resolution images, to aid in the extraction of terrain information
- In collaboration with other ISPRS Working Groups, evaluate the information content and accuracy of the new highresolution sensors
- To contribute to work on standardising the description of raster and vector contents of digital maps

WG IV/4: Virtual Globes and Context-Aware Visualisation**Chair****Jianya Gong**

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WG IV/4 Terms of Reference

- Assessment of remote sensing data for generating and visualizing landscape and models
- Database generation for digital topographic and thematic mapping (including orthoimages and digital terrain models)
- Integration of multi-source and multi-scale data in local and regional landscape modelling and visualization applications
- Application of dynamic models for integrating multi-temporal landscape data sets
- Application and assessment of advanced visualization, virtual reality and multimedia methods for 2-D, 3-D and 4-D mapping tasks in stand-alone, mobile or web-based environments
- Use of virtual globes for geospatial data integration, visualization and analysis
- Assessment of context-aware visualization and analysis of image data and geodatabases

WG IV/5: Distributed and Web-Based Geoinformation Services and Applications**Chair****Songnian Li**

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WG IV/5 Terms of Reference

- Development of web-based geospatial data processing, integration, services and applications
- Web-based geospatial information visualization, including raster-based spatial analysis with integration of web-based visualisation systems and web-based spatiotemporal analysis
- Integration of open source solutions and open standards/specifications
- Development of web-based spatial decision support systems, public participation GIS, and disaster management support systems
- Development of mobile and ubiquitous geospatial services and applications with adaptive and context-aware processing and visualisation
- Integration of spatial data in information-mobility services and development of Internet and web-based virtual and collaborative geospatial environments
- Development and applications of web-based multidimensional GIS
- Quality assessment of Internet- and web-based geospatial processes and applications
- Cooperation with related commissions and/or working groups, ICA (Internet and Mapping Commission), WGISS, FIG, etc.

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WG IV/6 Terms of Reference

- Review technical progress on global DEM creation which meets the GEO goal of public domain, 30m, freely available data of the entire Earth's land surface and the bathymetry of the Earth's continental shelves
- Discuss and promote best methods for characterising the errors of these DEMs including best practice for validation in the context of GEO guidelines on Cal/Val
- Assess co-registration and data fusion based on error characterisation of multiple DEM data sources
- Discuss issues of standardised formats for DEM data and their map visualisations and display
- Discuss and promote best methods for interoperability through OGC-compliant protocols

WG IV/7: Planetary Mapping and Databases**Chair****Jürgen Oberst**

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WG IV/7 Terms of Reference

- Development of advanced techniques in data acquisition, processing, and analysis pertaining to the mapping of celestial bodies
- Definition or evaluation of reference systems, coordinate systems, map sheet definitions, etc. and their standardization
- Development of spatial information systems to support extraterrestrial exploration and science
- Web based delivery of extraterrestrial map products and GIS data
- Cooperation with related working groups viz. IAU, NASA, ESA, ISRO, JAXA and other space organisations and liaisons with the ICA Commission on Planetary Cartography

WG IV/8: 3D Spatial Data Integration for Disaster Management and Environmental Monitoring**Chair****Sisi Zlatanova**

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WG IV/8 Terms of Reference

- 3D data models (geometry, topology, semantics), algorithms and standards for integration of data from different domains (e.g. geology, meteorology, ocean)
- 3D data structures, algorithms and standards for integration of BIM, CAD and GIS models for seamless (indoor/outdoor) navigation and evacuation
- 3D data models for management of geo-sensor data and their integration with other 3D information
- Data models allowing for efficient 3D visualization (including indoor) on different front-ends
- Analysis of 3D disaster management and environmental modelling needs for production and updating of spatial information

IC WG IV/II: Geo-Sensor Networking and Geogrid

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IC WG IV/II Terms of Reference

- Geo-sensor networks including their use in dynamic scenarios
- Investigate efficient ways to visualise and analyse the resulting,

- sometimes rather unconventional data streams
- Investigate data models for dynamic management, analysis and archiving of sensor data
- In-network computing versus centralized data processing
- Grid computing for geoinformatics
- Collaboration with ISPRS WG IV/5, IV/8

IC WG IV/VIII: Updating and Maintenance of Core Spatial Databases

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IC WG IV/VIII Terms of Reference

- Automated and autonomous processes for imaging data-based updating of core spatial databases
- Development of strategy and processes for efficient maintenance of core spatial databases at the 2.5-D and 3D levels
- at local, regional and global scales
- Updating process through efficient use of information intelligence embedded within the spatial databases
- Theoretical and operational aspects of incremental updating and versioning of vector and raster core spatial databases
- Automated algorithms for security and commercial-based versioning of core spatial databases
- Study of the special needs for maintaining spatial database subsets for disaster response and recovery efforts and for
- search and rescue operations
- Collaboration with national mapping agencies for understanding operational needs for updating and maintenance of
- core databases and other groups, such as EuroSDR, Global Mapping, UNSDI, GSDI and ISPRS WGs

Commission V – Close-Range Sensing: Analysis and Applications

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Commission V – Terms of Reference

- Systems and algorithms for real-time imaging, mobile mapping and video processing
- Photogrammetric vision metrology technologies with special consideration of CAD/CAM and spatial information systems

- Integration and fusion of multiple data sources for advanced object extraction and modelling
- Laser scanning for 3-D representation of objects and scenes
- Close-range image sequence analysis procedures
- Vision-based techniques for visualization, simulation, robotics and animation
- Vision metrology systems and industrial applications
- Photogrammetric techniques in biomedical engineering and human motion studies

- Techniques for architectural, archaeological and cultural heritage applications

WG V/1: Vision Metrology-Best Practice, Systems and Applications

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WG V/1 Terms of Reference

- Performance evaluation including definition of accuracy in vision metrology, best practice and contribution to international standards
- System developments and industrial applications including hybrid systems and colour processing
- Colour processing, recognising that many commercial-off-the-shelf systems incorporate colour sensors
- Camera-controlled robot and machine guidance
- 6DOF measurements (including optical sensor navigation)
- Large volume (sub millimetre capability at object scales of greater than 10 metres)
- Very close range (micrometre capabilities at object scales of less than 1 metre)

WG V/2: Cultural Heritage Data Acquisition and Processing

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WG V/2 Terms of Reference

- Development and promotion of measurement techniques, from close range through to satellite, and spatial information systems applicable to cultural heritage
- Integration of measurement techniques supporting the documentation, monitoring and presentational requirements of the archaeology, architecture, conservation and archiving communities
- Development and dissemination of best-practice protocols to aid appropriate application across related cultural heritage fields
- Development and promotion of low-cost, rapid, innovative, automated, commercial and open-source approaches
- Development and promotion of UAV platforms applicable to cultural heritage
- Close co-operation with related disciplines, national / international groups (e.g. CIPA) and other ISPRS working and regional groups

WG V/3: Terrestrial Laser Scanning and 3D Imaging

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WG V/3 Terms of Reference

- Geometric and radiometric sensor modelling and calibration of terrestrial laser scanners
- Automated and robust methods for point cloud registration
- Integration of terrestrial laser scanning and other sensors on static and kinematic platforms (in collaboration with WG V/5 and IC WG V/I)
- Feature extraction, 3D object modelling and scene classification (in collaboration with WG III/2 and WG V/4)
- Processing methods for range cameras and other 3D imaging sensors, in particular range camera image sequences (in collaboration with WG V/5)

WG V/4: Image-Based and Range-Based 3D Modelling

Chair

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WG V/4 Terms of Reference

- Stimulate the development of algorithms and software tools for (automated) geometric modelling using different data sources
- Promote integrated processing of point clouds, image and video data for the generation of realistic 3D models usable in virtual environments, animations, games, museums, etc.
- Benchmark the quality of 3D models generated through software tools and create standard datasets
- Consider efficiency and interoperability of models for Virtual Environment applications (e.g. simplification, standards)
- Address special requirements of 3D models for cultural heritage, architecture, engineering, construction (e.g. metric precision, geo-reference, annotation)

WG V/5: Image Sensor Technology

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WG V/5 Terms of Reference

- Design, characterization, calibration and evaluation of imaging sensors for close range photogrammetry and terrestrial application
- Evaluation of image sensors (CCD, CMOS, IR-Bolometer), thermal systems and time-of-flight based range image sensors
- Evaluation of non-standard imaging principles (panoramic cameras, fisheye systems, catadioptric sensors and other omni-directional vision techniques)
- Geometric and radiometric properties of image data, quality standards, and factors (environmental and others) affecting data quality
- Integrated sensors / sensor fusion (synchronization and metric aspects, alignment of different sensors)
- Multiple camera / multiple sensing systems and solutions for outdoor applications (surveillance and traffic object recognition)

WG V/6: Close Range

Morphological Measurement for the Earth Sciences

Chair

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WG V/6 Terms of Reference

- To increase awareness of close-range photogrammetry and laser scanning to enable wider and wiser application within the earth sciences
- Educate and inform “non-geomatic” users of the existence and benefits of involvement with ISPRS
- Identify and promote differing small format camera calibration requirements and approaches, suitable for scales of enquiry relevant for close-range activities
- Develop, and make freely available, ‘best-practice’ guidelines for non-expert users of consumer grade digital cameras (e.g. simplifying “3x3 rules”) and terrestrial laser scanners
- Identify and rank the key qualities of spatial data necessary for numerical simulation and physical modelling

IC WG V/I: Land-Based Mobile Mapping Systems

Chair

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IC WG V/I Terms of Reference

- Design, development and evaluation of integrated, multi-sensor, land-based mobile mapping systems
- Design and development of real-time data processing algorithms for land-based mobile mapping systems
- Automation of information extraction from land-based mobile imaging and ranging sensor data

- Development of novel applications in transportation infrastructure mapping and assessment, including pavement and asset mapping, emergency response
- Cooperation with ICA, IAG, FIG, and other ISPRS WGs on 3D mobile mapping; image indexing and retrieval; 3D object reconstruction and city modelling; point cloud processing; sensor integration and multiple sensing solutions; and applications in LBS and disaster management

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Commission VI – Terms of Reference

- Promotion of education and training at fundamental, advanced and professional levels
- Promotion of technology transfer, considering account regional needs and resources
- Computer-assisted teaching, training and distance learning
- Innovative techniques for information dissemination on the Internet
- Promotion of youth forum and innovative outreach activities
- Assist the Council in the promotion of ISPRS activities in the regions

- Quality enhancement of content and format of ISPRS publications and Internet home pages

WG VI/1: Web Based Education**Chair****Henny Mills**

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WG VI/1 Terms of Reference

- Exchange information and expertise and stimulate the development of tools and methods for web based education and elearning with emphasis on the following topics:
 - The use of open source material
 - E-learning methods
 - Modern trends: Social software
 - Use of web tool for teaching, e.g. Wiki

- Availability of courseware (software) for teaching on the web
- Maintain and update information on education and open source material on ISPRS Website
- Didactical aspects of e-learning
- Modern trends in teaching: blogs, podcast, RSS feeds, social networking, Wiki
- Tools for web based training and education
- Requirements for e-learning

WG VI/2: E-Delivery of Education Services**Chair****Gerhard König**

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WG VI/2 Terms of Reference

Exchange information and expertise and stimulate the development of e-delivery of educational services with emphasis on the following topics:

- Collection, analysis, dissemination and promotion of material, software and data (hardcopy and/or softcopy) for elearning including computer assisted teaching and distance learning
- Investigation of the role of e-learning in modern education and training such as material, methodologies and tools
- Assessment and evaluation of highly interactive multimedia material and the transformation of tertiary level courses in remote sensing, photogrammetry and SIS
- Denominate best practice examples
- Collecting of information on distance education courses
- Organization of software contest CATCON for promotion and dissemination of free educational software

WG VI/3: Cross Border Education 1: Frameworks for Cross-Border Education

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WG VI/3 Terms of Reference

Exchange information and expertise of institutional and legal aspects of cross-border education with emphasis on the following topics:

- Institutional and legal frameworks
- National and international frameworks
- quality standards and
- credit transfer systems

WG VI/4: Cross-Border Education 2: Joint Educational Programs

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WG VI/4 Terms of Reference

Exchange information and expertise and stimulate the development of cross-border educational services with emphasis on the following topics:

- Inventory & evaluation of joint educational programs (JEPs)
- Classification of existing JEPs
- Development of core curricula & educational modules
- Decentralized delivery chains for educational services
- Capacity building
- Best practices for joint education

WG VI/5: Promotion of the Profession to Young People

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WG VI/5 Terms of Reference

- Promotion of advances in photogrammetry, remote sensing and spatial information sciences to undergraduate and postgraduate students and young researchers
- Promotion of international cooperation and social cohesion among the youth
- Creation of adequate conditions and platforms for broader and more efficient involvement of youth into ISPRS activities, including financial aspects, facilitating their ISPRS participation and activities, and support by sponsors
- Promotion and support of the Student Consortium (SC)
- In close cooperation with the SC, advice and support in preparing activity plans, organization of summer schools and other activities defined in the ISPRS SC Statutes. Organisation of youth events, where SC has no local support and main responsibility for organising the technical programme of SC activities during Congresses
- Facilitation of the continuity of the SC and provision of an interface to TC VI, Council, other ISPRS TCs and WGs and regional and international organisations, especially sister societies and ISPRS members. Cooperation, especially with the WG VI/6: The Technology Transfer Caravan

- Promotion of international mobility for undergraduate and postgraduate students and young researchers, making also use of international funding capabilities, like EU research programmes, and encouragement of relevant organisations to facilitate international student exchange and training programs at various levels

WG VI/6-Special Interest Group "Technology Transfer Caravan"

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Special Interest Group Terms of Reference

- Transfer of knowledge and technology by initiating and organizing seminars, tutorials and workshops with special consideration of the needs of developing countries
- Focus on countries with less favourable opportunities for advanced education, also particularly in Africa and Latin America
- Establishment of links to Balkan countries
- Preparation and delivery of seminars for PhD level summer schools
- Development of teaching material for mobile, caravan-type teaching and training projects
- Initiation and support of e-learning and remote teaching activities with focus on integration of high-tech elements in teaching and training
- Support of events with strong participation of young scientists and students
- Solicitation of support from potential sponsors (system manufacturers, government agencies, NGO/NPOs, foundations etc.) for the projects and activities

Commission VII - Thematic Processing, Modelling and Analysis of Remotely Sensed Data

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Commission VII – Terms of Reference

- Relationship between spectral, radiometric and temporal properties of objects and surfaces, their physical and chemical properties and their variations
- Image classification and analysis methodologies
- Analysis of characteristics of multi-spectral, hyperspectral, multi-sensor,

microwave and multi-temporal image data for extraction of attribute information

- Methodologies of computer-assisted interpretation and analysis of remotely sensed data
- Validation of data and information using laboratory and in-situ methodologies
- Improving atmospheric modelling for radiometric correction
- Multi-source data fusion and integration techniques
- Modelling of satellite data derived parameters
- Global databases and determination of indicators of change for global modelling, monitoring and sustainable development
- Integration of remote sensing and GIS techniques

- Aerosol and particulate detection and identification

WG VII/1: Physical Modelling and Signatures in Remote Sensing

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WG VII/1 Terms of Reference

- Study the relationship of spectral, directional, temporal, and polarimetric properties of objects, as well as their
- physical and chemical properties and variations
- Research on advanced quantitative, physical based retrieval of biophysical and biochemical parameters
- Research of methods based on full spectral signatures using assimilation, inversion, and neural networks
- Study spectrodirectional ('the combination of multiple view angles with imaginary spectrometers') data acquisition
- potential and subsequent retrieval methods

WG VII/2: SAR Interferometry

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WG VII/2 Terms of Reference

- Generation and evaluation of DEMs derived by interferometric processing of airborne and spaceborne SAR imagery
- Object extraction from InSAR data
- Differential SAR Interferometry and Persistent Scatterer Interferometry
- Ground based SAR Interferometry

WG VII/3: Information Extraction from Hyperspectral Data

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WG VII/3 Terms of Reference

- Ground based validation and radiometric calibration of hyperspectral data
- Optical, NIR, SWIR and thermal imaging spectroscopy
- Operationalising and standardising (pre-)processing and methodological approaches
- Atmospheric parameter retrieval and atmospheric corrections
- Data and sensor fusion for improved parameter retrieval (combination with other remote sensing data (lidar, SAR, multi-angular) and a priori information)
- Mixture models for data analysis
- Data compression and band selection algorithms

WG VII/4: Methods for Land Cover Classification

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WG VII/4 Terms of Reference

- Image classification techniques and new algorithms for the extraction of thematic information including pixel-based classification, object-based classification, and artificial intelligent based classification, and synergism between classification approaches
- Image analysis methodologies for thematic information extraction including context analysis, texture analysis, image segmentation, and other analysis
- Advanced and practical methodologies of Computer Assisted Interpretation (CAI) and analysis of remotely sensed data, including expert systems and knowledge based tools to help the human interpretation of images
- Enhanced methodologies for thematic data extraction using emerging sensor data sources, multiple view sensors and thermal sensors
- New methodologies for classification quality assessment

WG VII/5: Methods for Change Detection and Process Modelling

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WG VII/5 Terms of Reference

- Analysis of characteristics of multi-temporal data for extraction of attribute information
- Methodologies of computer assisted interpretation and analysis of multi-temporal data
- Temporal pattern recognition and time series analysis and Modelling
- Methodologies for global monitoring, Modelling and prediction
- Methodologies for extracting essential climate variables from long-term satellite observations
- Algorithms and methods for monitoring and tracking changing objects
- Data integration and change detection for updating

WG VII/6: Remote Sensing Data Fusion

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WG VII/6 Terms of Reference

- Automatic registration of images with different sensor, different resolution, and different acquisition mode
- Concept study and methodology development of data fusion at different processing levels, especially at feature and decision level
- Multi-source/multi-sensor data fusion and integration methodologies, such as fusing laser scanning data with images, fusing high-resolution satellite optical imagery with high-resolution SAR imagery, etc.
- Applications of data fusion to feature extraction, object recognition, classification, mapping, disaster monitoring, change detection, etc.
- Information mining from multi-platform, multi-source, multi-scale, spatial-temporal data, e.g. geometric information, topological information, statistical information, etc.

WG VII/7: Theory and Experiments in Radar and LIDAR

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WG VII/7 Terms of Reference

- Polarimetric radar remote sensing for the retrieval of geophysical parameters
- Full-waveform laser scanning

- Radiometric calibration in radar and lidar remote sensing
- Scaling in radar and lidar remote sensing
- Physical radar and lidar backscatter models
- Experiments using both radar and lidar
- Synergetic use of lidar and radar for retrieval of geophysical parameters
- Multi-temporal radar and lidar remote sensing
- Terrestrial measurements for validation and calibration

Commission VIII – Remote Sensing Applications and Policies

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Commission VIII – Terms of Reference

- Forestry, vegetation, agricultural and biodiversity studies and applications;
- Hydrology, oceanography, coastal zone, snow and ice applications;
- Atmospheric and weather studies and applications;
- Geology, pedology and geomorphology studies and applications;
- Monitoring and management of land and water resources;
- Land use, human impact and ecosystem analyses;
- Disaster monitoring, mitigation and damage assessment;
- Hazardous waste and environmental pollution assessment;
- Infrastructure, transportation and communications studies and applications;
- Satellite and aerial remote sensing policies;
- Cooperation with international environmental programs and strategies;

- Earth Observation activities to support sustainable development.

WG VIII/1: Disaster Management

Chair

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WG VIII/1 Terms of Reference

- Generation of vulnerability and hazard zone maps for different type of disasters, such as forest fire, cyclone, floods, drought, volcano eruptions, earthquakes, land slides etc. and identification & assessment of potential risk zones
- Integrate remotely sensed observations and communication strategies with enhanced predictive modelling capabilities for disaster

- detection, early warning, monitoring, and damage assessment
- Development of disaster management plans for pre, during and post disaster situations and enhance support for early warning systems, emergency events mitigation and decision making
- Collaborate with GEO and take part in GEO task where appropriate

WG VIII/2: Health

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WG VIII/2 Terms of Reference

- Integrate Earth observations products with enhanced predictive modelling capabilities for early warning and surveillance of environmental impacts on human health in co-operation with other international, national, and regional organizations and activities.
- Participate in the ICSU initiatives including the GeoUnions Health Group and the Science for Health and Well-being (SHWB).
- Take a leadership role in appropriate GEO health tasks in accordance with the 10-year implementation plan.

- Contribute to the ISPRS book series focusing on environmental effects on human health.
- Develop a registry for human health projects and products that use Earth observations and kindred technologies.
- Bridge the Earth observing communities of practice and human health communities of practice by including health professionals in ISPRS sanctioned technical sessions, workshops, and symposia.

WG VIII/3: Atmosphere, Climate and Weather

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WG VIII/3 Terms of Reference

- Enhance retrieving and monitoring status and effects of clouds and aerosols.
- Enhance retrieving and monitoring status and effects of atmospheric greenhouse gases, like carbon dioxide, methane, etc.
- Enhance retrieving and monitoring capabilities of atmospheric minor constituents and aerosols both in stratosphere and troposphere.
- Enhance the monitoring capabilities of atmospheric winds.
- Increase the accuracy of atmospheric radiative forcing to contribute to the climate models.
- Increase the knowledge of atmospheric processes to improve the climate models.
- Improve the quality of remote sensing data input to numerical weather forecast system to increase the accuracy of weather forecasting and nowcasting.
- Collaborate with GEO and take part in GEO task where appropriate.

WG VIII/4: Water

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WG VIII/4 Terms of Reference

- Implement remotely sensed data to monitor and investigate discharge of pollutants into water transportation and storage system for investigating sedimentation in reservoirs and contamination of water resources
- Adopt remotely sensed data for monitoring quality and quantity of water resources
- Integrate remote sensing and GIS data for rainfall runoff modelling
- Enhance the capability of monitoring global rainfall as well as snowfall
- Improve the retrieval of soil moisture and latent heat for better understanding of water and energy cycle
- Collaborate with GEO and take part in GEO task where appropriate

WG VIII/5: Energy and Solid Earth

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WG VIII/5 Terms of Reference

- Adopt remote sensing data to non-renewable resource exploration, exploitation and related environmental monitoring, especially energy (hydrocarbons, geothermal and uranium) and minerals (precious, base metals and commercial minerals).
- Further the implementation and integration of higher level remote sensing products tailored for geological and geomorphological mapping, especially publicly available, continental-scale mapping opportunities.
- Help facilitate the development of geological and geomorphological product standards and related error assessment derived from remote sensing data
- Foster technology transfer through the sharing of convincing geological and geomorphological case histories derived from remote sensing data
- Help develop mechanisms that facilitate the uptake of geologic and geomorphologic remote sensing

information products into Earth science applications, especially understanding the 3D and 4D (temporal) nature of the solid Earth, such as tectonic activity, hydrocarbon and minerals systems, water catchment modelling and monitoring, soil processes (erosion, acidity, salinity and carbon), and dune systems (with Com.4/2 & 5/6)

- Collaborate with other ICSU GeoUnions; collaborate with GEO and take part in GEO task where appropriate

WG VIII/6: Agriculture, Ecosystems and Bio-Diversity

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WG VIII/6 Terms of Reference

- Define protocols and methodologies to efficiently and economically utilize remote sensing inputs to monitor crop production, crop vigor, and stresses for making agricultural decisions
- Development of techniques towards use of remote sensing data and GIS tools for site-specific management of agriculture

- Development of techniques towards use of remote sensing data and GIS tools for monitoring and analyzing human impacts to natural resources
- Improve the knowledge of carbon and nutrient cycles in vegetation
- Enhance the use of active sensors to evaluate and monitor biological and physical processes, which are important in agriculture ecosystems
- Improve the retrieval of crop land and grassland information from remote sensing data through advances in procedures and models for inventorying and monitoring of vegetation resources and biomass
- Study and promote vegetation biodiversity and sustainable application with respect to the convention of bio-diversity
- Improve regional/global monitoring of mangroves using remote sensing data
- Assess climate change impact on vegetation using Earth observation data and forecasting models
- Integrate remote sensing data, in-situ and other measurements into a GIS domain to monitor and facilitate study and research of wet lands, and monitor spatial and temporal changes in the wet land and processes of wet land degradation
- Implement remote sensing and geospatial methodologies in support of sustainable development in wet lands and wet land resources assessment
- Collaborate with GEO and take part in GEO task where appropriate

WG VIII/7: Forestry

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WG VIII/7 Terms of Reference

- Enhance the use of active sensors to evaluate and monitor biological and physical processes, which are important in forest ecosystems. (with Com.1/2)
- Improve the retrieval of forest information from remote sensing data through advances in procedures and models for inventorying and monitoring of forest resources, stocks and biomass.
- Apply remote sensing techniques and GIS tools to support forest management tasks. (with Com. 4/2, 4)
- Improve the knowledge of carbon cycle including NPP and NEP estimates using land remote sensing data
- Collaborate with GEO and take part in GEO task where appropriate

WG VIII/8: Land

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WG VIII/8 Terms of Reference

- Improve the accuracy of land cover mapping and generate global and regional land cover maps
- Improve the accuracy of land cover change detection and generate global and regional land cover change maps
- Apply improved interpretation and mapping methods for urban, sub-urban and peri-urban land cover in transition to help for better urban planning using remote sensing data
- Monitor urban environment and land cover change for the study of urbanization structure and development processes
- Use remote sensing and GIS for infrastructure development of urban settlements
- Explore, document and monitor natural and cultural heritages (with Com 5)
- Integrate remote sensing data, in-situ measurements and other geospatial data to facilitate research, applications, and monitoring of arid lands, rangelands and soils
- Improve the monitoring of spatial and temporal environmental changes in arid environments and processes of land degradation, desertification, salinization, wind and water erosion, ecohydrology, and biogeochemical cycling
- Implement remote sensing and geospatial methodologies in support of sustainable development in arid lands, land resources assessment and management of arid and dry lands
- Collaborate with organisations such as FAO to improve land use classification schemes
- Collaborate with GEO and take part in GEO task where appropriate

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WG VIII/9 Terms of Reference

- Measure, characterize, understand, and predict, the storage and transport of momentum, heat, water (salinity), and greenhouse gases in the ocean and the surface signatures (temperature, salinity, dynamic topography) of ocean response and the surface forcing (wind stress, fresh water, turbulent and radiative heat flux) from diurnal to decadal time scales, and from coastal to open oceans.
- Understand ocean's role in the changes and interaction among the biological, chemical, and energy/water cycles in the oceans and their influence on terrestrial and cryospheric changes.
- Coordinate present and future space missions related to ocean observation, and the calibration, validation, and dissemination of their data.

- Collaborate with GEO and take part in GEO task where appropriate

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WG VIII/10 Terms of Reference

- Improve the retrieval of geophysical parameters relevant to the different elements of the cryosphere.
- Develop strategies and algorithms for assimilating remotely sensed data in models of polar processes.
- Develop long term records and study on-going changes in polar regions.
- Study the changes of ice sheets in Antarctic and Greenland.
- Study the trends and changes of glaciers and glacier lakes.
- Study the trends and changes of sea ice.
- Study the trends and changes of snow cover and snow albedo.
- Monitor the thaw process and changes of permafrost.
- Collaborate with GEO and take part in GEO task where appropriate