

IAG Commission 4 Positioning and Applications



Sub-Commission 4.3 Atmosphere Remote Sensing

IAG – GGOS JWG 4.3.3 Combination of Observation Techniques for Multi- dimensional Ionosphere Modeling

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- Sub-Commission 4.3
Atmosphere Remote Sensing

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Chair: Michael Schmidt (Germany)

Vice-Chair: Jaroslaw Bosy (Poland)

Secretary: Mahmut O. Karslioglu (Turkey)

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Composition:

- Study Groups: 1
- Working Groups: 6
- Joint Study Groups: 1
- Joint Working Groups: 3

Sub-commission ToR

- The **Earth's atmosphere** can be structured into various layers depending on **physical parameters** such as
 - **temperature** or
 - **charge state.**
- From the geodetic point of view the atmosphere is nowadays
 - not only seen as a **disturbing quantity** which has to be corrected
 - but also as a **target quantity**, since almost all geodetic measurement techniques provide valuable information about the atmospheric state.
- **Space weather** and especially its impacts and risks are gaining more and more importance in politics and sciences, since our **modern society** is highly depending on space-borne techniques, e.g., for communication, navigation and positioning.
- **Coupling processes** between different atmospheric layers and **inter-relations with climate change** are other contemporary issues.

Sub-commission ToR, cont.

- The general objectives of this SC are to **coordinate research**
 - on the one hand side in **understanding processes** within and between the different atmospheric layers using space-geodetic measurements and observations from other branches such as astrophysics and
 - on the other hand in **developing new strategies**, e.g., for prediction and real-time modelling.
- Since **GNSS** is characterised as a highly precise observation technique it covers a wide range of applications and allows for a huge number of research topics.
- Besides sounding the atmosphere and studying space weather effects by modern evaluation methods, the promising **GNSS reflectometry technique** (GNSS-R) is another research topic within this SC.

Planned Activities

- To promote research **collaboration** among groups from geodesy and other branches worldwide dealing with atmosphere research and applications
- To organize and/or participate in **scientific** and **professional meetings** (workshops, conference sessions, etc.)
- To maintain a **web page** concatenating the Sub-Commission activities and reports
- To encourage **special issues**, e.g. of Journal of Geodesy, on research, applications, and activities related to the topics of this Sub-Commission

Study, Working, Joint Study, and Joint Working Groups

- **SG 4.3.1 Ionospheric and Atmospheric Coupling Processes and Phenomena: Modeling and Measurements**
 - Chair: Lucie Rolland (France)
 - Vice-Chair: Attila Komjathy (USA)
- **WG 4.3.1 Real-time Ionosphere Monitoring**
 - Chair: Alberto Garcia-Rigo (Spain)
 - Vice-Chair: David Roma Dollase (Spain)
- **WG 4.3.2 Ionosphere Predictions**
 - Chair: Mainul Hoque (Germany)

Study, Working, Joint Study, and Joint Working Groups

- **JWG 4.3.3 Combination of Observation Techniques for Multi-dimensional Ionosphere Modelling** (joint with GGOS)
 - Chair: Mahdi M. Alizadeh (Germany)
- **WG 4.3.4 Ionosphere and Troposphere Impact on GNSS Positioning**
 - Chair: Tomasz Hadas (Poland)
- **WG 4.3.5 Ionosphere Scintillations**
 - Chair: Lung-Chih Tsai (Taiwan)
 - Vice-Chair: Jens Berdermann (Germany)

Study, Working, Joint Study, and Joint Working Groups

- **WG 4.3.6 Troposphere Tomography**
 - Chair: Witold Rohm (Poland)
- **WG 4.3.7 Real-time Troposphere Monitoring**
 - Chair: Jan Dousa (Czech Republic)
- **JWG 4.3.8: GNSS tropospheric products for Climate** (joint with Commission 1)
 - Chair: Rosa Pacione (Italy)
 - Vice-Chair: Eric Pottiaux (Belgium)

Study, Working, Joint Study, and Joint Working Groups

- **JWG 4.3.9 GNSS-R** (joint with GGOS)
 - Chair: Felipe Nievinski (Brazil)
 - Vice-Chair: Thomas Hobiger (Sweden)

- **JSG 0.27: Space weather and ionosphere** ((joint with ICCT, see ICCT))
 - Chair: Klaus Börger (Germany)
 - Vice-Chair: Mahmut O. Karslioglu (Turkey)

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ToR

- The general objective of this working group is development of regional and global ionosphere maps of VTEC and electron density in 2D, 3D, and 4D; based on the combination of various observation techniques.

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Activities

- (1) investigate new space geodetic techniques suitable for providing information about the ionosphere,
- (2) focus on the development of appropriate parameter estimation and assimilation techniques based on the combination of different observation techniques,
- (3) study the integration of measurements from other sources into the combination procedure, e.g. ionosonde data,

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Activities, cont.

- (4) with respect to weighting of different techniques, further investigate on empirical, mathematical, and physical weighting schemes,
- (5) validate the combined maps through comparison with raw data from various space geodetic techniques, and
- (6) evaluate the global ionosphere maps with global models such as IRI and NeQuick and the regional maps with regional ionosphere models such as LPIM and TWIM model.

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Members (as of October 2016)

1. Mainul Hoque - DLR, Germany
2. Claudio Brunini - LaPlata, Argentina
3. Francisco Azpilicueta - LaPlata, Argentina
4. Anderzej Krankowski – UWM, Poland
5. Roman Galas – TU Berlin, Germany
6. Jens Berdermann – DLR, Germany
7. Norbert Jakowski – DLR, Germany
8. Manuel Hernandez Pajares – UPC, Spain
9. Mahmut O. Karslioglu – METU, Turkey
10. Jens Wickert – GFZ Potsdam
11. Robert Heinkelmann – GFZ Potsdam
12. Robert Weber – TU Wien, Austria
13. Joachim Feltens – Germany

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Members (as of October 2016), cont.

14. Lyubka Pashova – NIGGG, Bulgaria
15. Ernest Macalalad – Phillipin
16. Stefan Heise – GFZ potsdam
17. Mathias Fritsche – GFZ Potsdam
18. Kinga Wezka – TU Berlin
19. Christina Arras – GFZ Potsdam
20. Lung-Chih Tsai – CSRSR, Taiwan
21. Dudy Wijaya - Indonesia
22. Eren Erdogan – TU Munich
23. Dieter Bilitza – GMU, USA
24. Anthony Mannucci – JPL, USA
25. Chen Peng – OSU, USA
26. Mahdi Alizadeh – KNTToosi, IRAN

Looking forward to a fruitful collaboration 😊

Thank you for your attention

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