

SCIENTIFIC PROGRAM

THURSDAY, SEPTEMBER 10, 2026

08:00-09:00 **Registration** (and poster mounting time)

09:00-09:20 **Welcome & Opening Event**

Moderator: tbd

Welcome and Remarks by the Organizers

Ulrich Foelsche, Julia Danzer, Marc Schwärz (OPAC-8): Organizational remarks

Hui Shao, Tony Mannucci (IROWG-11): IROWG introductory remarks

Welcome Address

Andrea Steiner (Dean – School of Environmental & Regional Sciences and Education, University of Graz)

Rector/Vice rector Uni Graz (tbc)

09:20-10:30 **Opening Talks**

Moderator: Ulrich Foelsche

09:20-09:50 GNSS-RO for Climate (keynote)

B. Randel

09:50-10:10 Occultations for probing atmosphere and climate at Uni Graz: highlights from 30 years ARSCLiSys Research Group science (invited)

G. Kirchengast

10:10-10:30 Current and future activities in radio occultation at EUMETSAT (invited – 40 years EUMETSAT)

C. Marquardt

10:30-11:00 **Coffee Break** (and poster mounting time)

11:00-12:25	Morning Session Current Missions 1 Chair: tbd
11:00-11:20	COSMIC Data Analysis and Archive Center GNSS Radio Occultation Status (invited) J. Braun
11:20-11:40	Status on the processing of new and old satellite missions at the ROM SAF (invited) S. Syndergaard
11:40-11:55	NOAA NESDIS Commercial Data Program - Overview and Status M. Gasbarro
11:55-12:15	PlanetiQ GNSS-RO Observing System: 2026 Update (invited) J. Brandmeyer
12:15-12:25	Operational and Emerging Capabilities from Spire's GNSS-RO and GNSS-R Constellation (invited) V. Nguyen
12:25-14:00	Lunch Break
14:00-15:45	Afternoon Session 1 Current to Future Missions Chair: tbd
14:00-14:20	NOAA Commercial RO - Planning for the Future (invited) M. Gasbarro
14:20-14:35	Balancing RO Architecture and Design with Enterprise Needs: Take-Aways from the NOAA RO Analysis of Alternatives W. Gullotta
14:35-14:50	Radio Occultation on Metop-D: Mission Overview and First Results R. Notarpietro
14:50-15:10	Updates on FY3F/3G/3H status and Private Sector Engagement (invited) M. Lao

15:10-15:30	Overview of YunYao RO Constellation, Data Processing and Data Quality (invited) Y. Cheng
15:30-15:45	Advance of the Climate and Atmospheric Composition Exploring Satellites Mission (CACES) in China Z. Zhang
15:45-16:15	Coffee Break
16:15-17:20	Afternoon Session 2 Specific occultation methods – Reflections and Airborne Chair: tbd
16:15-16:35	Characterizing Earth's Planetary Boundary Layer (PBL) Using Grazing Reflected Signals (invited) P. Vergados
16:35-16:50	Tracking Sentinel-6 GNSS-RO Grazing Reflection Signals and its PBL Characterization Applications K.-N. Wang
16:50-17:05	Toward a Mission-Agnostic Machine Learning Framework for GNSS-R Wind Speed Retrieval E. Lasota
17:05-17:20	1D-Var retrieval using refractivity observations from GNSS airborne radio occultation P. Hordyniec
17:20-17:35	Augmenting the dataset for investigating surface fluxes in atmospheric rivers using open-loop tracking airborne radio occultation in the lower troposphere P. Bhattacharjee
17:35	Thursday Scientific Sessions Adjourn
18:00-22:00	Get-Together Party

FRIDAY, SEPTEMBER 11, 2026

09:00-10:35 Morning Session 1
NWP 1 – Processing, Assimilation and Forecasting Advancements
Chair:

09:00-09:20 Status of GNSS-RO assimilation at ECWMF (*invited*)
K. Lonitz

09:20-09:35 Impact evaluation of GPS Radio Occultation (GNSS-RO) In Australian Regional Models (*remote*)
B. Biadglgne

09:35-09:50 GNSS RO Data Assimilation in the NOAA GFS: Recent Progress
X. Li

09:50-10:05 Estimation of GNSS RO Observation Impact in CMA Global Numerical Weather Prediction System
Y. Liu

10:05-10:20 Impact of 2D ROPP Forward Operators and Airborne Radio Occultation Assimilation on Global Numerical Weather Prediction
H. Christophersen

10:20-10:35 Increasing the impact of GNSS-RO observations in the Met Office NWP system
N. Bowler

10:35-11:05 Coffee Break

11:05-12:30 Morning Session 2
Atmospheric Physics and Climate 1
Chair:

11:05-11:25 Temperature trends in ROM SAF climate data records and CMIP6 climate models (*invited*)
H. Gleisner

11:25-11:40 The impact of atmospheric extremes on tropopause characteristics
M. Stocker

- 11:40-11:55 Global Variability of Double Tropopauses from Radio Occultation and Their Links to Climate Modes
A. de la Torre
- 11:55-12:10 Latest results in radio occultation wind field monitoring and analysis
J. Danzer
- 12:10-12:25 Assessment of GRAS-RO and MW/IR Instruments on Metop-A in UTLS: Brightness Temperature Comparison
V. Ludwig-Barbosa

12:25-14:00 Lunch Break

**14:00-15:35 Afternoon Session 1
Occultation Methodology 1
Chair:**

- 14:00-14:20 An update of the estimation of the refractivity expression (invited)
J. Aparicio
- 14:20-14:35 Recent updates to the CDAAC neutral atmospheric RO data processing system
J. Sjoberg
- 14:35-14:50 Characterizing Residual Ionospheric Errors in GNSS RO Bending Angles: A Comparative Analysis of COSMIC-1 and COSMIC-2
J. Chang
- 14:50-15:05 Tandem Radio Occultation Experiments for Direct Estimation of Bending Angle Uncertainty: Metop and Sentinel-6 Applications
S. Paoletta
- 15:05-15:20 GNSS RO bending angle accuracy in the lower troposphere
R. Kursinski
- 15:20-15:35 Commercial and COSMIC-2 GNSS-RO Neutral Atmosphere Near-real-time Product Processing and Generation at NOAA/STAR and Performance Assessment
C. Cao

15:35-16:00 Coffee Break

16:00-17:00 Afternoon Session 2

IROWG

Chair:

16:00-16:30 IROWG: Reports from CGMS-53 and CGMS-54

16:30-17:00 Open Actions from CGMS WGII and WGIII

Pre-Planning of IROWG-12 (2027/28)

Preparig the IROWG co-chair election

17:00-19:00 Poster Session

Chair:

P1 GNSS-RO Monitoring and Data Download Dashboard for Processing at UCAR's

M. Sleziak-Sallee

P2 Evaluation of NOAA STAR-processed COSMIC-2 and Commercial GNSS RO

Bending Angle Assimilation in the GFS Model

W. Miller

P3 Application of the three-cornered hat method to evaluate and compare model
analyses and forecasts

J. Sjoberg

P4 COSMIC-2 Payload Status - From Launch through Extended Mission

J. Braun

P5 Impact of Vertical Observation Error Modeling of GNSS RO on Forecast
Performance in the Korean Integrated Model

E.-H. Kim

P6 Modulating the RO observation operator when assimilating 35,000 radio
occultations per day during ROMEX

K. Lonitz

P7 Evaluating the impact of a ray-tracing operator on the assimilation of Radio
Occultation Observations Using JEDI and the GFS Atmospheric Model

H. Shao

P8 Developing a Forward Operator on Polarimetric Radio Occultation (PRO)
observations

K.-N. Wang

- P9 Assessing the potential of GNSS-R for tropospheric sensing using signal simulations
W. Kowalczyk
- P10 1DVAR assimilation of GNSS-ARO observations in ROPP software
A. Maciejewska
- P11 GNSS Radio Occultation Ducting in the Tropical Cyclone Boundary Layer and Implications for NWP Data Assimilation
K. Nelson
- P12 ROM SAF radio occultation activities for the period 2027 to 2032
K. Lauritsen
- P13 Construction and Application of Radio Occultation Bending Angle Climatology for Quality Control and Assessing Spatio-Temporal Variability
A. Tripathee
- P14 Robust Detection and Extraction of Radio Occultation (RO) Reflection Signals for Lower Troposphere Profiling
A. Tripathee
- P15 Tropopause variability at the edge of the tropics and the expansion of the tropical belt
F. Ladstädter
- P16 Characterizing and Correcting GNSS Radio Occultation IWV Bias in Atmospheric River Conditions Using Multi-Source Observations
B. Rahimi
- P17 Retrieval of Multi-GNSS TEC and Electron Density Profiles from Radio Occultation at NOAA/STAR with Applications to Recent Space Weather Storms
X. Shao
- P18 Altitude and Spatial Distribution of Equatorial Plasma Bubbles Derived From GNSS Radio Occultation and Compared With GOLD Radiance Images
C. Quilis Alfonso
- P19 Calibration, Processing, and Operations of the PlanetiQ Total Electron Content Observations
J. Brandmeyer
- P20 Equatorial ionospheric irregularities from the COSMIC-2 mission during solar cycle 25
J. Braun
- P21 Ionospheric Occultations and Scintillations from Cosmic-2 and Sentinel-6 Radio Occultation Antennas
T. Meehan

- P22 Validation and Characterization of the Ionospheric Data from the Miniaturized GNSS Occultation Sounder (GNOS-M) Onboard the TianMu-1 Satellite Constellation
Y. Sun
- P23 Comparing IRI-2020 Ray Tracing Absorption Estimates with Observed 10 MHz Signal Strength via the HamSCI GRAPE Network
G. Zayed

19:00 Friday Adjourn

19:00-20:00 Dinner

SATURDAY, SEPTEMBER 12, 2026

09:00-10:30 IROWG Subgroup Working Meetings

10:30-11:00 Coffee Break

11:00-12:30 Consolidation of IROWG Subgroup-Recommendations

12:30-14:00 Lunch Break

15:00-22:00 Excursion and Dinner*

SUNDAY, SEPTEMBER 13, 2026

Optional excursion to Graz or explore Castle Seggau.*

*** SEE ENCLOSED INFO SHEET!**

MONDAY, SEPTEMBER 14, 2026

09:00-10:35 Morning Session 1

Specific occultation methods – Polarized and Infrared

Chair:

09:00-09:20 Polarimetric Radio Occultations: Processing, simulations and exploitation (invited)

R. Padullés

09:20-09:35 All-Sky Radiative Transfer Simulations Enabling Joint Interpretation of Polarimetric Radio Occultation and Passive Microwave Observations for Hydrometeor Characterization using WRF-ARTS

V. Vidal

09:35-09:50 Processing Polarimetric Radio-Occultation Soundings with Wave Optics Methods

J. Brandmeyer

09:50-10:05 PlanetiQ linearly polarized RO results measuring precipitation

R. Kursinski

10:05-10:20 Development of a broadband frequency locked laser source for SWIR atmospheric occultation measurements

T. Yu

10:20-10:35 Fulllink uncertainty evaluation for spaceborne infrared laser occultation measurements

S. Huang

10:35-11:05 Coffee Break

11:05-12:35 Morning Session 2

Current Missions 2

Chair:

11:05-11:20 The Operation and Orbit maintenance of FORMOSAT-7/COSMIC-2 Constellation

C.-Y. Huang

11:20-11:35 GRAS-2 In-Orbit Verification Results for the First Metop-SG Satellite

A. Carlström

- 11:35-11:50 Performance of Occultation Data from the Miniaturized GNSS Occultation Sounder (GNOS-M) Onboard the TianMu-1 Satellite Constellation
C. Liu
- 11:50-12:05 Sentinel-6B Non-Time-Critical Radio Occultation products by EUMETSAT
S. Padovan
- 12:05-12:20 Enhanced PBL Capabilities from the COSMIC-2 and Sentinel-6 Missions
C. Ao
- 12:20-12:35 Precise orbit determination for Metop-D at EUMETSAT: status and challenges
V. Rivas Boscán

12:35-14:00 Lunch Break

14:00-15:35 Afternoon Session 1
Radio Occultation Data for Climate Monitoring
Chair:

- 14:00-14:20 GNSS radio occultation processing at the GFZ: 25 years of data for weather forecast and climate research (*invited*)
T. Schmidt
- 14:20-14:35 EUMETSAT Reprocessing Activities
F. Martin Alemany
- 14:35-14:50 How recent armed conflicts disrupt RO GNSS climate monitoring
S. Scher
- 14:50-15:05 The radio occultation reprocessing at the Wegener Center: Validation and uncertainty evaluation of rOPS long-term climate monitoring data
M. Schwärz
- 15:05-15:20 Methodology for determining climatic winds from radio occultation data
I. Nimac
- 15:20-15:35 The impact of propagated GNSS RO uncertainties on climate trend estimates
F. Ladstädter

15:35-16:05 Coffee Break

16:05-17:50 Afternoon Session 2
NWP 2 – ROMEX Data Usage
Chair:

16:05-16:20 An extended ROMEX experiment

C. Marquardt

16:20-16:35 Dry temperature comparisons and diurnal variability from ROMEX radio
occultation observations

J. Sjöberg

16:35-16:50 Status of GNSS-RO in global data assimilation at DWD

H. Anlauf

16:50-17:05 GNSS-RO capabilities in JEDI

B. Ruston

17:05-17:20 Global Forecast Impacts of Radio Occultation Observations Using Traditional and
AI-Based Data Assimilation with the AIFS

K. Bathmann

17:20-17:35 Radio occultation simulation and prediction at EUMETSAT: current and future
applications

F. Sancho

17:35-17:50 Beyond COSMIC-2: Can polar and mid-inclination orbits fill the tropical gap?

F. Sancho

17:50 Monday Scientific Sessions Adjourn

19:00-20:00 Dinner

20:00-22:00 Wine Tour

TUESDAY, SEPTEMBER 15, 2026

09:00-10:15 Morning Session 1

Occultations in ionospheric and planetary science

Chair:

09:00-09:15 Performance Assessment of Total Electron Content Products from the Spire Constellation

M. Talpe

09:15-09:30 Development of GNSS-Based Data Assimilation for Space Weather at NRL Using JEDI

H. Shao

09:30-09:45 Ionospheric Radio Occultation Data from LEO Satellite Constellations and Their Data Assimilation Applications

N. Fu

09:45-10:00 Three-cornered hat estimation of NmF2 error variances from radio occultation, ionosonde and ANN model and its application in data assimilation

M. Wu

10:00-10:15 Definition of system requirements and hardware selection for a cross-link radio occultation instrument to observe the lunar ionosphere

G. Radaelli

10:15-10:45 Coffee Break

10:45-12:30 Morning Session 2

NWP 3

Chair:

10:45-11:00 Taking into account the uncertainty in the expression of refractivity in the GNSS-RO observation operator

D. Raspaud

11:00-11:15 Towards the Operational Assimilation of Polarimetric Radio Occultations: Forward operator development and NWP applications

A. Paz Carracedo

- 11:15-11:30 First results from assimilating Polarimetric RO data
K. Lonitz
- 11:30-11:45 Integrated Impact of GNSS-RO and GNSS-R Data Assimilation on Tropical
Cyclogenesis Prediction: A Case Study of Typhoon Gaemi (2024)
S.-Y. Chen
- 11:45-12:00 Assessments of new data sources and observation error statistics
L. Hall
- 12:00-12:15 Study on the Distribution Characteristics and Collaboration of Global GNSS
Occultation Missions
W. Lu
- 12:15-12:30 Establishing a Standard for the Modeled Radio Occultation
C. Barsoum

12:30-14:00 Lunch Break

14:00-15:30 Afternoon Session 1
New Techniques – AI and NI
Chair:

- 14:00-14:15 Bias characteristics and estimation of the FORMOSAT-7/COSMIC-2 radio
occultation bending angle in the low troposphere with a machine learning
algorithm
G.-H. Pham
- 14:15-14:30 Processing deep occultation data from GRAS-2 using sliding window phase
matching and multiple correlators
J. Rasch
- 14:30-14:45 Wavelet-Transform-based Phase Matching Method for Impact Multipath
Mitigation in GNSS Radio Occultation
J. Park
- 14:45-15:00 Reliable Ducting Detection with Sliding Window Phase Matching
J. Brandmeyer
- 15:00-15:15 Deep Learning for Detecting Atmospheric Ducting in GNSS-RO Data
H.-W. Cheng
- 15:15-15:30 Generating realistic synthetic RO soundings in extreme atmospheric events
C. Allietta

15:30-16:00	Coffee Break
16:00-17:35	Afternoon Session 2 Climate Trends and Water Vapor Chair:
16:00-16:20	Atmospheric temperature trends from observations: an update (invited) A. Steiner
16:20-16:35	Leveraging GNSS radio occultation excess phase and bending angle observables for anthropogenic climate signal detection in the troposphere and stratosphere J. Innerkofler
16:35-16:50	An observational perspective on wind trends: a comparison of RO and reanalysis data A. Reiter
16:50-17:05	Climatological Regimes of Precipitable Water Vapor Revealed by Clustering of GNSS Radio Occultation and ERA5 Data A. de la Torre
17:05-17:20	Observing Atmospheric Rivers and their Vertical Structure with GNSS Radio Occultation U. Foelsche
17:20-17:35	The ROM SAF tropospheric humidity Climate Data Record development. J. Nielsen
17:35	Tuesday Scientific Sessions Adjourn
18:00-19:00	Dinner
19:00-21:00	WGIII discussion (IROWG to assess the impact of the decline in COSMIC data availability)

WEDNESDAY, SEPTEMBER 16, 2026

09:00-09:40 **Morning Session 1**
IROWG – Reporting of Subgroups
Chair:

09:00-09:20 Reporting of the IROWG Subgroup on NWP (*invited*)
Subgroup co-chairs

09:20-09:40 Reporting of the IROWG Subgroup on Climate (*invited*)
Subgroup co-chairs

09:40-10:00 Reporting of the IROWG Subgroup on Space Weather (*invited*)
Subgroup co-chairs

10:00-10:20 Reporting of the IROWG Subgroup on Innovation (*invited*)
Subgroup co-chairs

10:20-10:50 **Coffee Break**

10:50-12:00 **Morning Session 2**
IROWG Recommendations to CGMS
Chairs: **U. Foelsche** and **H. Shao**

10:50-11:05 Providing an Answer to CGMS WGIII

11:05-12:50 **Main IROWG Recommendations to CGMS**
(Moderated by IROWG co-chairs)

12:50-13:00 **Workshop Wrap-up & Farewell**

13:00-14:00 **Lunch (optional)**