

# The 4<sup>th</sup> International Workshop on Equatorial Plasma Bubbles

14–18 September 2026

National Institute for Space Research (INPE),  
São José dos Campos, São Paulo, Brazil

Support

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Sponsors



## EPB-4 Oral Presentation Program

| Time          | Monday<br>September 14                  | Tuesday<br>September 15          | Wednesday<br>September 16        | Thursday<br>September 17         | Friday<br>September 18                                      |
|---------------|-----------------------------------------|----------------------------------|----------------------------------|----------------------------------|-------------------------------------------------------------|
|               | Chair: Cristiano Wrasse                 | Chair: Cosme Figueiredo          | Chair: Paulo Fagundes            | Chair: Yuichi Otsuka             | Chair: Jonas Souza                                          |
| 09:00 – 09:20 | Registration                            | Irina Zakharenkova               | Yasunobu Miyoshi                 | Joseph Huba                      | Vincenzo Romano                                             |
| 09:20 – 09:25 | Adenilson Silva<br>(CGCE Coordinator)   |                                  |                                  |                                  |                                                             |
| 09:25 – 09:30 | Joaquim Resende<br>(Head of DICEP)      |                                  |                                  |                                  |                                                             |
| 09:30 – 09:40 | Mônica Oliveira<br>(AEB representative) |                                  |                                  |                                  |                                                             |
| 09:40 – 10:20 | Richard Eastes                          | Shun-Rong Zhang                  | Jiyao Xu                         | Esfhan Kherani                   | Alison Moraes                                               |
| 10:20 – 10:40 | Coffee Break                            | Coffee Break +<br>Poster Session | Coffee Break +<br>Poster Session | Coffee Break +<br>Poster Session | Coffee Break                                                |
|               | Chair: Cristiano Wrasse                 | Chair: Cosme Figueiredo          | Chair: Paulo Fagundes            | Chair: Yuichi Otsuka             | Chair: Jonas Souza                                          |
| 10:40 – 11:20 | Delano Gobbi                            | Yuichi Otsuka                    | Cesar Valladares                 | Jonas Souza                      | Roberto Madeira                                             |
| 11:20 – 11:40 | Rezy Pradipta                           | Carolina Carmo                   | Eliah São Sabbas                 | Weijia Zhan                      | Francisco Meneses Jr.                                       |
| 11:40 – 12:00 |                                         | Paulo Fagundes                   | Qi Jiang                         |                                  | Teddy Surco Espejo                                          |
| 12:00 – 14:00 | Lunch Time                              | Lunch Time + Group Photo         | Lunch Time                       | Lunch Time                       | Lunch Time                                                  |
|               | Chair: Diego Barros                     | Chair: Eurico de Paula           | Chair: Prosper Nyassor           | Chair: Carolina Carmo            | Jonas Souza<br>Roundtable Discussion                        |
| 14:00 – 14:40 | Lianhuan Hu                             | Bela Fejer                       | Hisao Takahashi                  | Graciela Molina                  |                                                             |
| 14:40 – 15:00 | Charles Swenson                         | Iurii Cherniak                   | Cosme Figueiredo                 | Xiaoqing Pi                      |                                                             |
| 15:00 – 15:20 |                                         |                                  | Marco Ridenti                    |                                  |                                                             |
| 15:20 – 15:40 | Coffee Break                            | Coffee Break +<br>Poster Session | Coffee Break +<br>Poster Session | Coffee Break +<br>Poster Session | Joaquim Resende<br>Presentation and Visit to<br>the EMBRACE |
|               | Chair: Diego Barros                     | Chair: Eurico de Paula           | Chair: Prosper Nyassor           | Chair: Carolina Carmo            |                                                             |
| 15:40 – 16:00 | Edgardo Pacheco                         | Ankit Kumar                      | Gang Chen                        | André Martinon                   |                                                             |
| 16:00 – 16:20 |                                         | Rodolfo de Jesus                 | Jixin Guo                        |                                  |                                                             |
| 16:20 – 16:40 | Luis Loures da Costa                    | Prosper Nyassor                  | Gbadebo Adeniran                 | Gowher Rather                    |                                                             |
| 16:40 – 17:00 | Tommaso Lo Presti                       | Yuxiao Li                        | Eduardo Macho                    | Sávio Rennó                      |                                                             |
| 19:00         |                                         |                                  |                                  | Workshop Dinner                  |                                                             |

- Keynote speakers (green names): 30-minute presentation + 10-minute Q&A
- Regular presentations (black names): 15-minute presentation + 5-minute Q&A
- Roundtable: The Future of EPB Research – EPB-5, Monthly/Annual Virtual International EPB Meetings, Observation Campaigns, New Scientific Insights, and Strategies to Mitigate the Socioeconomic Impacts of Equatorial Plasma Bubbles
- Workshop Dinner – Coco Bambu restaurant; expenses will be covered by each participant
- CGCE – General Coordination of Space Engineering, Technology and Science
- DICEP – Space Weather Division
- AEB – Brazilian Space Agency
- EMBRACE Program – The Brazilian Program for Studies and Monitoring of Space Weather

## Session

 Session I - Upcoming Satellite Missions, Ground-Based Experiments, and Innovative Techniques for Monitoring Equatorial Plasma Bubbles

 Session II - Space Weather Effects on the Seeding and Evolution of Equatorial Plasma Bubbles

 Session III - Wave-Like Perturbations, Including Gravity Waves and Medium-Scale Traveling Ionospheric Disturbances, and Their Role in the Seeding and Development of Equatorial Plasma Bubbles

 Session IV - Couple1d Models and Numerical Simulations to Advance the Understanding of Equatorial Plasma Bubble Seeding, Growth, and Variability

 Session V - Advancing Forecasting Capabilities through the Integration of Artificial Intelligence, Machine Learning, Observations, and Modeling

 Session VI - Societal and Technological Impacts of Equatorial Plasma Bubbles on GNSS, Satellite Communications, and Space Weather Services

## Speakers and Presentation Titles

|   | Speaker                                                                                                          | Presentation Title                                                                                                                                                                      |
|---|------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | <b>Richard Eastes</b> - Laboratory for Atmospheric and Space Physics (LASP), University of Colorado Boulder, USA | EPBs – Insights and Continuing Questions                                                                                                                                                |
| 2 | <b>Delano Gobbi</b> - National Institute for Space Research (INPE), Brazil                                       | EQUARS: A Coordinated Multi-Instrument Observational Framework for Equatorial Plasma Bubble Science                                                                                     |
| 3 | <b>Rezy Pradipta</b> - Boston College, USA                                                                       | Formulating a Better Global Coordination for Multi-instrument Data Analysis, Reduction, and Tabulation of Equatorial Spread-F, Equatorial Plasma Bubbles, and Scintillation Occurrences |
| 4 | <b>Lianhuan Hu</b> – Institute of Geology and Geophysics, Chinese Academy of Sciences (IGGCAS), China            | Monitoring Equatorial Plasma Bubbles and Estimating maximum usable communication frequency from Pacific to Indian Oceans Using the Low Latitude Long Range Ionospheric Radar (LARID)    |
| 5 | <b>Charles Swenson</b> - Utah State University, USA                                                              | Observations of Fine Scale Density Structures in equatorial plasma bubbles by the SPORT Mission                                                                                         |
| 6 | <b>Luis Eduardo Vergueiro Loures da Costa</b> - Aeronautics Institute of Technology (ITA), Brazil                | ITASAT2: A Multi-Satellite CubeSat Mission to support Space Weather Monitoring and Equatorial Plasma Bubble Investigations                                                              |
| 7 | <b>Edgardo Pacheco</b> - Instituto Geofísico del Peru, Peru                                                      | Characterizing Equatorial Ionospheric Irregularities: Spread-F and Vertical Drifts in Peru                                                                                              |
| 8 | <b>Tommaso Lo Presti</b> – GFZ, Germany                                                                          | Cross-Validation of Equatorial Plasma Bubble Signatures over Brazil from Ground-Based GNSS, In Situ Spaceborne Measurements, and Ionosonde Observations                                 |

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| <b>9</b>  | <b>Yuichi Otsuka</b> – Nagoya University, Japan                                                                      | Occurrence of Plasma Bubbles Reaching Mid-Latitudes Based on GNSS observations at the American Longitudinal Sector                                   |
| <b>10</b> | <b>Irina Zakharenkova</b> – COSMIC Program Office, University Corporation for Atmospheric Research, Boulder, CO, USA | On occurrence of ionospheric super plasma bubbles during strong geomagnetic storms                                                                   |
| <b>11</b> | <b>Bela Fejer</b> - Utah State University, USA                                                                       | Magnetic Storm Drivers of Equatorial Ionospheric Plasma Bubbles                                                                                      |
| <b>12</b> | <b>Carolina Carmo</b> – China-Brazil Joint Laboratory for Space Weather (CBJLSW), Brazil                             | Geomagnetic Storm–Driven Generation and Suppression of Equatorial Plasma Bubbles in the American Sector                                              |
| <b>13</b> | <b>Paulo Fagundes</b> - University of Vale do Paraíba (UNIVAP), Brazil                                               | Observations of Spread-F During the May 2024 Geomagnetic Superstorm                                                                                  |
| <b>14</b> | <b>Iurii Cherniak</b> - SRRC, University of Warmia and Mazury in Olsztyn, Poland                                     | On performance of GNSS ROTI maps for investigation of equatorial plasma bubbles development under quiet and disturbed conditions                     |
| <b>15</b> | <b>Shun-Rong Zhang</b> - MIT Haystack Observatory, USA                                                               | Storm-time observations of Bubble-like Ionospheric Super depletion Structure (BLISS) and Super Equatorial Plasma Bubbles                             |
| <b>16</b> | <b>Ankit Kumar</b> - University of Vale do Paraíba (UNIVAP), Brazil                                                  | Multi-Instrument Investigation of Equatorial Plasma Bubble Occurrence Over the South American Region During the 15–16 April 2025 Geomagnetic Storms. |
| <b>17</b> | <b>Rodolfo de Jesus</b> - China-Brazil Joint Laboratory for Space Weather (CBJLSW), Brazil                           | Dynamics of the equatorial and low-latitude ionosphere in the Brazilian sector during the 11-14 June 2025 geomagnetic storms                         |
| <b>18</b> | <b>Prosper Nyassor</b> - National Institute for Space Research (INPE), Brazil                                        | Coupling of the Lower and Upper Atmosphere: Case Studies on the role of Ray Tracing Model                                                            |
| <b>19</b> | <b>Yuxiao Li</b> - Institute of Geology and Geophysics, Chinese Academy of Sciences, China                           | Complex Ionospheric Irregularity Echoes Observed by Low Latitude Long Range Ionospheric Radar                                                        |
| <b>20</b> | <b>Yasunobu Miyoshi</b> – Kyushu University, Japan                                                                   | Numerical Simulation of Traveling Ionospheric Disturbances generated by upward propagating gravity waves                                             |
| <b>21</b> | <b>Xu Jiyao</b> - State Key Laboratory of Solar Activity and Space Weather, Chinese Academy of Sciences, China       | Upper Atmospheric Disturbances and Ionospheric Irregularities Induced by Intense Events in the Lower Atmosphere                                      |
| <b>22</b> | <b>Cesar Valladares</b> - Boston College, USA                                                                        | Long-term statistics of TEC depletions, S4 indices, and traveling ionospheric disturbances                                                           |
| <b>23</b> | <b>Qi Jiang</b> - School of Earth and Space Science, University of Science and Technology of China, China            | Direct Observations of Large-Scale Wave Structures and Post-sunset                                                                                   |

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|    |                                                                                                                                                  | Rise of the Ionosphere in the Generation of Equatorial Spread F                                                                                                       |
| 24 | <b>Jixin Guo</b> - State Key Laboratory of Solar Activity and Space Weather, National Space Science Center, CAS, China                           | Quasi-Periodic Wave-like Perturbations of Calcium Ions in the Ionosphere                                                                                              |
| 25 | <b>Hisao Takahashi</b> – National Institute for Space Research (INPE), Brazil                                                                    | Interaction of Equatorial plasma bubbles with travelling ionospheric disturbances and midnight brightness wave observed under the equatorial ionospheric Anomaly zone |
| 26 | <b>Cosme Figueiredo</b> - Federal University of Campina Grande (UFCG), Brazil                                                                    | The Role of Midnight Brightness Waves in Triggering Secondary Instabilities within Equatorial Plasma Bubbles over the Brazilian Sector                                |
| 27 | <b>Marco Antonio Ridenti</b> – Aeronautics Institute of Technology (ITA), Brazil                                                                 | Forecasting Ionospheric Irregularities Using Interpretable Generalized Linear Models                                                                                  |
| 28 | <b>Gbadebo S. Adeniran</b> – National Institute for Space Research (INPE), Brazil                                                                | Scintillation Variability During the 2022–2023 Sudden Stratospheric Warming Under Varying Geomagnetic Conditions Over the Brazilian Sector                            |
| 29 | <b>Gang Chen</b> - School of Earth and Space Science and Technology, Wuhan University, China                                                     | Why Do Small-Scale Irregularities Migrate Beyond the Equatorial Plasma Bubble?                                                                                        |
| 30 | <b>Eduardo Macho</b> - Mackenzie Presbyterian University, Brazil                                                                                 | Solar-Cycle and Seasonal Variability of Ionospheric Irregularities over the American Sector from GNSS ROTI Observations                                               |
| 31 | <b>Eliah F. M. T. São Sabbas</b> – National Institute for Space Research (INPE), Brazil                                                          | Atmosphere-Ionosphere Coupling signaled by FAIRIES Observed with the LEONA Network                                                                                    |
| 32 | <b>Joseph Huba</b> – Syntek Technologies, USA                                                                                                    | Modeling Equatorial Plasma Bubbles                                                                                                                                    |
| 33 | <b>Esfhan Kherani</b> – National Institute for Space Research (INPE), Brazil                                                                     | Day-to-day variability of plasma bubble occurrence during the month of maximum occurrence                                                                             |
| 34 | <b>Jonas Souza</b> - National Institute for Space Research (INPE), Brazil                                                                        | Climatology of ionospheric plasma bubbles for the Brazilian longitude sector: empirical modeling                                                                      |
| 35 | <b>Weijia Zhan</b> - State Key Laboratory of Solar Activity and Space Weather, National Space Weather Center, Chinese Academy of Sciences, China | Impact of Quiet-Time Day-to-Day Variability of Vertical Drifts on the Generation of Postmidnight ESF                                                                  |
| 36 | <b>María Graciela Molina</b> - School of Exact Sciences and Technology, National University of Tucumán, Argentina                                | ML models for ionospheric irregularities studies: latest results                                                                                                      |
| 37 | <b>Xiaoqing Pi</b> – NASA Jet Propulsion Laboratory (JPL), Retired, USA                                                                          | Predicting Equatorial Vertical Plasma Drift Using TEC data and a Machine Learning Model, and Beyond                                                                   |

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| <b>38</b> | <b>André Ricardo Fazanaro Martinon</b> – National Institute for Space Research (INPE), Brazil | Forecasting Ionospheric Scintillation: A structured literature review of physics, data, models, and validation                                                                           |
| <b>39</b> | <b>Gowher Rather</b> - National Institute for Space Research (INPE), Brazil                   | Exploiting Spatial Correlations for Scintillation Nowcasting in Brazil: A Graph Neural Network Approach                                                                                  |
| <b>40</b> | <b>Sávio Jenner Vianna Silva Rennó</b> – Aeronautics Institute of Technology (ITA), Brazil    | Temporal Climatology of Ionospheric Scintillation Using Fixed SBAS Links at Low Latitudes                                                                                                |
| <b>41</b> | <b>Vicenzo Romano</b> - National Institute of Geophysics and Volcanology (INGV), Italy        | From Ionospheric Scintillation Monitoring to Operational Space Weather Services: the INGV experience.                                                                                    |
| <b>42</b> | <b>Alison de Oliveira Moraes</b> – Aeronautics Institute of Technology (ITA), Brazil          | Advances in Statistical Modeling of Ionospheric Scintillation                                                                                                                            |
| <b>43</b> | <b>Roberto Livy Gomes Madeira</b> - National Institute for Space Research (INPE), Brazil      | Investigating the relations between spectral and temporal parameters of the ionospheric scintillation phenomenon observed by a stand-alone GNSS receiver at Cachoeira Paulista in Brazil |
| <b>44</b> | <b>Francisco Meneses</b> - Federal Institute for Science and Technology of Paraná, Brazil     | Ionospheric Scintillation and Precision Agriculture in Brazil: UAV Operator perceptions and perspectives                                                                                 |
| <b>45</b> | <b>Teddy Surco Espejo</b> - Boston College, USA                                               | Performance Assessment of Low-Cost GNSS Receiver for Ionospheric Monitoring                                                                                                              |

## Poster Presentation

|   | <b>Name</b>                         | <b>Poster Title</b>                                                                                                              |
|---|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| 1 | Luiz Fillip Rodrigues Vital         | Effects of Sudden Stratospheric Warmings on Equatorial Plasma Bubbles                                                            |
| 2 | Suallyson Sômston Araújo da Cruz    | Observation of Midnight Brightness Wave over South American Low to Middle Latitudes                                              |
| 3 | Moisés José dos Santos Freitas      | A GAN-Based Synthetic Generator of Amplitude Scintillation Time Series for Equatorial Ionospheric Channels                       |
| 4 | Cesar Valladares                    | Recent Advances on the Generation Mechanism of near 1 Kilometer Irregularities                                                   |
| 5 | Pedro Ernesto Oliveira Pontes Nunes | Development of a Visual GNSS/INS Simulation Environment for Aircraft Approach Analysis Under Equatorial Ionospheric Disturbances |
| 6 | Alberto Ivo da Costa Vieira         | Automatic Detection of Equatorial Plasma Bubbles in Airglow Images Using Machine Learning Techniques                             |
| 7 | Shiyu Yang                          | Interhemispheric Asymmetry of Equatorial Plasma Bubbles in the American Sector                                                   |
| 8 | Wenjie Sun                          | Super Equatorial Plasma Bubbles During Magnetic Storms                                                                           |
| 9 | Yimeng Xu                           | Nighttime Ionospheric Enhancements Associated With the Thermospheric-Ionospheric Ca <sup>+</sup> Layers                          |

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| 10 | Iurii Cherniak | Advantages of COSMIC-2 Multi-instrument Measurements for investigation of Equatorial Plasma Bubble phenomenon                                 |
| 11 | Yuxiao Li      | On the Origin of Postmidnight Upwelling Plume-Like F Region Irregularities Echoes at Low Latitudes on 29 September 2025                       |
| 12 | Lianhuan Hu    | Comparative Analysis of EPB Characteristics over the Asia-Western Pacific and America-Atlantic Sectors During the January 2026 Magnetic Storm |

## Venue: LIT Auditorium

