Panels (P)
Extending the Prediction Horizon of Earth's Radiation Belts: from Science to End-users Space Weather Services (PRBEM.3)

PREDICTING THE ULTRA-LOW FREQUENCY PLASMA WAVE POWER USING SOLAR WIND DATA: A NEURAL NETWORK APPROACH

Jose Paulo Marchezi, jpmarchezi@gmail.com
1State Key Laboratory of Space Weather, National Space Science Center, Chinese Academy of Sciences, China. 2National Institute for Space Research – INPE, São José dos Campos, SP, Brazil., Sao Jose Dos Campos, Brazil
Lei Dai, ldai@spaceweather.ac.cn
National Space Science Center, Chinese Academy of Sciences, Beijing, China: Chinese Academy of Sciences (CAS)
Ligia Alves Silva, ligia.alves01@gmail.com
1State Key Laboratory of Space Weather, National Space Science Center, Chinese Academy of Sciences, China. 2National Institute for Space Research – INPE, São José dos Campos, SP, Brazil., São Jose Dos Campos, Brazil
Paulo Ricardo Jauer, pauloricardojauer@gmail.com
National Space Science Center, CAS, Sao Jose Dos Campos, Brazil
Alisson Dal Lago, alisson.dallago@inpe.br
National Institute for Space Research (INPE), Sao Jose Dos Campos, Brazil
David Sibeck, david.g.sibeck@nasa.gov
NASA GSFC, Greenbelt, Maryland, United States
Vinicíus Deggeroni, vinidegg@gmail.com
Southern Regional Space Research Center–CRS/INPE–MCTI, in collaboration with the Santa Maria Space Science Laboratory–LACESM/CT–UFSM, Santa Maria, RS, Brazil., Santa Maria, Brazil
Livia Alves, liviarib@gmail.com
National Institute for Space Research (INPE), Sao Jose Dos Campos, Brazil
Chi Wang, cw@spaceweather.ac.cn
National Space Science Center, Chinese Academy of Sciences, Beijing, China: Chinese Academy of Sciences (CAS)
Hui Li, hli@spaceweather.ac.cn
National Space Science Center, Chinese Academy of Sciences, Beijing, China: Chinese Academy of Sciences (CAS)
Liu Zhengkuan, liuzhengkuan@nssc.ac.cn
State Key Laboratory of Space Weather National Space Science Center, Chinese Academy of Sciences, Beijing, China: Chinese Academy of Sciences (CAS)

Changes in the configuration of the sun's magnetic field influence the properties of the solar wind and, consequently, all planets and spacecraft within the heliosphere. Amongst other effects, perturbations in the solar wind generate waves within the Earth's magnetosphere that can interact with energetic particles trapped within the Earth's magnetic field. Ultra-low frequency (ULF) waves in Earth's magnetosphere transport and energize energetic electrons in the Van Allen outer radiation belt via radial diffusion. The main goal of this work is to conduct a statistical study of ULF wave occurrence patterns using ground-based magnetometer data at high latitudes and thereby estimate the power spectrum density of these ULF waves, which is needed to model the radiation belts. We also use observations from the solar wind at the L1 Lagrangian point over the course of two solar cycle phases. Finally, we use Recurrent Neural Networks to predict the ULF integrated power at latitudes that can be mapped to the Van Allen outer radiation belt. Therefore, this work helps improve estimates of the radiation belt electron diffusion coefficients corresponding to ULF waves, a crucial factor in any particle diffusion models for the outer radiation belt.