A Global Magnetohydrodynamic Simulation Study of Ultra-Low Frequency Waves Activity in the Inner Magnetosphere: Corotating Interaction Region + Alfvénic Fluctuation

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When the Earth's magnetosphere is under the influence of a complex solar structure comprised of a Corotating Interaction Region (CIR) followed by solar wind Alfvénic fluctuations it is not straightforward to decisively say which solar wind parameters or which combinations thereof are most effective in causing disturbances in the inner magnetosphere, or how each part of the complex interplanetary structure influences the most the temporal evolution of the magnetosphere. Using global magnetohydrodynamic (MHD) simulations we perform a study which address some of these questions. Firstly, we use the magnetic field and plasma parameters of a real CIR+Alfvénic fluctuations event as input to the SWMF/BATS-R-US code. The model outputs are used to calculate the convection electric field's power spectral density (PSD) integrated in the ultra-low frequency (ULF) waves frequency range in the equatorial, nightside magnetosphere region. Then, we separate the real event into its constituent parts by building up synthetic magnetic field and plasma profiles based on the physical parameters which characterize each of these parts. The MHD code is then fed with each new synthetic profile containing Alfvénic fluctuations with two driving frequencies, namely 0.833 and 1.66 mHz. Our preliminary results show that the toroidal electric field (E_r) component fluctuations are related with both driving frequencies, specially at farther out locations near the flanks of the modeled magnetopause. The poloidal (E_f) component fluctuations do respond differently to the driving frequencies in terms of both spatial structure and integrated power intensities.

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