SWOL2023 SPACE WEATHER OBSERVATIONS THROUGHOUT LATINOAMERICA	**Session: Magnetosphere and Geomagnetism** **Presentation type**: Oral (X) Poster( ) No preference ( )

Study of the variation of plasma pressure in the Earth's magnetosphere during geomagnetic storms using satellite data and numerical modeling

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The maintenance of magnetostatic equilibrium is the first problem that should be solved while we are analyzing any plasma configuration. It is not yet fully understood how the magnetosphere reaches magnetostatic equilibrium and what specific conditions are necessary to maintain it. Unraveling these processes requires knowledge about the 2-D distribution of plasma pressure for different geomagnetic conditions. In this work, we have obtained a self-consistent numerical solution for the dipole magnetic field disturbances caused by plasma pressure in the case of an azimuthally symmetric plasma distribution specified in the near Earth's magnetosphere. These results are complemented with the use of actual data measured by high-orbit satellite missions, such as THEMIS, RBSP or MMS. The primary outcome is the development of a novel methodology enabling the calculation of the Earth's magnetic field depression caused by a two-dimensional pressure profile during intense geomagnetic storms.

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