Radio waves diagnostics of near Earth environment state of art and perspectives

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Summary

Electromagnetic emissions observed in the nearest Earth environment are a superposition of natural emissions and various types of man-made noises. Also, as a consequence of catastrophic events on the Earth surface such as: thunderstorm activity, earthquakes, volcanic eruptions, electromagnetic signals are registered on board low orbiting satellites. Therefore, a more accurate physical description of such a complex and dynamic system calls for a long term multi-point and multi-scales coordinated monitoring of space environment. The magnetised solar-terrestrial space plasma is a highly non-linear medium, which exhibits many different types of turbulence and instabilities. A study of mass, energy, and momentum transport in the solar terrestrial plasma is directly related to the study of space plasma turbulence. The wide range wave in situ diagnostics and new generation multi-point and multi-type sensor diagnostics, as the LOFAR-LOIS system can be a good tool for monitoring such complex system. Ground-based multi-frequency and multi-polarisation netted radio and radar facilities and observation clusters in space will be helpful to find solutions to problems in space physics and to detect long-term environmental changes.
The presentation will give the overview of some physical processes, related to the turbulent plasma instability and detected in near Earth environment by help the radio waves diagnostics located on low orbiting satellite. We will show what we have learned about limitation of radio waves diagnostics and we will present the new idea of space plasma diagnostics; as in situ wave measurements combined with ground based LOIS netted radar registration.