

Spacecraft "clusters" for space weather studies

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Space Weather is fundamentally driven by the Solar activity and sometimes has a major impact on Earth and human lives. The consequences of severe space weather events can be disastrous for several sectors, including power, aviation and satellites. Therefore, the continuous monitoring of space weather and the accurate prediction of its impact on Earth, become vital tasks for our society.

In this presentation, we demonstrate and evaluate a concept mission, "fully dedicated" to the study of the space weather, with several assets whose low cost will allow us to replace and upgrade the assets almost continuously and at an affordable cost. The mission uses microsatellites carrying compact and fully dedicated state-of-the-art instruments. Not only will each single element of our proposed flotilla will be cheaply and quickly refreshed but also their position in the relevant part of the circum-terrestrial space could be easily modified not by complex navigation operations requiring complex and costly onboard subsystems. Indeed, by setting up a production line of very similar small and fully dedicated spacecraft, "clusters" of these spacecraft could be deployed in those parts of the Earth's magnetosphere that will be deemed necessary to be navigated to have a fully comprehensive study and forecasts of the space weather.

Another qualifying aspect of our mission study will be the use of appropriate multivariate-multidimensional statistical analyses piloted by AI algorithms. Indeed, a major obstacle to the correct formulation of the space weather forecasts, but also of well-functioning models of the interaction of the solar wind with the Earth's magnetosphere, require the analysis of gigantic quantities of data that are produced daily, together with need of comparing these data with those historically archived and sometimes never analyzed. We will finally discuss the scientific value of the collected data-set in the scope of multi-point studies of plasma dynamics within the inner magnetosphere.