

Monitoring space weather: from SOHO, PROBA2 to the future

J.J. Zender

¹ESA/ESTEC, *The Netherlands*

If we define weather as the atmospheric conditions at a location at Earth over a short period of time, then space weather is the environmental condition at a place in our solar system over a short period of time. The variables that define the 'environmental conditions' are manifold and increase in sync with our increased knowledge about the Sun, the solar wind, and planetary atmospheres. At the same time, the number of 'places' of interest for human kind increases continuously with the technology advances on Earth, in the Earth vicinity, and astronomy in general.

Weather is of interest for all of us. Weather plays however a crucial role – and here especially the art of weather forecasting – to protect economic and safety interest. In previous times, weather forecasting could ensure the success of the yearly harvest or the lives of ship crews. With a better understanding of our Sun and it's related activities in the solar corona and the propagation of the solar wind in our solar system, scientists were able to predict the impact of the solar wind to the upper Earth atmosphere, and in particular the impact on technology either in low Earth orbit or on-ground, e.g. power grid systems.

With astronauts in Earth orbit or rovers on Mars, scientists had to increase their space weather prediction capabilities both in timeliness and scope.

The variables that determine the space weather prediction capabilities are manifold. First to mention the radio wave emissions from the Sun itself, e.g. caused by solar flares. These can disturb communication systems on the surface of planets as well as in their respective orbit. Solar electro-magnetic field interactions with the Earth magnetosphere can cause disturbances on high-frequency devices used by a manifold of equipment. Thirdly, ionizing radiation origination from solar high-energetic particle events, the galactic cosmic ray background, or from Earth trapped radiation belts, has an effect on detectors and electronics in general.

An overview is given following these considerations and their evolution in the past decades, and an outlook dared into the next couple of years.