Exploring the use of EUV measurements for making real-time SEP predictions

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Forecasting the occurrence and intensity of a Solar Energetic Particle (SEP) event is an important task for space weather research, and appears mandatory if human beings are to be sent aboard spacecraft beyond low-Earth orbit. SEP forecasting schemes have been developed, which use earlier signatures of particle acceleration to predict the arrival of solar protons and ions in the space environment of the Earth. The UMASEP scheme (Núñez, 2011, 2015) forecasts the occurrence and the intensity of an SEP event based on combined observations of soft X-rays, their time derivative, and protons at geosynchronous orbit. We explore the possibility to replace the derivative of the soft X-ray time history with the extreme ultraviolet (EUV) time history in the UMASEP scheme. To this end we studied a 4-year period from January 2011 to December 2014 using data from the Extreme Ultraviolet Sensor (EUVS) instrument of the GOES 13-15 satellites, and feed this time series to the UMASEP prediction scheme. During the selected period the GOES detected twentyone >10 MeV SEP events related with activity in the western solar hemisphere. We show that the UMASEP forecasting using EUV measurements (called here UMASEP-10euv) has a better probability of detection and anticipation time as the UMASEP-10 method using soft X-rays (Núñez, 2011) and the UMASEP-10mw using microwaves (Zucca et al 2017), but higher false alarm ratio. The next steps are to continue calibrating the model with SDO EUV data, and to validate it using STEREO beacon EUV and particle data for predicting >10 MeV and >30 MeV SEP events. The ultimate goal is to contribute in the studies on future autonomous SEP forecasters to be deployed onboard spacecraft in manned space missions.