1. **Title of the presentation**

SOLPENCO: An engineering model for solar energetic particles in interplanetary space

2. **Speaker**

Angels Aran

3. **Abstract**

Exposure to solar energetic particle events (SEPs), specially, for energies between 1 MeV and 1 GeV, is a hazard in space for spacecraft components and astronauts. The effects of SEP radiation can be either produced by a time extended flux exposure or by short but intense increase of the particle flux. In the first case, the most relevant is the fluence of the SEP event, while for the second it is the peak flux. One of the major drawbacks of existing statistical models used to predict fluences of SEP events is that they do not take into account the contribution to flux and fluence of energetic particles accelerated by interplanetary shocks, and injected in heliosphere, during its propagation and expansion from the Sun. We have developed a first version of an operative code that can be used for flux and fluence particle prediction, based on the combined interplanetary shock-plus-particle propagation model of Lario et al. (1998). Lario's model derives an empirical relation between the injection rate of shock-accelerated particles and the strength of the shock at the point at its front where particles are assumed to be injected (the cobpoint, Heras et al., 1995). Modeling SEP events is a specialized scientific task which deserves large periods of time, much more than those required for space weather predictions, either in real time or for engineering purposes. Therefore, we have created SOLPENCO, a data base containing synthetic proton flux and fluence profiles, with a user-friendly interface which permits to derive by interpolation the flux and cumulate fluence profiles in the upstream part of an SEP event, for a given solar-interplanetary scenario selected by the user. SOLPENCO's data base contains a set of 448 different scenarios at 1 AU and at 0.4 AU, for proton energies ranging from 0.125 MeV to 64 MeV. The two main input variables are the initial shock velocity and the heliolongitude of the solar activity which triggers the particle event. SOLPENCO also provides the shock transit time and transit speed of the shock to propagate from the Sun to the observer, as well as the total fluence, from the onset of the event up to the shock passage by the spacecraft location. The present version (1) allows us to analyze which aspects of the theory and modeling of the SEP events must be improved in order to produce more reliable flux and fluence proton predictions useful for space weather; (2) after its validation, and keeping in mind its limitations, to be used as a prediction tool for gradual SEP events; and (3) contributes to shed light on the dependency of the SEP event fluence on the heliocentric distance.

Heras, A. M., B. Sanahuja, D. Lario et al., Astrophysical J. **445**, 497 (1995)
Lario, D., B. Sanahuja and A.M. Heras, Astrophysical J. **509**, 415 (1998)