

Solar energetic particle forecasts based on linear filter and layer recurrent neural network

Fridrich Valach

Geomagnetic Observatory, Geophysical Institute of the SAS¹

Miloš Revallo

Geophysical Institute of the SAS²

Pavel Hejda, Josef Bochníček

Institute of Geophysics, Academy of Sciences of the Czech Republic³

Abstract: Solar energetic particle (SEP) modelling has become of great interest in connection with space weather issues, e.g. safety of crews and protection of technological systems of spacecrafts outside the shielding Earth's magnetosphere. Here we propose two models for the prediction of solar energetic proton (SEP) enhancements. The models are based on a linear filter and on a special type of dynamic artificial neural network known as the layer-recurrent neural network. The models are fed with input data related to the class of X-ray flares originated close to the centre of the solar disc, types II or IV of the radio bursts, and of the position angles, widths, and linear speeds of the full or partial halo CMEs observed. The models are designed to provide the output in terms of the fluxes of protons with the energies exceeding 10 MeV in the libration point L1.

Key words: solar energetic particles, linear filters, recurrent neural networks

¹ Komárňanská 108, 947 01 Hurbanovo, Slovak Republic; e-mail: fridrich@geomag.sk

² Dúbravská cesta 9, 845 28 Bratislava, Slovak Republic; e-mail: geofmire@unix.savba.sk

³ Boční II/1401, 141 31 Prague, Czech Republic; e-mails: ph@ig.cas.cz, jboch@ig.cas.cz