

Despiking energetic proton flux to study galactic cosmic ray modulation

Zhao Lingling

Galactic Cosmic Ray (GCR) is usually assumed as a stable background with solar influence considered as a modulation. The violent Solar Energetic Particle (SEP) events associated with solar activities change particle fluxes several orders of magnitude in a few minutes. Thus, the flux observation of GCR provided by satellites may be heavily contaminated by spurious spikes due to SEPs, and that provided by ground-based neutron monitors may be contaminated by the system error spikes and ground level enhancement(GLE) effect. To obtain the pure background GCR flux for modulation research, the removal of multifarious spikes is necessary. In this article, we use a robust automatic despiking algorithm based on Poincare map thresholding method provided by Goring and Nikora for purification of the time-series GCR flux observations. We can show that the algorithm is good at cleaning up the heavily contaminated GCR intensity rates measured by both spacecraft and neutron monitors without artificial parameters. In addition, using the algorithm to despike the spacecraft observations of relatively lower energetic proton flux, we get both 11-year and 27-day period cycles comparable to the much higher energy GCR flux data measured by the ground-based neutron monitors.