

Extreme Solar Flares and the Acceleration of Particles up to Relativistic Energies at Shock Waves in Interplanetary Space

V.E. TIMOFEEV¹, A.T. FILIPPOV²

¹ *Yu.G. Shafer Institute of Cosmophysical Research and Aeronomy, 31 Lenin Ave., 677980 Yakutsk, Russia*

² *Physical-Technical Institute of M.K. Ammosov Yakutsk State University, 48 Kulakovskogo, 677007 Yakutsk, Russia*

Cosmic ray events in October-November 2003 are studied by using data of the Yakutsk detector complex and world station network, of cosmic rays. Peculiarities of increases observed are compared with characteristics of well known events in July 1959, November 1960, August 1972, October 1981 and September-October 1989. These events have the similar scenario of development. Several major sequential solar flares from one active region generate the energetic particles and produce alternating shocks in interplanetary space. The characteristic feature is that a next shock wave moves about twice as fast as the previous one. In this case, the additional increase of the relativistic particle flux observed on the Earth is caused by the acceleration of energetic particles in interplanetary space between the approaching shock fronts.