

# Characteristics of Proton Acceleration at the Sun on January 20, 2005, observed by the surface particle detectors

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On January 20, 2005, 7:02-7:05 UT the Aragats Multidirectional Muon Monitor (AMMM) located at 3200 m a.s.l. registered enhancement of the high energy secondary muon flux (threshold  $\sim 5$  GeV). The enhancement, lasting three minutes, has statistical significance of  $\sim 4\sigma$  (for the three-minute time series) and is related to the X7.1 flare seen by the GOES satellite and the Ground Level Enhancement detected by the world-wide network of neutron monitors and by muon detectors. The energetic and temporal characteristics of the muon signal from the AMMM are compared with the same characteristics of other solar monitors located at the Aragats Space-Environmental Center (ASEC). Various ASEC detectors select different energetic populations of the Solar Cosmic Rays (SCR). Therefore, from the multivariate time-series we conclude that in the episode of the particle acceleration at 6:55 – 7:05 UT 20 January 2005: (a) protons were accelerated at the Sun up to energies of 20 GeV in excess; (b) the relativistic protons with energies  $< 10$  GeV were ejected in the interplanetary space earlier than the highest energy protons ( $> 20$  GeV); (c) protons accelerated in the episode (maximum at 7:12 -7:15 UT), have lower energy compared with first acceleration episode.