Some aspects of the analysis of the decay phases of SEP events

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The majority of few-MeV solar energetic particle (SEP) events exhibit exponential-law decays. The comparison of experimental values of characteristic decay times, τ_{obs}, with those obtained previously in theoretical models considering convection transport and adiabatic deceleration shows that theoretically expected τ values, τ_{theor}= 4V(1 + γ)/3r (V is the solar wind speed, γ spectral exponent, r distance), depending on environmental plasma parameters, are reasonably close (within about 25 %) to the fitted slopes in nearly 50% of all cases where solar wind speed stays approximately constant. The events where τ_{obs} is considerably different from theoretical values might be explained by the variation of magnetic connection between the observer and a flare site through the decay, when the observer's footpoint approaches to or diverges from the flare site and consequently τ_{obs} increases or decreases as compared to τ_{theor}. In such a case one can calculate a correction to the theoretical value of τ and then obtain a "heliolongitudinal profile" of the particle injection at or near the Sun from the difference $\tau_{obs}^{-1} - \tau_{theor}^{-1}$ and solar rotation speed. Simultaneous observations at various radial distances (aboard IMP, ACE, and Ulysses) are also analyzed indicating that whereas high-energy (tens of MeVs) proton profiles sometimes are surprisingly identical, MeV protons in the same events have considerably longer decay phases at $>$1 AU, qualitatively supporting the idea of convection transport and adiabatic deceleration.