



On the importance of the Local Interstellar Spectrum for the Solar Modulation Parameter

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This study compares several local interstellar proton spectra often used in literature. We show that the modulation parameter ϕ , which parametrizes the modulation of the local interstellar spectrum (LIS) in the heliosphere, strongly depends on the LIS itself. Further we will show that all studied LIS require individual ϕ values to fit the differential proton fluxes measured at 1 AU by using measurements of the PAMELA instrument during the solar minimum in July 2006. Taking the LIS-dependency of the modulation parameter into account, we also derive linear equations to convert ϕ between the different LIS. The conversions used here are afterwards applied to a long-term reconstruction of ϕ derived from a record of the cosmogenic radionuclide ^{10}Be . For some LIS models occasionally negative ϕ values are obtained, a fact which is impossible from the physical point of view. Despite non-heliospheric effects such as uncertainties in the geomagnetic field and climate influences on the ^{10}Be production, one possible reason may also be the choice of the LIS. By using the derived LIS conversions, we show that the negative ϕ values in the reconstruction vanish for certain LIS. Thus, the reconstruction of ϕ provides the potential to derive the lower intensity limit of the LIS, keeping in mind that first the non-heliospheric effects have to be completely removed from the data.