Solar ions in the heliosheath as a possible new source of heavy neutral atoms pickup ions and ACR seed populations

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We show that multiply ionized C, N, O, Mg, Si, S carried by the solar wind and neutralized by multiple electron capture from neutral insterstellar atoms constitute an important source of Energetic Neutral Atoms in the inner heliosheath, with energies up to ˜1 keV/n. In the model we developed the heavy ions are treated as test particles carried by a hydrodynamic plasma flow (with a Monte-Carlo description of interstellar neutrals) and undergoing all relevant atomic process determining the evolution of charge-states of particular species. In the case when the heavy ions in the solar wind upon entering the heliosheath exchange energy with background plasma mainly by Coulomb scattering, the neutralization process is fast enough to provide important ENA sources for a number of species. For instance the predicted ENA fluxes at 1 AU may reach ˜1 at./(cmˆ2 s sr) both for C and O. The strength of ENA sources integrated over the upwind heliosheath amounts to 6x10ˆ7 g/s for C (and ˜10ˆ8 g/s for O) and is therefore comparable to corresponding total heliospheric requirements for ACR-carbon seed particles estimated from cosmic ray data. We suggest the considered mechanism provides a simple explanation for the as-yet-not-understood presence among the PUI and ACR populations of species whose first ionization potential is too low (as for C, Mg, Si) to allow them to exist as neutral atoms in the local interstellar medium.