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Heavy solar wind ions in the heliosphere: spatial distribution and expected X-ray emissions

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We model the heliospheric spatial distribution of multiply ionized ions of C, N, O, Mg, Si, S as they emerge from the solar corona and interact (radiative and dielectronic recombination, charge exchange with neutrals, collisional and photonic ionizations, Coulomb scattering) with plasmas in the supersonic wind, the heliosheath and distant heliospheric tail, as well as with neutral H and He populations. The distribution of plasma and neutrals in the outer heliosphere and distant tail is based on a gasdynamic model with the Monte-Carlo treatment of neutral populations as developed by V. Izmodenov and D. Alexashov (Astron. Lett. 29 (2003) 58-63). The heavy coronal ions may survive in highly ionized states to large heliocentric distances (˜thousands of AU in the heliotail) if cooling to thermal plasma is mainly due to Coulomb scattering on background protons. The soft X-ray emission of these ions resulting from electron capture into excited states is of the order of (up to a few) photons/(cmˆ2 s sr), depending on the look direction. Such signal should be detectable in the X-ray ROSAT data and thus provide independent means to study the spatial distribution and physical state of heliospheric plasmas beyond the termination shock.