



On the geometrical characteristics and energy variations of the heliospheric "Belt" as revealed by Cassini/INCA measurements

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One of the most striking features of the already published Energetic Neutral Atom (ENA) heliospheric maps is the bright and relatively wide region discovered by the Ion Neutral Camera (INCA), commonly known as the "Belt". With this study, we examine the characteristics of the Belt using energy resolved all-sky ENA maps for the heliosheath to further investigate its geometrical characteristics, possible energy dependence and its possible variability with time. The analysis involves ENA measurements obtained from the INCA experiment onboard Cassini, in 4 discrete energy passbands within the energy range of 5.4 to 55 keV for an extended time period from year 2003 to 2009. The resulting maps revealed that the ENA emissions forming the Belt are moderately well organized in galactic coordinates, i.e. they fall roughly within $\pm 60^\circ$ latitude about the galactic equator. By integrating each map over $\sim 10^\circ$ in galactic longitude and $\sim 4.5^\circ$ in latitude we are able to examine the degree of this organization by producing galactic latitude profiles of the ENA emissions throughout the sky sphere. Primary results of this study are summarized as follows: (a) statistically significant variations are found in the latitudinal profiles in all energy ranges and longitudes, with several relative peaks across the Belt, (b) the intensity of the profiles vary by a factor of ~ 2 along the Belt, being higher in the -180° to 90° longitude range, (c) the Belt extends to a latitudinal width of $\sim 80^\circ$ Full Width at Half Maximum (FWHM) in a longitudinal range of -180° to -60° , it then widens to $\sim 100^\circ$ in the range of 0° to 90° and narrows to $\sim 60^\circ$ as it loops back to wrap around the sky sphere, (d) albeit variable in longitude, the width does not seem to be dependent on energy, (e) the position of the Belt's peak is found to be increasing in latitude (from $\sim 15^\circ$ to 35°) in the range -180° to -100° longitude and then sharply decreases (-30° to 30°) in the range -100° to -40° longitude while remaining almost stable (at $\sim -20^\circ$) from $\sim 0^\circ$ to 180° longitude, (f) the consistency of the ENA distributions as a function of latitude between the different INCA channels indicates that the morphology of the Belt is almost energy-independent from 5 keV to 35 keV (minor deviations start to appear from > 35 keV energies).