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Latest IBEX discoveries on the neutral interstellar helium flow parameters (solicited)

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Interstellar Boundary Explorer (IBEX) studies Energetic Neutral Atoms from the heliosphere and interstellar medium. Using its IBEX-Lo neutral gas detector, it observed multiple neutral interstellar species, including hydrogen, helium, oxygen, and neon. In this review, the IBEX Science Team presents analysis of neutral interstellar helium observations, carried out using two independent analysis methods. The results of the two analyses, performed on the data from the 2009 and 2010 observing seasons separately and subsequently repeated on the whole data set merged, agree that the inflow parameters of interstellar helium are markedly, statistically significantly different than previously thought. Temperature and velocity of the gas and the flow direction coordinates as they result from the analysis are all related to each other, forming narrow alleys in the four-dimensional parameter space. The best fit to the data is obtained for the flow velocity about 23 km/s, temperature 6000 K, ecliptic longitude of the flow 259 deg and latitude -5.1 deg. These results are significantly different from the results obtained previously from analysis of Ulysses/GAS observations, but do agree with the results of analysis of interstellar matter lines in the spectra of stars in the Local Interstellar Medium by Redfield and Linsky (2008). The consequences are far reaching: the Sun may be close to the boundary between the LIC and G clouds, but still within the LIC cloud. However, the flow speed and direction in the LIC is different than used to be believed, which results in a deficit of ram pressure from the interstellar side in the pressure balance that keeps the heliosphere, which needs to be compensated for by an increased magnetic pressure (and thus a stronger magnetic field) and/or an increased plasma density. The seemingly small difference in the flow direction suggests that the orientation of the hydrogen deflection plane is markedly different than previously thought, namely by about 25 deg, and thus the orientation of the interstellar magnetic field is different.