



## **Did IBEX detect interstellar neutral helium or oxygen from anti-ram direction?**

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The Interstellar Boundary EXplorer (IBEX) directly measures the inflow of interstellar neutral (ISN) matter into the heliosphere. Inverting the signal strength and location of the neutral species (mainly helium, hydrogen, and oxygen) measured from Earth orbit allows to determine the flow velocity, direction, and temperature of the interstellar matter. So far, only observations from ram-directions when IBEX was moving toward the inflow direction (February and March of each year) showed a clear interstellar signal. Inverting these observations represents a partially degenerate problem; a unique solution for flow velocity, direction, and temperature cannot be found, and the uncertainty of the various fit parameters depends on each other. The detection of the anti-ram signal in October and November, when IBEX is moving away from the interstellar signal, would narrow the range of possible parameters of the interstellar neutral flow. This study presents a rigorous search for the fall signal during the first three years of IBEX data. The absence of an unambiguous fall signal translates into an upper observational limit with implications on the interstellar flow.