OBSERVATIONS OF INTERSTELLAR HYDROGEN FLUORIDE AND HYDROGEN CHLORIDE IN THE GALAXY

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We present Herschel/HIFI observations of interstellar hydrogen chloride (HCl) and hydrogen fluoride (HF) along the line-of-sight towards Galactic sources with strong submillimeter continuum emission from the PRISMAS and HEXOS GT KP. The halogen-containing molecules are of special interest because of their unique thermochemistry and their important role as tracers of the neutral ISM. The detection of foreground absorption by HF J = 1–0 transition line in each source probes the distribution of HF throughout the Milky Way, in diffuse clouds with varying values of the visual extinction, as a potential valuable surrogate for molecular hydrogen. For the optically thin absorption components we calculate the column densities of HF. We find that, in many of the background clouds, the abundances of HF with respect to $H_2$ is consistent with the theoretical prediction that HF is the main reservoir of gas-phase fluorine for these clouds. Observations of hydrogen chloride isotopologues, $H^{35}Cl$ and $H^{37}Cl$ J = 1–0 transition line at different galactocentric distances provide insights of how elemental abundances change with location in the Galaxy. We model the HCl observations with a non-LTE radiative transfer model to derive gas densities and HCl column densities for sources with HCl emission. Interstellar HCl abundances and isotopic ratios [$Cl^{35}$/$Cl^{37}$] are essential for improving our understanding of stellar nucleosynthesis and global chemical enrichment and evolution in the Galaxy.