THE IONIZATION TOWARD THE HIGH-MASS STAR-FORMING REGION NGC 6334 I

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In this work we present high-resolution spectral line observations carried out with the HIFI (Heterodyne Instrument for the Far Infrared) instrument on board the *Herschel Space Observatory* (*HSO*) toward the so-called hot core NGC 6334 I, a region of high-mass star formation. From the *Herschel*/HIFI observations of the molecular tracers $C^{18}O$, $C^{17}O$, HCO^+, $H^{13}CO^+$, and N_2H^+, we determined the line parameters of each of the rotational transitions, with $J_{up} \geq 5$. With these results, and using a non-Local Thermodynamic Equilibrium (LTE) Large Velocity Gradient (LVG) radiative transfer code, we modeled the spectral line emission of the molecular transitions in order to estimate the temperature, H_2 density, source size, and CO, HCO^+ and N_2H^+ column density toward NGC 6334 I. We also derived the H_2 column density as well as the relative abundances between the various molecular species by using the results from the LVG analysis. Finally, by modeling the chemical evolution of the source with a gas-phase reaction network, we obtained an estimate of the cosmic ray ionization rate toward the region. Based on our results, we conclude that there is an expansion of the envelope surrounding the hot core of NGC 6334 I, and the physical and kinematical properties of this expanding envelope are described in our analysis.