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Herschel PACS and SPIRE spectroscopy of the Photodissociation Regions associated with S 106 and IRAS 23133+6050

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We present recent *Herschel* PACS and SPIRE observations of the Galactic PDRs associated with the star forming regions S 106 and IRAS 23133+6050. While both sources have very different morphologies – IRAS23133+6050 is an ultracompact H II region, and S 106 is a classical H II region more reminiscent of the Orion nebula – they share similar PDR parameters, potentially due to similar spectral type exciting stars. For each object we analyze a full PACS/SPIRE spectrum from 55–210 μm, including all of the major ionic cooling lines of [O I], [C I] and [C II], along with the full CO spectrum in that range (J_U = 4 – 23). From these lines, as well as the total far-IR continuum flux, we use classical PDR diagnostics (e.g., cooling line ratios) to determine the average PDR parameters (density, n; UV radiation field, G_0) which we then use as inputs to constant thermal pressure numerical PDR models (as described by Wolfire et al. 2010 and Hollenbach et al. 2012). In addition, the full CO ladder spectrum for these objects is investigated, firstly by employing `RADEX` (van der Tak et al. 2007) fits to the CO line fluxes and subsequently using rotation diagrams. The diagnostic diagrams and CO lines indicate that at least two distinct combinations of UV field and density (referred to as clump: $n \sim 10^6$ cm^{-3}, $G_0 \sim 10^5$; and interclump: $n \sim 10^4$ cm^{-3}, $G_0 \sim 10^4$) exist within both PDRs. For S 106 an extra excitation component is observed in the high-J CO lines which could be representative of a shock, or an additional extremely dense PDR component. Following this we discuss the derived parameters in the context of other galactic PDRs and H II region expansion.

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