The origin of the broad $22\,\mu$m dust feature and its association with the molecular gas: a study of the PDR in the Great Nebula in Carina

Ronin Wu[1], Takashi Onaka[1], Tomohiko Nakamura[1], Frédéric Galliano[2], Franck Le Petit[3], Emeric Bron[3], Fumihiko Usui[1], Itsuki Sakon[1], Tamami Mori[1], Daisuke Ishihara[4] and Yoko Okada[5]

[1] *Department of Astronomy, the University of Tokyo, Bunkyo-ku, Tokyo, 113-0033, Japan*

[2] *Laboratoire AIM, CEA Saclay, 91191 Gif-sur-Yvette, France*

[3] *Observatoire de Paris, LUTH and Universit Denis Diderot, Place J. Janssen, 92190 Meudon, France*

[4] *Graduate school of science, Nagoya University, Furo-cho, Chikusa-ku, Nogoya 464-8602*

[5] *Physikalisches Institut der Universitt zu Kln, Zlpicher Strae 77, 50937 Kln, Germany*

With the ISO/SWS observations, Chan and Onaka (2000) have identified a broad (width $\sim 10\,\mu$m) emission feature with unknown carrier(s) at $22\,\mu$m in the Great Nebula of Carina. This feature resembles what has been observed in Cas A and may relate to the dust grains formed in supernova ejecta. In order to invesitate the physical conditions of the region, where the $22\,\mu$m has been detected, we observe the CO and ^{13}CO gas in a wide range of excitation states (from $J = 4-3$ to $J = 13-12$), spatially–resolved down to $\sim 0.5\,$pc. The observation targets at an area of $2' \times 7'$ ($2\,\mathrm{pc} \times 7\,\mathrm{pc}$), which covers a part of the PDR in the Great Nebula of Carina, by the *Herschel* Space Observatory. The ionization front of this PDR sits at a projected distance of $\sim 2\,$pc from the young ($1-2\,$Myr) OB-star cluster, Trumpler 14 (Tr 14), which provides its dominant UV input.

Tr 14 hosts a dozen of O-stars and more than a hundred of B-stars, and its stellar components have been well studied. The estimated UV input by Tr 14 to this PDR is 10^3 to $10^4\,G_0$, which is slightly weaker than that by Trapezium to the famous Orion Bar, yet comparable to that found in the extragalactic starburst region, 30 Doradus. In the Carina Nebula, the brightest $3.29\,\mu$m emission, attributed to the polycyclic aromatic hydrocarbons (PAH), a major component of dust grains, is found here. Such a region is likely a representation of prototypical PDRs near star–forming sites that dominate the extragalactic observations of starburst systems where individual PDRs are mostly unresolved with our current technology in the infrared and submm.

Based on the spatially resolved physical parameters derived from the CO spectral line energy distribution (SLED) and the spectral energy distribution (SED) of dust, I will present

1. a comparison of the physical states of the molecular gas and dust at the sub-parsec scale
2. heating and cooling of the PDR under the effects of local star–forming activities
3. the distribution of the 22 μm dust feature and its relation to the physical states of the surrounding PDR.