THE 3.4 MICRON ABSORPTION IN THE GALACTIC CENTER SOURCES

T. NAGATA
Department of Physics, Nagoya University
Nagoya 464-01, Japan

1. Introduction

The 3.4μm absorption feature, first detected in the Galactic center source IRS7 (Soifer et al., 1976), has been observed in other Galactic center sources IRS3, IRS12 (McFadzean et al., 1989), and IRS6E (Pendleton et al., 1994). This feature is regarded as characteristic of dust in the diffuse interstellar medium, and attributed to C-H stretching vibrations. Several objects in the lines of sight other than the Galactic center is now known to have the feature (Sandford et al. 1995 and references therein; Imanishi et al. 1996). The absorption depths per unit visual extinction \( \frac{\tau_{3.4}}{A_V} \) for these sources are compared with those for the Galactic center sources, and they are thought to increase near the Galactic center. However, the "Galactic center" sources are all in the central parsec cluster, and the features observed in them may be only representative of interstellar medium local to the central parsec, not the general diffuse interstellar medium of the inner Galaxy. In this paper, we report the 3.4μm absorption feature detected in near-infrared sources within 1° of the Galactic center.

2. Observations and Results

The observations were made at the NASA Infrared Telescope Facility (IRTF) on Mauna Kea with the Cooled Grating Array Spectrometer (CGAS). Low resolution spectra (\( \lambda/\Delta \lambda \sim 150 \)) between 2.0μm and 3.5μm of 50 objects within 1° of the Galactic center (Nagata et al., 1993) plus some infrared sources in the central parsec were obtained.

From the 2μm part of spectra, we can infer the spectral type of the star. CO absorption at 2.3μm indicates that the star is of late type, and
extremely deep H$_2$O absorption around 2.0$\mu$m and 2.5$\mu$m indicates that
the star is a long period variable. Of the 50 objects, 7 do not have these
features and they are presumably not late type stars. (Among them are
Objects #24 and #26 which are Quintuplet members, Object #25 which
is a luminous blue variable candidate near the Quintuplet, and Object #17
which is actually a cluster of emission-line stars; see Nagata et al. 1997)
On the other hand, the 3$\mu$m part contains absorption bands due to O-H
(3.0$\mu$m) and C-H (3.4$\mu$m).
Many of the observed stars show both the absorption features, but the
correlation between their depths does not seem to be very good. To esti-
mate the 3.4$\mu$m absorption depths per unit visual extinction $\tau_{3.4}/A_V$, we
calculate the color excess $E_{J-H}$ of these objects. If the star is of late type,
we assume $(J - H)_0 = 0.88$ mag, and if not, we assume $(J - H)_0 = 0$ mag.
This assumption might not be valid for the long period variables, which
tend to have larger $(J - H)_0$ due to large amount of circumstellar dust.
This might have increased the scatter of the data points. The $J$ and $H$
photometry is from Nagata et al. (1993)
The objects within 1$^\circ$ of the Galactic center have $\tau_{3.4}$ up to $\sim 0.15$, and
their $\tau_{3.4}/A_V$ are slightly smaller than IRS3, 7, and 11 in the central parsec.
The smaller $\tau_{3.4}/A_V$ is comparable to the ratio (Imanishi et al. 1996; Nagata
et al. in preparation) found in Stephenson objects (Stephenson, 1990), most
of which are late-type giants and supergiants relatively close to us (< several
kpc; Goto et al. 1997). Some of the objects within 1$^\circ$ of the Galactic center
might be also stars relatively close to us. However, the 3.4$\mu$m absorption
to the central parsec cluster might have a small local component, and the
increase in $\tau_{3.4}/A_V$ might not be a general trend in the inner Galaxy.

References
112, 235
Nagata, T., Kawara, K., Onaka, T., Kitamura, Y., Okuda, H. 1997, this volume