THE 3.4 MICRON ABSORPTION IN THE GALACTIC CENTER SOURCES

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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 $\tau_{3.4}/A_V$ 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 2.0$\mu$m and 3.5$\mu$m 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

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extremely deep H_2O absorption around 2.0μm and 2.5μm 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 3μm part contains absorption bands due to O-H (3.0μm) and C-H (3.4μm).

Many of the observed stars show both the absorption features, but the correlation between their depths does not seem to be very good. To estimate the 3.4μm 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° of the Galactic center have $\tau_{3.4}$ up to ~ 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° of the Galactic center might be also stars relatively close to us. However, the 3.4μm 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.

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