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SPATIALLY-RESOLVED MID-INFRARED SPECTROSCOPY OF IC 5063

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N-band spectroscopy of the radio strong Seyfert 2 active galaxy IC 5063 (z=0.0110) was obtained using Gemini South in conjunction with the Thermal-Region Camera Spectrograph (T-ReCS; Telesco et al. 1998). T-ReCS uses a Raytheon 320×240 pixel SiAs IBC array, at a plate scale of 0.089″ pixel^{-1}. The observations were conducted on the nights of UT 2005 July 7 and 9 using the standard chop-nod technique to remove the time-variable sky background, telescope thermal emission, and the so-called 1/f detector noise. A 0.67″ wide slit was used aligned along the position angle of the radio axis at 305°(Morganti et al. 1998) and close to the extended narrow line emission region (ENLR) axis at 303°(Colina et al. 1991). The total on-source integration time was 1212 seconds.

Standard data reduction techniques were used to produce the final spectra that were extracted in 0.45″ sections (chosen to match the approximate size of the average seeing disk, corresponding to a spatial resolution of ∼ 100 pc), stepping outwards from a position centred on the flux peak. Inspection of the resultant spectra shows a deep silicate absorption feature that dominates at all spatial positions. This is similar to the situation for the archetypal Seyfert 2 galaxy NGC 1068 (Mason et al. 2006).

For all the extracted spectra the continuum increases strongly to longer wavelengths in F_ν. The slope of the continuum varies with a decreasing gradient moving from south-east of the nucleus to the north-west that is significant at the 3-σ level. The resulting color temperatures of the mid-IR emitting dust, as estimated from the difference in flux densities at 8 μm and 13 μm, are ∼ 245 K 0.45″ SE, ∼ 255 K on nucleus and ∼ 275 K 0.45″ NW.

The optical depth of the silicate absorption feature is measured at $\tau_{9.7} = 0.33 \pm 0.02$ for the central 0.45″ aperture. There is a significant asymmetry in the spatial distribution of the silicate optical depth close to the nucleus as illustrated in Figure 1. These values are similar to those measured for NGC 1068 (Mason et al. 2006). The illustrated trend is consistent with observations of a one-sided NLR and ENLR to north-west of the nucleus, indicating that extinction is less in this region.

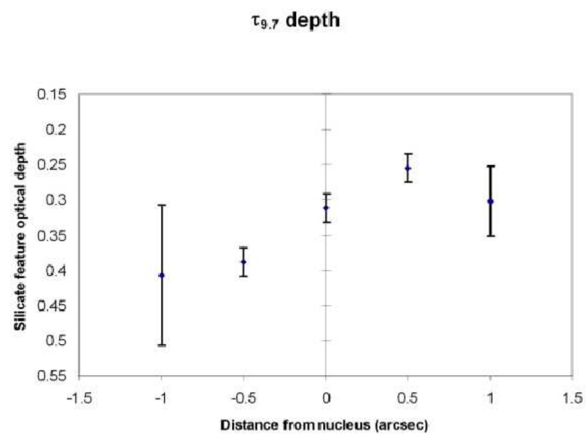

Fig. 1. $\tau_{9.7}$ plotted against distance from the nucleus of IC 5063 in 0.45″ bins. Positive distances are NW of the nucleus and negative distances are to the SE.

The presence of silicate absorption to the north-west of the nucleus, co-spatial with the near-side emission line cone, is consistent with the dust being in a clumpy distribution. Dense clouds of dust are self-absorbing when observed through their back-face. In the near-side NLR a combination of front, side and back of the clouds will be seen if they have a small enough filling factor. Thus the overall result will be contribution of silicate emission and absorption from different clouds leading to a reduced overall silicate absorption depth as observed.

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