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CATCHING A RUNAWAY IN THE GALACTIC CENTER: A STUDY OF THE IRS8 BOWSHOCK

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In this summary we present early results from our on-going study of the Galactic Center source IRS8.

In the mid-IR the signature of dust in the Galactic Center (GC) is unmistakable. Along with a region of complex extended emission there are at least 15 very bright point-like mid-IR sources within a radius of ~3 pc from the central 2×10^6 solar mass black hole (named Sgr A*). One of the most unusual of these bright mid-IR sources is IRS8 which is located 30″ north of Sgr A* in the 'suburbs' of the GC. Because of its relatively remote location with respect to the other GC sources, IRS8 has not been studied extensively. Indeed, it was a somewhat serendipitous discovery when Geballe et al. (2004) first saw a detailed bow shock of emission associated with the source during observations with the near-IR adaptive optics system Hokupa'a on Gemini North.

Here we present preliminary results from our study of this source in the mid-IR with the Gemini instruments T-ReCS and MICHELLE. Our imaging with T-ReCS complements the near-IR data of the discovery paper as it conclusively shows that the bow shock and photosphere of IRS8 are heating the nearby dust to temperatures of several hundred Kelvin. We have also obtained low and high resolution spectroscopy with MICHELLE. Our low resolution spectra is presented in Figure 1. With R~100 a single observation covers the entire 10 μm atmospheric window from 8 - 13 μm. The spectrum is dominated by the broad silicate absorption feature attributed to ISM dust. The smooth shape of the feature shows that there is little crystalline silicate dust near IRS8, implying that the hard radiation field of the star is not actively processing any ISM dust into crystalline grains. At the long wavelength end of the spectrum we see the strongly detected emission line of Ne[II] centered at 12.8 μm which we studied at much higher spectral resolution.

We recently used MICHELLE as a 'pseudo IFU' by stepping a 0.2″ slit across the IRS8 bow shock. We obtained a total of 40 individual spectra of the source, each at a different position on the bow shock.

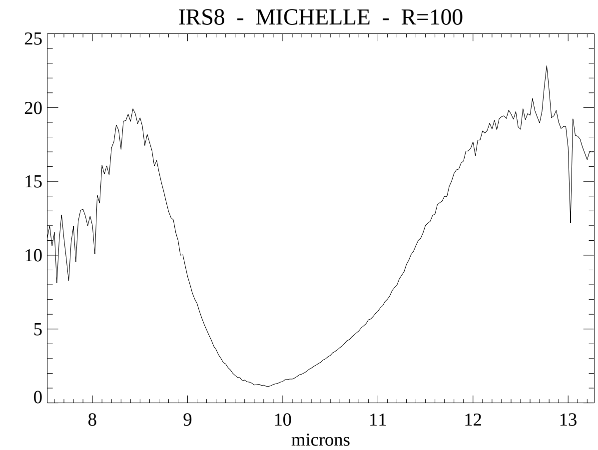

Fig. 1. MICHELLE low resolution (R = 100) spectrum of IRS8. The spectrum is dominated by the deep and smooth ISM silicate absorption feature. Also note the strongly detected Ne[II] line at 12.8 microns. Y-axis is in Jy.

Our echelle spectra (R~30000) were centered on the Ne[II] line at 12.8 μm, allowing us to study the detailed kinematics and complex velocity structure of the gas within and near the IRS8 bow shock. Initial analysis of the data shows that we recovered the two gas velocity components first observed by Lacy et al. (1991), a strongly peaked line at v = -10 km/sec, and a broader emission bump centered at v = +100 km/sec. We believe that the ~ 0.3″ spatial resolution of the echelle spectra will shed new light on the nature of the bow shock, and the origin of the central star itself.

This research is presented to highlight the capabilities of modern facility-class instruments on a 8-10m class telescope. Given that CANARICAM has similar capabilities to both T-ReCS and MICHELLE (including imaging and spectro-polarimetry) the GC region and IRS8 itself will be obvious targets for more in depth studies with the GTC.

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