Mesa-Delgado, A.; Zapata, L.; Henney, W. J.; Puzia, T. H.; Tsamis, Y.
PROTOPLANETARY DISKS IN THE HOSTILE ENVIRONMENT OF CARINA
Revista Mexicana de Astronomía y Astrofísica, vol. 49, julio, 2017, p. 74
Instituto de Astronomía
Distrito Federal, México

Available in: http://www.redalyc.org/articulo.oa?id=57153211035
PROTOPLANETARY DISKS IN THE HOSTILE ENVIRONMENT OF CARINA

A. Mesa-Delgado\(^1\), L. Zapata\(^2\), W. J. Henney\(^2\), T. H. Puzia\(^1\), and Y. Tsamis\(^3\)

We report the first direct imaging of protoplanetary disks in the star-forming region of Carina, the most distant, massive cluster in which disks have been imaged.

Using the Atacama Large Millimeter/submillimeter Array (ALMA), the disks are observed at the location of the young stellar objects (YSOs) PCYC 429 for 104-593 and PCYC 1173 for 105-600 (Povich et al. 2011). As it is shown in Fig. 1, they are embedded inside evaporating gaseous globules (EGGs) and exhibit outflow activity in the form of Herbig-Haro objects, evidencing the ongoing accretion process onto the protostars.

The disks are detected with peak signals about 50\(\sigma\) and 100\(\sigma\), and both are resolved with an average de-convolved size of 0.05'' \(\times\) 0.03'' \(\approx 120\) AU \(\times\) 70 AU at the Carina distance of 2300 pc (Smith & Brooks 2008). From the millimeter fluxes, we derive masses \(M_{\text{disk}}\) of about 50 \(M_{\text{Jup}}\) and 30 \(M_{\text{Jup}}\) for 104-593 and 105-600, respectively. These values are on the upper end of the typical \(M_{\text{disk}}\) distribution found in Class I sources in less hostile environments as Taurus and Orion (see Williams & Cieza 2011, and references therein). The disks are considered protoplanetary since the measured masses are well above the minimum \(M_{\text{disk}}\) of about 10 \(M_{\text{Jup}}\) required for a pre-solar nebula to develop a planetary system (Weidenschilling 1977). Additionally, since the minimum timescale to form planets is \(\sim 1 - 2\) Myr (Lissauer et al. 2009; Najita & Kenyon 2014), the Carina population is old enough to be plausible that young planets are forming within these EGGs (\(\sim 1 - 4\) Myr; Smith & Brooks 2008).

No millimeter emission was detected above the 4\(\sigma\) threshold in a section of the Tr 14 cluster. These threshold yields an upper limit of \(\sim 7\) \(M_{\text{Jup}}\) to the mass of any disk that might be present, which is roughly similar to the median mass of \(\sim 5 - 8\) \(M_{\text{Jup}}\) for Class II disks (see Williams & Cieza 2011). The

REFERENCES