P132a Discovery of the Secondary Outflow Structure in IRAS 15398−3359

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IRAS 15398−3359 is a low-mass Class 0 protostellar source ($T_{\rm bol}$=44 K) located in the Lupus 1 molecular cloud (d=155 pc). A bipolar outflow along the northeast to southwest axis is reported (Oya et al. 2014). Its dynamical timescale is $\sim 10^3$ yr, indicating that this source is in the earliest stage of protostellar evolution. A Keplerian disk perpendicular to the outflow is associated with the protostar (Okoda et al. 2018).

We have conducted observations toward this source on scales from 50 au to 1800 au as a part of the ALMA large program FAUST (Fifty AU STudy of the chemistry in the disk/envelope system of Solar-like protostars). We have found an interesting collimated feature in the H_2CO, SO, SiO, and CH_3OH emission lines which extends along a direction almost perpendicular to the previously observed outflow. These molecular line emissions show a shell-like structure apart from the protostar by 1200 au in the southeastern part. The shell-like structure is blue-shifted from the systemic velocity. The H_2CO emission shows a gradient of 1.2 km s^{-1}/1200 au from the protostar to the shell-like structure, so that the above extended distribution cannot be explained by infalling motion to the protostar. Since SO, SiO, and CH_3OH are known as shock tracers, the shell-like structure is most likely a shocked region caused by a secondary outflow. This result implies a change in the outflow direction caused by episodic accretion, although an unresolved close companion (<30 au) cannot be ruled out.