ABSTRACT

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Magnetic Fields in Evolved Stars: Imaging the Polarized Emission of High-Frequency SiO Masers

We present Submillimeter Array observations of high frequency SiO masers around the supergiant VX Sgr and the semi-regular variable star W Hya. The $J = 5 - 4$, $v = 1$ ^{28}SiO and $v = 0$ ^{29}SiO masers of VX Sgr are shown to be highly linearly polarized with an average polarization of $\sim$ 25%. They are found within $\sim$ 8 − 30 mas of the star, corresponding to 13 − 51 AU at a distance of 1.7 kpc. The linear polarization vectors are consistent with a dipole magnetic field, with position and inclination angles similar to that of the dipole magnetic field inferred in the H2 O and OH maser regions at much larger distances from the star. We thus show for the first time that the magnetic field structure in a circumstellar envelope can remain stable from $\sim$ 3 stellar radii out to $\sim$ 1400 AU. This provides further evidence supporting the existence of large scale and dynamically important magnetic fields around evolved stars. Due to a lack of parallactic angle coverage, the linear polarization of masers around W Hya could not be determined. For both stars we observed the ^{28}SiO and ^{29}SiO sotopologues and find that they have a markedly different distribution and that they seem to avoid each other. Additionally, emission from the SO $5_5 - 4_4$ line was imaged for both sources. Around W Hya we find a clear offset between the red- and blue-shifted SO emission. This indicates that W Hya is likely host to a slow bipolar outflow or a rotating disk-like structure. In this poster we discuss our results in the context of Herschel, and future ALMA, observations.