

COMPLEX ENVELOPE CHEMISTRY AND DYNAMICS OF NML CYGNUS

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Oxygen-rich supergiant stars undergo intense, sporadic mass loss often causing them to have highly directed, non-isotropic outflows. These outflows have been previously identified in the envelope of the supergiant VY CMa, both in the infrared and in molecular lines. In VY CMa, these flows are best traced by sulfur-bearing molecules SO₂ and SO. To further investigate the unusual properties of supergiant stars, we have conducted a 1 mm survey of another such object, NML Cyg. This survey revealed the presence of unusual species such as PO, AlO, NS, and PN in NML Cyg, as well as HCN, HCO⁺, CN, NaCl, SO, SiS, and SO₂ - an almost identical set of molecules as observed towards VY CMa. Two major asymmetric outflows have also been identified in the envelope of NML Cyg from the spectra of SO and SO₂, one blue-shifted and the other red-shifted. Spectral line analysis with the radiative transfer code ESCAPEDE suggests that these two outflows are in random directions and are not bipolar in nature.