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IUE AND IRAS OBSERVATIONS OF LUMINOUS M STARS WITH VARYING GAS-TO-DUST RATIOS.

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Previous work on circumstellar gas and dust surrounding M giants and supergiants (with sufficiently thin dust shells that the spectra in the blue can be observed at high resolution) has shown the stars to split into two distinct classes (Hagen, Stencel and Dickinson, 1983, Ap. J. 274, 286). Stars with a high gas-to-dust ratio all show chromospheric Ca II H and K emission. Stars with a high dust-to-gas ratio do not show chromospheric Ca II emission but are the only ones to show Balmer emission indicative of atmospheric shocks and are also the only ones to show maser emission. In order to determine whether all chromospheric indicators disappear in high dust-to-gas ratio stars, we are conducting a survey of stars in both of these classes with the IUE satellite. Our initial low-resolution observations of the 2200-3200A spectral region of a limited number of stars reveal 2800A Mg II emission in all the observed stars regardless of the dust-to-gas ratio. In addition, very deep exposures of three dusty stars show Fe II, Al II and perhaps Mg I emission, and one of the three (TW Peg) even appears to show C II (UV 0.01) emission near 2325A. These lines are usually associated with chromospheres in late-type evolved stars. Although there is some overlap, the dusty stars tend to have higher ratios of flux in the Fe and Al lines to the flux in the Mg lines. This could be a result of the Mg II line (with its similar atomic structure to that of Ca II H and K) flux being reduced by the same process which inhibits Ca emission. Mg may not be as significant a radiative loss channel for the chromospheres of cool, dusty stars.

The long-wavelength infrared fluxes for the program stars were obtained from the IRAS point source catalog. In general the long-wavelength fluxes were consistent with the silicate emission seen in previous observations of the 10-micron feature. Stars with no observable 10-micron dust emission show a black-body distribution of the longer-wavelength flux. There is no obvious difference in the long-wavelength observations between the two groups of stars; the long-wavelength excess tends to follow the 10-micron excess and not the dust-to-gas ratio. Comparisons of the IRAS observations with dust shell model claculations will be presented.