IRAS LRS Spectral Class and Light Curve of M & S Miras

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A large sample of 177 Miras, comprising 164 M and 13 S stars, has been examined to determine the dependence of 9.7 μm silicate emission, as revealed by their IRAS LRS Spectral class, on the visual light curve asymmetry factor, f. It is found that the silicate feature occurs not only in M (Vardya et al. 1986; Onaka & de Jong 1987) but in S Miras also only for $f \lesssim 0.45$. This, however, is only a necessary condition, as about one fifth of Miras with $f \lesssim 0.45$ do not show the 9.7 μm emission. This non-detection shows dependence on other parameters like the mean visual light amplitude. Non-detection is highest in the region $0.43 < f \lesssim 0.45$, as well as when mean amplitude is $\lesssim 5^m.0$. Though strong emission features in M Miras may occur for any value of f, very weak features are absent for small values of f, and the strongest feature tends to appear for large values of f. Infrared excess tends to increase with increase in the strength of the silicate emission and with decrease in the value of f.

Detection of silicate emission, viewed from the visual light curve classes (Ludendorff, 1928) is very high for α_1, α_2, and α_3 classes, decreases for α_4 and γ_1, and is negligible for β class. The strength of the silicate emission is highest for the α_1 class, decreases for (α_2, α_3, α_4)- classes, and is the lowest for the γ_1 class.

Coming to the S Miras, it is surprising that not a single S star shows a strong silicate feature, when even a C Mira, RV Cen, shows it. This may reflect a gradual change from M to S phase. This may also be due to silicate emission peak being somewhat shifted redward from 9.7 μm.

The above results can be understood qualitatively. However, a quantitative treatment of pulsation, shock waves, and condensation chemistry is essential for proper application.

References:

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