SHOCK-INDUCED BEHAVIOR OF ATOMIC SPECIES IN LPV ATMOSPHERES

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A dynamic model of the LPV atmosphere which calculates the time-dependent variations of density, temperature, velocity, and composition with radius has been used to predict changes in absorption line profiles with phase. General results based on density variations are shown in figure 1. Similar graphs, based on concentrations of individual species, are presented for six metals: Fe, Si, Mg, Ca, Cr, and Ti. Those species which remain essentially proportional to the density (e.g., most neutral metals) exhibit the same type of variation. Ionized metals show more individual variations, including some doubling at certain phases, caused by enhanced ionization in the regions traversed by the upper shock. The basic variation predicted by this model has been observed for CO lines in Chi Cygni. (Hinkle, Hall, and Ridgway 1982, Ap. J. **252**, 697)

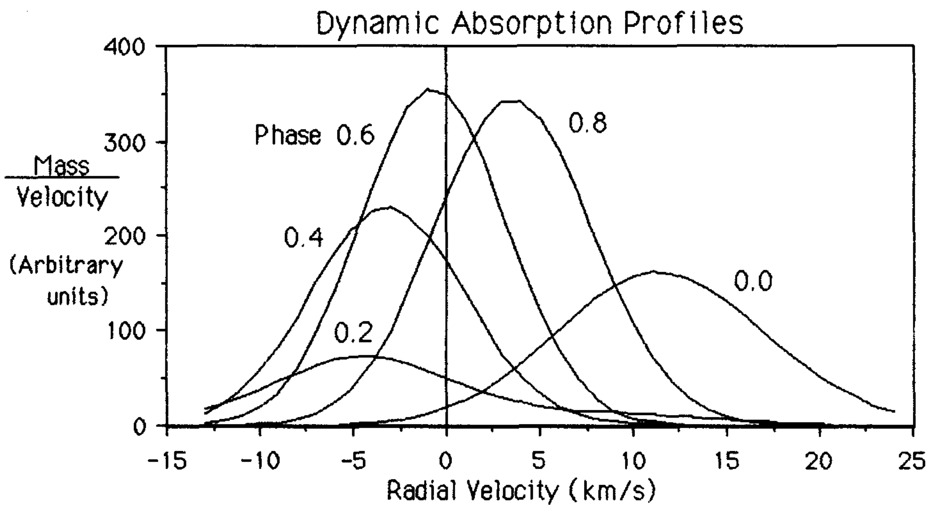

Figure 1. The ordinate is the column density (above the photosphere), binned by radial velocity and integrated over the photospheric disk. The vertical line marks the radial velocity of the star. The profiles are produced both by Doppler broadening and by the line-of-sight velocities induced by the passage of shock waves through the atmosphere. The redshifted profile at phase 0.0 (maximum light) originates in the high-density infalling gas above the lower shock. By phase 0.2, when the shock has become transparent, the original profile has faded and a blueshifted profile has arisen, formed by the high-density gas rising behind the lower shock. During the rest of the cycle this profile strengthens and shifts toward the red as the absorbing region begins to fall back in toward the photosphere.

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