# O-Star Winds: Is Rotation Important?

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The inclusion of rotation as an ingredient in radiation pressure driven stellar wind models is a nontrivial undertaking. Those bold enough to attempt an investigation of its likely importance include Castor (1979), Abbott (1980), and Marlborough & Zamir (1984), whose work shows that the critical point is expected to move away from the stellar surface with increasing rotation. Observationally, the surface mass flux is predicted to be insensitive to rotation, but the wind acceleration is expected to be less than in a nonrotating star and the terminal velocity smaller.

We are working on an ultraviolet study of O star winds, and have preliminary mass-loss rates and terminal velocities for about 150 stars; here we examine the dependence of these data on rotation rate. As an empirical handle on the last quantity we adopt Conti & Ebbets' (1977) measures of $v_e \sin i$, which we assume is related in a simple way to the projected equatorial rotation velocity.

Figure 1 shows the residuals from a linear fit of $\log_{10}(\dot{M})$ *vs.* $M_{BOL}$, plotted against $v_e \sin i$. Rotation appears not to be a significant additional parameter, as expected. Figure 2 shows the column measured for the $N^{4+}$ narrow components – discrete features in the absorption troughs of P Cygni profiles – as a function of $v_e \sin i$. A lower boundary is sketched in to emphasise a possible trend, *i.e.* rapid rotators may always have strong narrow components (although strong components are not exclusively associated with high values of $v_e \sin i$), but this is obviously not a well established result.

Figures 3 and 4 show the terminal velocities against $v_e \sin i$. If rotation does have a detectable rôle in radiation pressure driven winds we might hope to see its effects here, since they are predicted to be quite large (*e.g.* figure 2 of Castor 1979) and $v_\infty$ can normally be measured directly and unambiguously from the high resolution spectra we have examined. Unfortunately, as can be seen from the figures, no significant trends are evident in our data. This result, while perhaps unexpected, may be due to the lack of stars in our sample rotating very near to break-up velocity; certainly we do not regard it as casting significant doubt on radiation pressure as an important mechanism in O star winds, especially given the state of development of the models.

## References:

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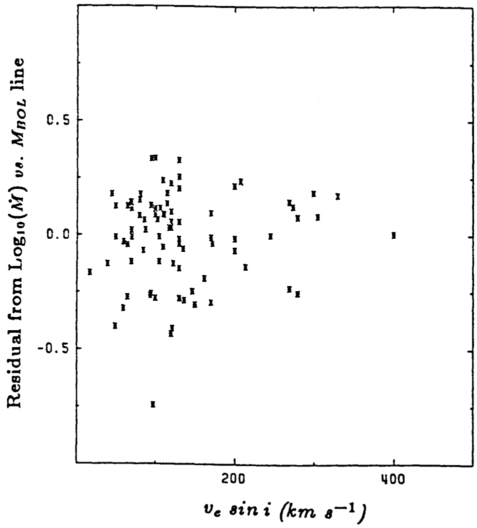


Fig. 1 — Residuals from $\log_{10}(\dot{M})$ *vs.* $M_{BOL}$ line versus $v_e \sin i$.

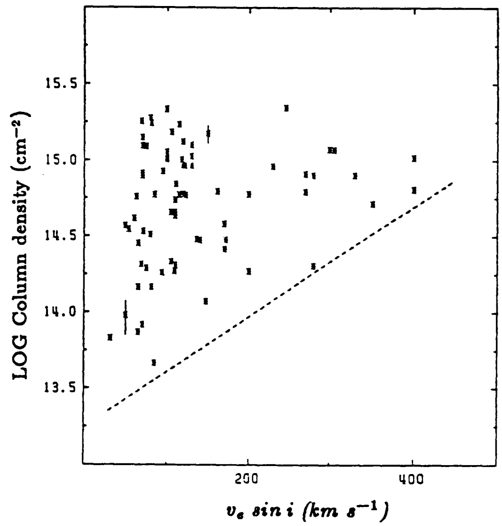


Fig. 2 — Log of the narrow component column density versus $v_e \sin i$.

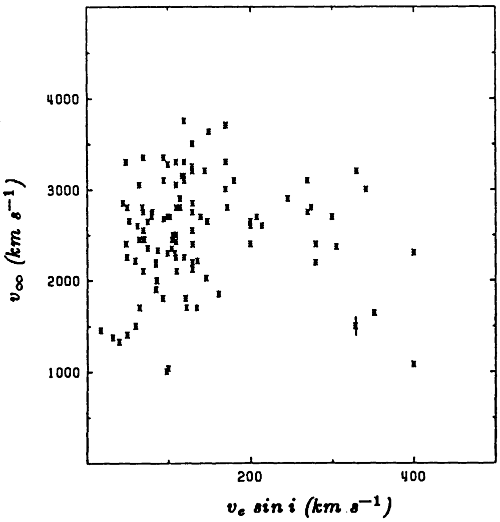


Fig. 3 — Terminal velocity versus $v_e \sin i$.

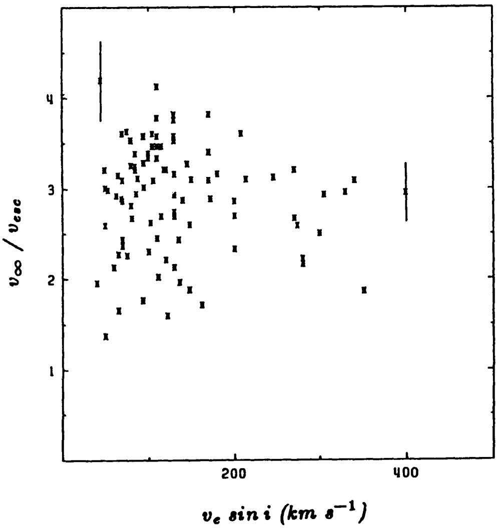


Fig. 4 — The ratio of terminal velocity to escape velocity verus $v_e \sin i$.

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