

# X-RAY OBSERVATIONS OF THE STELLAR WINDS OF OB SUPERGIANTS WITH COMPACT SECONDARIES

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There are about half a dozen OB supergiants that have compact companions in close orbit, such that the compact star (which is in all but one case a neutron star) is embedded in the stellar wind of the primary. By measuring the amount of photo-electric absorption of the low energy X-rays by the stellar wind it is possible to directly probe the structure of the wind. We have used the Einstein Solid State Spectrometer in conjunction with the Monitor Proportional Counter to measure the parameters of the stellar winds of Vela X-1, 4U1700-37, SMC X-1 and Cygnus X-1. We can distinguish between those systems where the X-ray luminosity is sufficient to fully ionize the wind on most of the X-ray source side of the X-ray source (SMC X-1 and possibly Cyg X-1) and those where it is not (Vela X-1 and 4U1700-37). As noted by past observers for Vela X-1 and 4U1700-37 there is a marked asymmetry in the amount of absorption before and after  $\phi_x \sim 0.5$  indicating that the presence of the X-ray source is in some way disrupting the stellar wind. In Vela X-1 the absorption at earlier phases is consistent with that expected from the stellar wind. After  $\phi \sim 0.5$  there is a factor of 4 increase in absorption with pronounced Si and S edges indicating an anomalous ionization state of the gas, which could be brought about by the presence of a soft component of  $\sim 1$  keV X-rays distributed throughout the wind. Absorption events are seen from 4U1700-37, SMC X-1 and Cyg X-1 on timescales of  $\sim 10$  min that indicate the presence of large scale inhomogeneities in the wind. These are probably responsible for X-ray flickering activity seen from 4U1700-37 and Vela X-1 and possibly also for the generation of the soft X-ray emission.

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