Silicon Ion Fluorescence Spectra in Vela X-1 and Cygnus X-3

D.A. Liedahl(*LLNL*), M. Sako, S.M. Kahn, F. Paerels (*Columbia*), P.S. Wojdowski (*LLNL*), F. Nagase, B. Paul (*ISAS*), N.S. Schulz (*MIT*), M.L. McCollough (*USRA*)

Abstract

Using the Chandra HETG, we have detected a set of spectrally isolated discrete features in Vela X-1 and Cygnus X-3, which we identify as Si K-alpha line complexes from a broad range of charge states, many of which are individually resolved. The reprocessing gas producing these features is extended, presumably part of the stellar wind from the massive companion in these systems. The fluorescing gas is likely to be an overdense component of a clumpy wind formed and maintained by a host of instabilities. We discuss the implied physical characteristics of this fluorescing wind component. Also, in support of spectral analyses of these data, we have performed new atomic level population kinetics calculations, which properly account for the excited level population distribution prior to K-shell photoionization. These calculations point to the possible reduction in the efficiency of resonant Auger destruction among fluorescing L-shell ions.

CATEGORY: BLACK HOLE AND NEUTRON STAR BINARIES