

And, finally, how does the BAL phenomenon fit into our picture of the structure and evolution of active galactic nuclei?

1.4 : Time Variability of QSO Broad Absorption-Lines

Because of the high velocities and the (possible) close proximity to the highly variable and luminous QSO continuum source, one might expect BALs to show changes over observable timescales. Whether or not these variations are observable will depend on the nature and evolution of the BALR. Time variability in BALs has been noted previously by other groups in three BALQSOs: 1303+3048 (Foltz *et al.* 1987), 1413+1143 (Turnshek *et al.* 1988), and 1246-0542 (Smith and Penston 1988). Work during our own project has resulted in two new cases: 0019+0107 (Barlow *et al.* 1989) and 0842+3431 (Barlow *et al.* 1992). This thesis will present the results of several new cases of time variable BALs. The primary goal of any time variability study is to determine the mechanism causing the changes. Using this information, one can derive whatever physical properties are measurable, depending on the available data, the model for the BALR, and the variability mechanism.

All the cases so far, including all the work in this project, have seen changes in the residual-intensity (flux level relative to the continuum), rather than changes in the outflow velocity structure. An attempt to look specifically for velocity variations was only able to set upper limits (Foltz *et al.* 1987). Although our observations certainly can provide more upper limits on velocity variations over a wide range of objects, for the purposes of this thesis, we will only consider the residual intensity variations of the lines.

Because the changes are only residual intensity variations, this suggests that the variations are caused by changes in the ionization levels of the gas, which alter the distribution of fractional abundance of ions for any given element. Also, since the changes occur over a wide range of velocity in a relatively short time, we believe that the changes are caused by an ionizing flux of photons which is coincident with the radiation flux from the continuum source. This is because a change in the flux from the continuum source would be seen