that the shape of the ionizing continuum stays approximately this same.† In principle, the change in L_ν can be estimated by accurately monitoring the continuum level between epochs and assuming that the ionizing portion of the continuum changes in the same manner as the observed continuum. In this case, we can estimate what the expected fractional changes in column densities should be as a function of U. Thus, in principle, we could derive a value for U using the time variations of a *single* BAL.

Since the assumption of equivalent changes in the observed and ionizing continuum may not be valid, we must compare the changes in BALs of different ions in order to estimate the change in the ionizing continuum. However, this method would still be independent of any assumptions on the relative total abundances.

The most important use of the techniques described in this thesis is the test of the primary hypothesis: that the BALR is photoionized, optically thin at the HI ionization edge, and that the changes are due to ionization level changes.

3.5 : Predictions for Time Variable BALs

In figure 3-5, we show the expected fractional change in fractional abundance (fa) for an increase in luminosity between two epochs ($\Delta\log(U)=\log(U_2)-\log(U_1)$), plotted as a function of $\log(U_1)$. The top graph shows C^{+3} for three different luminosity changes. Assuming that the continuum shape stays constant, $\Delta\log(U) \sim \Delta\log(L_\nu) = \Delta\text{magnitude}/2.5$. Therefore, the curves for $\Delta\log(U)$=0.2, 0.08, and 0.04 correspond to magnitude changes of 0.5, 0.2, and 0.1, respectively.

The lower graph of figure 3-5 shows the changes for various relevant ions for a magnitude change of 0.2. The point at which each curve crosses zero corresponds to U_p for each ion. Note that the level of change always increases for values of U further from U_p.

† This may be a poor assumption, since the continuum flux is probably made up of at least a few, possibly independent, components (see Bregman 1991). Changes in the slope of the UV continuum has been seen in Seyfert galaxies (low redshift AGNs) by Edelson *et al.* 1990 (see §8.5.1), and during thesis project (see chapter 13).