

8.3.3 : Character of the Variations

The timescale of the variations, the magnitude of the variations, and the frequency of variations may differ considerably among QSOs. These qualities may or may not be correlated with obvious physical parameters such as luminosity and redshift. If we assume that every QSO has the same variability characteristics, then every QSO will show variability over a long enough timespan. This would imply that the fact that we observe variability in only 33% of our sample is due to the finite timespan of our observations. However, if there exist separate populations of variable and non-variable QSOs, then the fraction of detected variable QSOs should asymptotically approach the fraction of variable QSOs as the timespan increases. How quickly we approach this limit would depend on the frequency and timescale of variability among the variable QSOs. In principle, these values can be derived by considering how the fraction of detected variable QSOs changes with the timespan of the observations. The upper-right graph of figure 8-3 shows variability versus the observation timespan in the QSO rest frame. Since each point represents a separate QSO, the points are independent. There does not seem to be any significant increase in the fraction of variable objects with timespan, which would suggest a separate population of variable QSOs or at least a range of characteristics. However, our sample is probably too small to show any significant trends.

If all the variable QSOs had similar maximum variations and we observe the full variation in all cases, then we would see a bi-modal distribution of QSOs as a function of maximum deviation. The lower-left graph of figure 8-3 shows a histogram of BALQSO class objects versus maximum deviation. To avoid any large non-physical random fluctuations, we have restricted the objects to those with median calculated errors less than 0.028 magnitudes. The distribution seems to lack any significant bi-modality, however the distribution may be smeared due to the variability timescale being comparable to the observation timespan (see below). In other words, some significant fraction of the objects may have the start or end of the observation timespan during the middle of a variation.