must traverse at least 0.04 pc in one year (QSO frame). This means that the BALR must be at least ~0.5 pc from the central source. However, using statistical arguments based on the number of BALQSOs, larger limits are possible. The fact that no BALs have been seen accelerating up to their current velocity on short time scales implies that the acceleration process must be fairly gradual. This would probably necessitate limits of ~5 pc or larger, *i.e.* BALR lifetimes of more than 100 years.

Limits can also be set using the ionization parameter, U (see chapter 3). The distance (r) from the ionizing source depends on the electron density (n_e), the luminosity of the source, and the ionization parameter (U). From the formula for U in chapter 3, assuming U~0.04, H_o=50, q_o=0.5, for a V~17, z_e~2 QSO, we have: $r \simeq 15(10^8/n_e)^{0.5}$ pc, where n_e is in cm^{-3}. At densities of $n_e = 10^9$, the BALR would be just outside the BELR at $r \sim 5$ pc, while at $n_e = 10^4$ we have $r \sim 1$ kpc. Finally, for the [O III] limit of $n_e < 10^6$, we would have $r < 150$ pc.

2.6 : Filling Factor and Cloud Size

The filling factor is defined as the volume taken up by absorbing clouds divided by the total volume of the BALR. We can estimate limits on the filling factor and cloud size using some rough estimates for various physical parameters. Following a notation similar to Weymann *et al.* 1985, for a filling factor of ϵ, an average electron density of n_e, a line-of-sight extent of the BALR of ΔS, and a total hydrogen column density of N(H), we have: $n_e \epsilon \Delta S \sim$ N(H). Here we have assumed $n_e \sim n_H$ (see chapter 3). From the minimum lifetime of a BALR ($\gtrsim$10 years) based on the lack of velocity time variations in all BALQSOs observed during the last two decades, and a total velocity width of at least 10,000 km s^{-1} in many BALs, we know that $\Delta S \gtrsim 0.1$ pc.† From the estimates of the

† This assumes that the BAL is not a *standing-wave* pattern, where the matter is replenished but the velocity structure stays approximately constant. This is certainly the case in P-Cygni type stars, but cannot explain the *detached* troughs (see chapter 4) and velocity structure seen in BALQSOs.