

origin to the QSO, and they are almost certainly due to gas flowing out from the QSO with velocities ranging from near zero to 30,000 km s<sup>-1</sup> and higher (up to ~60,000 for at least one object, 1414+0859, Foltz *et al.* 1983). See chapter 4 for the nomenclature of QSOs and a catalog of BALQSOs.

### 1.3 : QSO Broad Absorption-Lines

Ground-based studies have shown that broad absorption-lines (BALs) appear in about 10% of all QSOs with redshifts high enough to shift the high-ionization resonance lines (*e.g.* CIV  $\lambda$ 1549) into the optical band (Weymann *et al.* 1991). Since BALs are assumed to be intrinsic to the QSO, such objects are often referred to as broad absorption-line QSOs (BALQSOs). The widths of these lines can range from 1,000 to 20,000 km s<sup>-1</sup>. The troughs of these lines can be complex in structure or smooth, deep or shallow, detached from the emission line, or overlapping the center and blue wing of the emission line. Although most BALQSOs show a single strong BAL trough, many have multiple BAL troughs. By using these lines to study the absorbing gas in the broad absorption-line region (BALR), we can learn about the environment surrounding the central engine of the QSO.

Studies of BALQSOs have attempted to answer several questions about the nature of the BALs. These questions include: What is the location and geometry of the BALR relative to the continuum source? What is the evolution and dynamical nature of the BALR? What is the acceleration mechanism of the BAL clouds? What is the relation of the BALR to the broad emission-line region (BELR)? What are the physical properties of the absorbing gas (*e.g.* density, ionization levels, elemental abundances, etc.)? How similar (or different) are BALQSOs and non-BAL QSOs which share similar continuum and emission-line properties (Weymann *et al.* 1991)? What is the reason for the lack of radio-loud BALQSOs (Stocke *et al.* 1992)? What is the relation between high-ionization and low-ionization (those that show Mg II  $\lambda$ 2800 absorption) BALQSOs (Voit *et al.* 1993)?