

lines will give us constraints on the ionization parameter in the BALR and possibly the soft X-ray continuum.

9.3 : Which Absorption Lines Should We Observe?

Due to the abundance of Carbon and the ionization level of C^{+3} , the C IV line is inevitably the strongest BAL redward of the Lyman- α forest. The apparent lack of any significant emission features immediately blueward of the C IV emission line make it suitable for estimating the velocity extent of the BALR and as a “template” for identifying other BALs. For BALQSOs with $z_e \gtrsim 1.2$, C IV is the primary line of interest.

Unfortunately, C IV is often so strong at the bottom of the trough that it is difficult or impossible to measure an accurate optical depth. This is due to the frequently high column density of C^{+3} , and the contribution from scattered light which (apparently) tends to fill in the bottom of the trough. Si IV is the second strongest BAL redward of the Lyman- α forest and is usually weak enough to (in principal) obtain accurate optical depths. (The problems of estimating optical depths will be discussed later.)

The NV and Lyman- α BALs are the next highest priority for our spectroscopic studies. Despite the presence of the Lyman- α forest and Lyman- α emission line, NV is an important BAL since its fractional abundance peaks at a higher value of U , and thus can be used to constrain the ionization parameter in cases of BAL time variability. It is usually as strong as the C IV BAL, and can be used to constrain the covering factor of the BALR around the central source since it is expected to produce a significant amount of resonance-line scattered light (*cf.* Turnshek 1988).

The Lyman- α BAL may offer a key to the possibility of metal enhancement in the BALR. This BAL is thought to be unusually weak (for cosmic abundances), although it is difficult to determine the “true” optical depth of the trough due to the contribution from scattered light.

If the redshift is high enough ($z_e \gtrsim 2.2$) the O VI BAL should be the next highest priority. Despite the ubiquitous Lyman- α forest lines, this line is strong enough to be