Solar Physics 2005-2006: Exercises to Lecture 12

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1 Maximum Field Strength

Estimate the maximum possible field strength for a flux tube in the thin tube approximation in the photosphere at $\tau_{500\mathrm{nm}} = 1$.

2 Flux Tube Shape with Height

Assuming hydrostatic equilibrium and a constant pressure scale height, calculate the magnetic field strength and the tube diameter as a function of height and magnetic flux.

3 Inclined Fluxtubes

Flux tubes are buffeted by convective motions. How does the inclination angle of a flux tube due to these motions depend on its diameter? Hint: Compare drag forces and buoyancy.

4 Magnetic Line Ratio

Show how the ratio of Stokes V amplitudes of two spectral lines depend on the magnetic field strength assuming that the only difference between the two lines is their Landé g-factor. Hint: expand the Stokes V profiles in Taylor series to second order in the Zeeman splitting.

5 Problem with Stix's Book

Explain why the right side of Figure 8.10 might not measure the true field strength.