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most active regions containing large, dominant spots. These flows are primarily horizontal with average velocities of 5-10 km s⁻¹. The velocity patterns reverse between east and west hemispheres on the sun.

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51.08 Thermal Bifurcation in Solar Calcium Plages

T.K. AYRES, LASP, U. of Colo., J.L. LINSKY, JILA, U. of Colo., & NBS, L. TESTERMAN and J. BRAULT, KPMO, discuss some of the implications of simultaneous, co-spatial measurements of Ca II 3934 Å (K) emission and 2.4 μm carbon monoxide absorption in a variety of solar active and quiet regions. The observations were obtained at very high spectral resolution and excellent S/N utilizing the 1-meter Fourier Transform Spectrometer of the KPMO McMath Solar telescope in a novel dual-detector mode. Our observational objective was to measure at the same time and at the same position on the solar disk two thermal diagnostics that exhibit opposite sensitivities to local plasma conditions. In particular, the emission core and damping wings of the near ultraviolet resonance lines of CaII respond preferentially to the hotter components of an inhomogeneous atmosphere, while the infrared vibration-rotation bands of the CO molecule are formed preferentially in the cooler components. Our interpretive goal was to establish, by the behavior of the complementary thermal diagnostics, the degree of atmospheric inhomogeneity within magnetic active regions. In particular, the two leading inhomogeneous descriptions of plages — the mild, uniform perturbation approach and the extreme thermal bifurcation of the flux-tube scénario — predict very different amounts of weakening for the CO absorption bands in plages of increasing Ca II K-line intensity. Unfortunately, the actual observations appear to be incompatible with both of the competing models. Some preliminary progress in resolving the Ca II-K dilemma will be presented.

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51.09 The Structure of a Force Free Magnetic Flux Tube

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An attempt is made to model the magnetic field configuration of a force free solar flux tube. A constant radius of curvature and toroidal symmetry are assumed. It is also assumed that the radius of the tube is small compared to its radius of curvature. An extension of the much explored case of a straight, isolated, magnetic flux tube is made by a perturbation technique, where the expansion parameter used is the ratio of the radius of the tube to its radius of curvature. It is found that a twisted magnetic flux tube of finite curvature, unlike its straight counterpart, must have a nonzero radial magnetic field component. A relation between the magnetic energies of the poloidal and toroidal components of the field is derived for a tube confined by a constant external gas pressure. The implications for a sub-photospheric flux tube are discussed.