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Experimental and theoretical studies of pressure broadened alkali-metal lines for astrophysical applications F. SHINDO, C. ZHU, J. BABB, K. YOSHINO, A. DALGARNO, K. KIRBY, Harvard-Smithsonian — We are undertaking a program of experimental and theoretical studies of the pressure broadening of Na and K by He and H_2. This work is motivated by the need for accurate absorption coefficients to validate models of atmospheric opacities which can be used to characterize properties such as gravity and effective temperature of brown dwarfs or predict spectra of irradiated extrasolar giant planets. Due to the collisions with gaseous H_2 and He at high concentration in these objects with temperatures of around 1000 K, the profiles of Na and K lines (respectively at 590 nm and 770 nm) are strongly broadened by at least 100 nm. The design of our spectroscopic experiment allows us to collect absorption spectra of alkali vapors at temperatures around 900 K in the presence of buffer gas at pressures of several hundred torr. The atomic densities are measured precisely using the anomalous dispersion ("hook") method. Investigating the spectral range 380-920 nm, we observed the broadening of the K 770 nm lines and we find the K 404 nm doublet exhibits a putative satellite feature on its blue wing. The theoretical calculations utilize accurate molecular potential energies and transition dipole moments and fully quantum-mechanical methods. Supported in part by NASA grant NAG5-12751

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