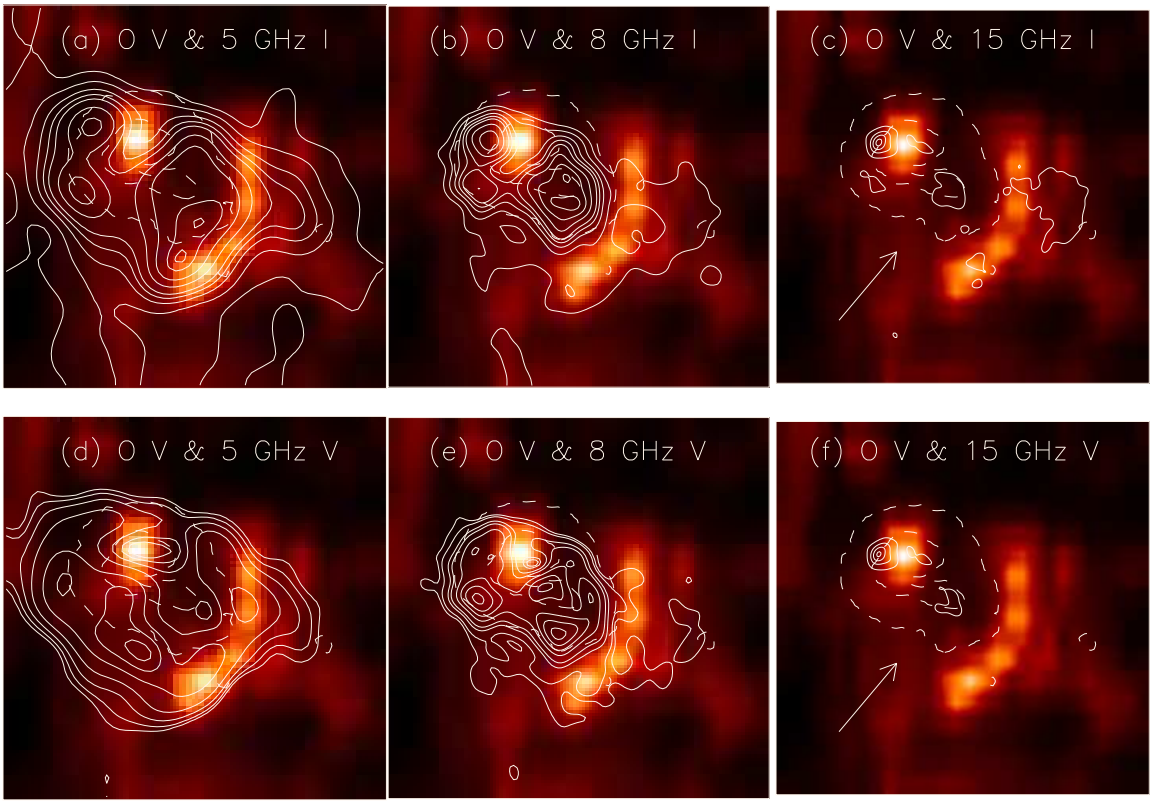
Depression in Sunspot Radio Emission Linked With Plume



These observations were the first that enabled us to establish a direct link between a sunspot's plume and depressions in the sunspot's radio emission. We observed a large sunspot in Active Region 8539 on 1999 May 13 at radio frequencies of 5, 8, and 15 GHz with the Very Large Array (VLA) and at extreme-ultraviolet (EUV) wavelengths with the Coronal Diagnostic Spectrometer (CDS) aboard the *SOHO* spacecraft. The EUV observations reveal a plume, which appears brightest in emission lines from ions formed at temperatures between 1.6×10^5 and 5.0×10^5 K, in the sunspot. The $2' \times 2'$ image in all six frames above shows the intensity of an emission line from an O^{+4} ion (also written "O V", formed at 2.5×10^5 K) at 629.7 Å. The inner dashed contour outlines the sunspot umbra, and the outer dashed contour the penumbra; the brightest O V emission is located in the umbra. The corresponding radio intensity I (frames a,b,c) and Stokes V (a measure of polarization; frames d,e,f) are displayed as contours. Radio depressions occur in and around the plume because the sunspot's radio emission is dominated by thermal gyroemission, which depends on the magnetic field strength and becomes optically thick at smaller temperatures inside the plume (hence the smaller intensities) than outside. [From J. W. Brosius & S. M. White, *The Astrophysical Journal*, vol. 601, p. 546 (2004 Jan. 20).]