Analysis of the Ground Based Data for 3C279: 1990-1999

S. D. Bloom, A. E. Wehrle (JPL/Caltech), T. J. Balonek (Colgate), H. Teräsranta, M. Tornikoski (Metsähovi Radio Research Station), M. F. Aller, H. D. Aller (University of Michigan), G. Tosti (University of Perugia), L. Takalo (Tuorla Observatory), D. J. Thompson (NASA/GSFC)

We consider the multi-waveband light curves for the blazar 3C 279 during 1990-1999. Overall, a growth of a long term outburst from 1990 to the present is apparent from 4.8-37 GHz, with an amplitude roughly between a factor of 2-3 gain in flux, depending on frequency. This long term behavior is ambiguous at higher frequencies, probably due to undersampling. After subtraction of exponential functions which are fit to the minima of the short term flares, we see that the amplitudes of these short term flares (at 22 and 37 GHz) match the shape of the gamma-ray light curve of the EGRET instrument on the *Compton Gamma-Ray Observatory* (CGRO). The ratio of the fluxes from the succesive peaks in millimeter emission is similar to that of the ratio of fluxes from the succesive gamma-ray peaks for similar time spans; however,the time delays of millimeter or optical and gamma-ray flares are difficult to establish due to the paucity of gamma-ray observations. The R-Band optical light curve does not show the same structure as the millimeter light curves. To quantify these results further, we have calculated the Discrete Correlation Functions (DCF's) for the radio, millimeter, and optical data of 3C 279 during the last decade (mostly co incident with the CGRO/EGRET mission). We have used this technique before and after the subtraction of exponential functions. As expected, the data closest in frequency show moderate to strong correlations with time lags of -150 to 150 days. However, the optical data are not correlated with the radio or millimeter data. The most likely explanation is that the optical emission (especially during flares) comes from a much smaller scale component than the total source contributing to the radio-millimeter flux. This effect is further mitigated by the much shorter outburst timescales expected for higher frequencies, under the assumption that the radio-optical spectrum is explained by the synchrotron process.