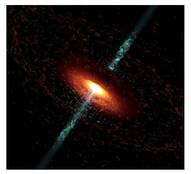

The SMA Calibrator Flux Density History Database

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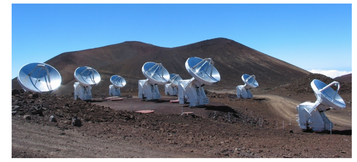
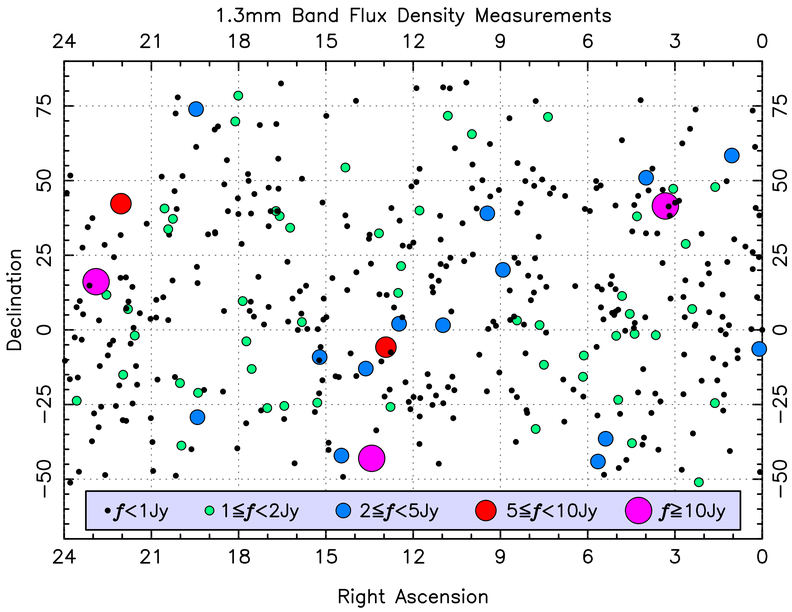
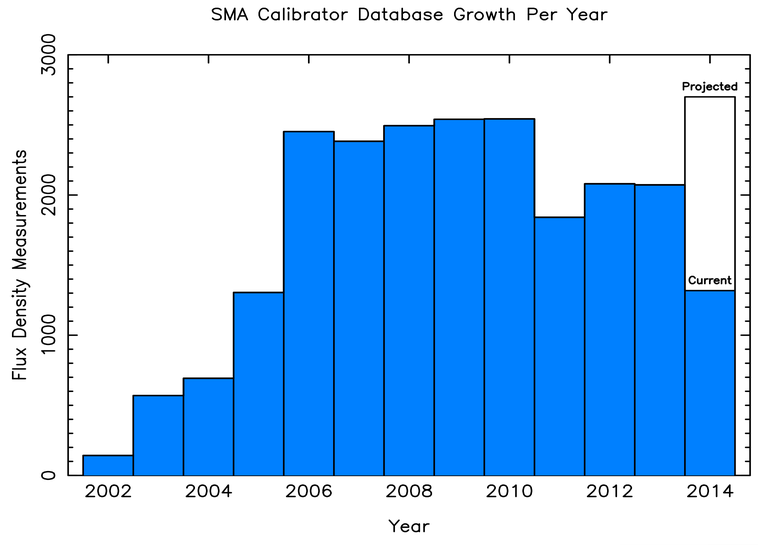
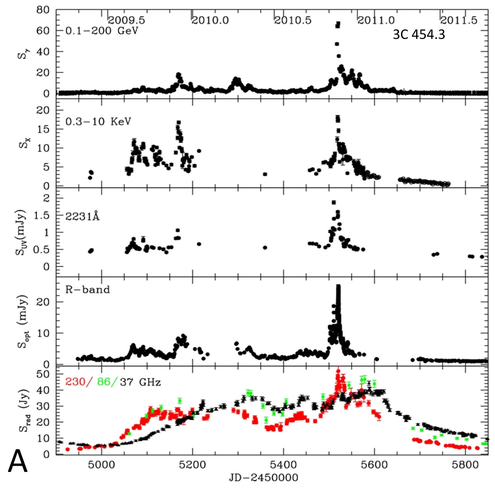


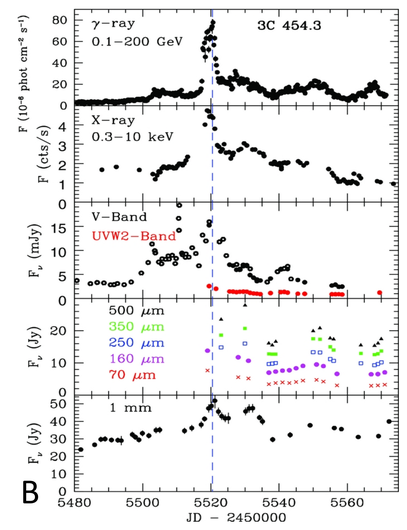
INTRODUCTION: Interferometric arrays such as the Submillimeter Array typically use short observations of strong point sources such as blazars –flat-spectrum radio-loud quasars (FSRQs) and BL Lac objects– as calibration targets for correcting moderate timescale atmospheric phase fluctuations and tracking instrumental phase and amplitude drifts. Targets adequate to use as calibrators for current submillimeter facilities are relatively scarce. We present results from our long-term monitoring program of SMA calibration sources at 1.3mm, 1.1mm, and 870 μm. The sky distribution of these sources is shown at right, with current values for the 1.3mm band flux density coded by color. Over the past 12 years this program has amassed more than 22,400 individual flux density measurements obtained through calibration of dedicated "flux" tracks, baseline determination tracks, and select science tracks. The Submillimeter Calibrator List, hosted at the SMA Observer Center (http://sma1.sma.hawaii.edu/tools.html), is updated regularly, and is by far the most comprehensive publicly accessible repository of monitoring data for these wavelength bands. Since 2006, the database has grown by 2300 measurements per year on average (see history to right). Rapid calibration of this data provides an up-to-date listing of currently bright sources, useful for planning SMA observations. In addition, this data set provides a rich and unique source of information on the mm/submm variability of more than 400 sources. Interest in the SMA as an observational resource has been particularly strong since the launch of the Fermi Gamma-ray Space Telescope, with data from the SMA Flux Density Database used in more than 45 peer-reviewed publications since 2008.







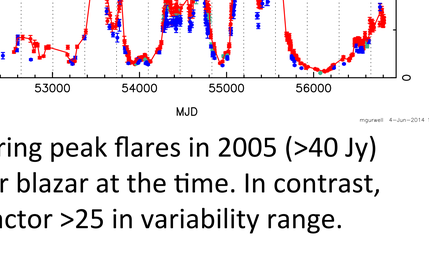
A



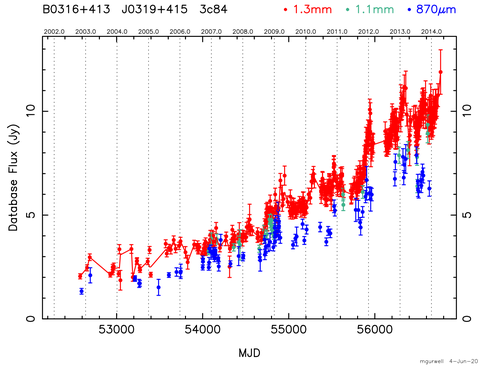
B

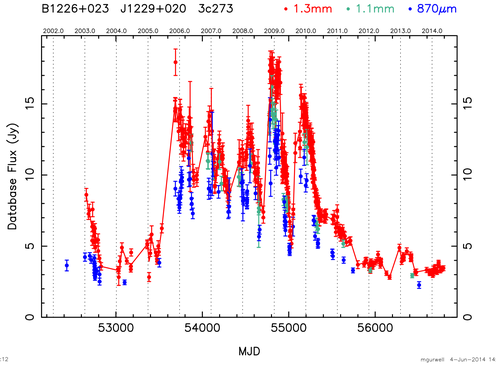
BLAZAR ACTIVITY: In a series of papers, SMA lightcurves for several blazars were analyzed using multi-wavelength monitoring data, spanning γ-rays to radio. Often a time-delayed correlation exists between γ-ray/X-ray and submillimeter lightcurves, as shown for 3C 454.3 in A and B (above) and prototype blazar BL Lac (C, right). The analysis identifies the location of scattering regions for different photon populations, and thereby seeks to define, or place strong constraints on, the physical conditions in the inner regions of the AGN jet.

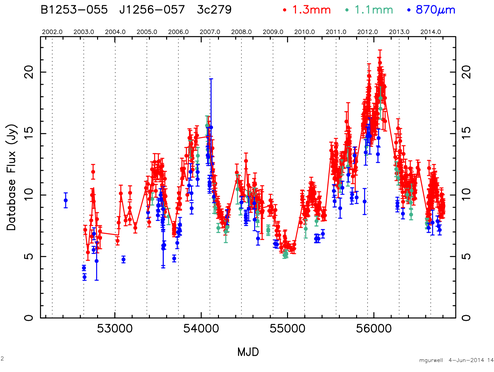
References for Figures
A - Jorstad et al (2013) ApJ 773, 147
B - Wehrle et al (2012) ApJ 758, 72
C -Raiteri et al (2013) MNRAS 436, 1530

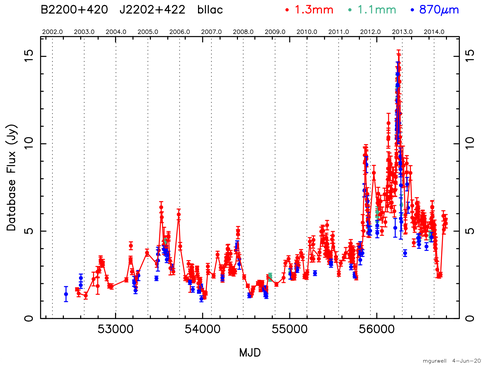


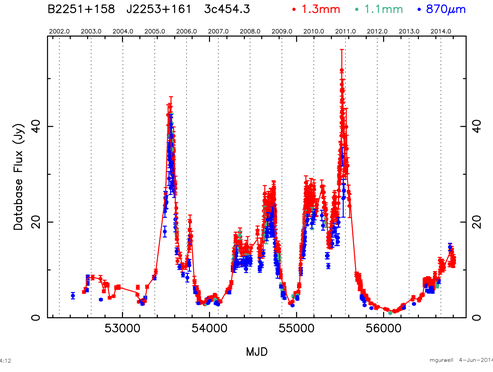
C











LIGHTCURVES: Flux density history at mm/submm wavelengths for five well-known calibration sources measured with the SMA. They exhibit variability on many time scales, such as the steady rise of 3C 84, roughly yearly quasi-periodic fluctuations in 3C 273, to rapid flaring in BL Lacertae.

The range of flux density variability can be quite extraordinary. During peak flares in 2005 (>40 Jy) and 2010 (>50 Jy), 3C 454.3 was significantly brighter than any other blazar at the time. In contrast, exhibits a quiescent flux density < 2 Jy at 1.3mm (as in 2012) for a factor >25 in variability range.