When a Standard Candle Flickers: Hard X-ray Variations in the Crab Nebula

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Abstract:
In the first two years of science operations of the Fermi Gamma-ray Burst Monitor (GBM), August 2008 to August 2010, a ~7% (70 mcrab) decline was discovered in the overall Crab nebula flux in the 15 - 50 keV band, measured with the Earth occultation technique. This decline was independently confirmed with four other instruments: the RXTE/PCA, Swift/BAT, INTEGRAL/IBIS, and INTEGRAL/SPI. The pulsed flux measured with RXTE/PCA from 1999-2010 was consistent with the pulsar spin-down, indicating that the observed changes were nebular. From 2001 to 2010, the Crab nebula flux measured with RXTE/PCA was particularly variable, changing by up to ~3.5% per year in the 15-50 keV band. These variations were confirmed with INTEGRAL/SPI starting in 2003, Swift/BAT starting in 2005, and Fermi GBM starting in 2008. Before 2001 and since 2010, the Crab nebula flux has appeared more stable, varying by less than 2% per year. At higher energies, above 50 keV, the Crab flux appears to be slowly recovering to its 2008 levels. I will present updated light curves in multiple energy bands for the Crab nebula, including recent data from Fermi GBM, Swift/BAT, INTEGRAL, MAXI, and NuSTAR and a 16-year long light curve from RXTE/PCA.