

OSSE Mapping of Positron Annihilation Radiation

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During eight years of operation the OSSE instrument on-board CGRO has observed sources in many regions of the sky, primarily near the Galactic Center and along the Galactic Plane. From these individual observations, Purcell et al. (1993,1997) created a large dataset of fitted 511 keV line fluxes, and mapped the Galactic Center region. These were the first maps of galactic positron annihilation radiation. That dataset has been augmented with additional data, both recent and archival, and re-analyzed to improve the spectral fitting. The improved spectral fitting has permitted the estimation of the positronium continuum emission (the fitted 511 keV line is robust relative to spectral modelling). The mapped region has been extended to include the entire Galactic Plane, as well as the Virgo and LMC/SMC regions. Maps of both components of positron annihilation radiation have been generated, and combined to form maps of positron annihilation radiation which cover $\sim 65\%$ of the sky. These are the first maps ever produced of positronium continuum emission, and the most extensive maps of 511 keV line emission. The central component of the 511 keV map remains the Galactic Center region, the current maps show improved definition due to additional exposure.

Utilizing simulated maps for comparison, the astrophysical implications of these maps will be discussed. Particular issues addressed will be the shape of the bulge and disk emission, the status of the “annihilation fountain”, the evidence for emission away from the Galactic Plane, and the spatial variation of the positronium fraction.