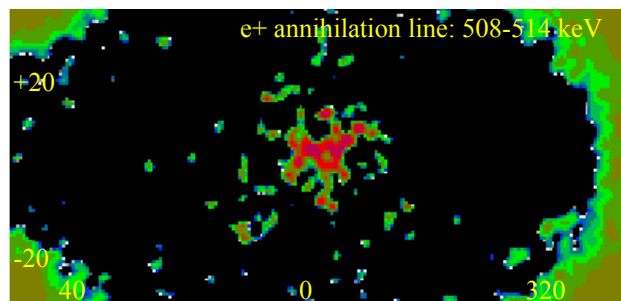
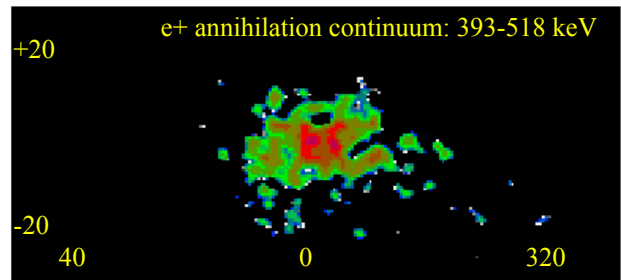
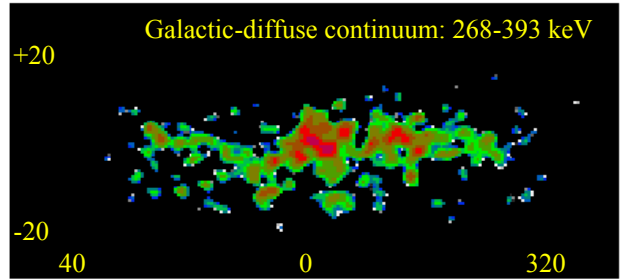
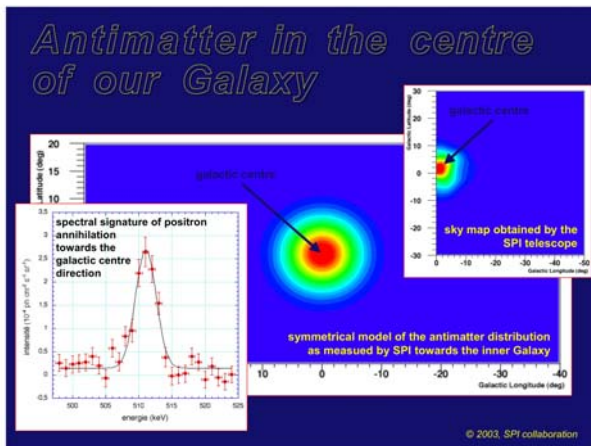


Positrons are ejected into interstellar space from sources of nucleosynthesis, but also from compact sources such as pulsars and microquasars. Many non-imaging instruments have measured e^+ annihilation emission from the general direction of the inner Galaxy. Through imaging, INTEGRAL/SPI is able to map the Galaxy in annihilation emission, and thus help clarify its origin.

The study of e^+ annihilation emission from the inner region of the Galaxy is as old as the history of gamma-ray line astronomy. For many years, a variable point source in the center of our Galaxy was suspected to be the dominating source.

First imaging information and long-term space monitoring from the OSSE instrument then established that the annihilation emission was steady, and diffuse in nature, extending over the central $\sim 10^\circ$ of the Galaxy.



With INTEGRAL/SPI, much more sensitive and detailed mapping of annihilation emission is possible, over the >6 -year mission.

The coded-mask imaging information allows both a significant suppression of strong instrumental 511 keV background as well as imaging deconvolution with a resolution of $\sim 2^\circ$. Annihilation emission occurs in a rather sharp line at 511 keV, and in a continuum extending downward from 511 keV, from annihilations through intermediate formation of positronium. Their relative proportions reflect the annihilation conditions of e^+ in the ISM.

References:

- Strong A.W.: ESA INTEGRAL www (2004)
- Strong A.W., et al.: A&A 411, L447 (2003)
- Weidenspointner G., et al.: ESA-SP552 (in press)(2004)

The above first images from Maximum-Entropy deconvolution show the inner Galaxy in three different energy bands, from ~ 4 Ms of SPI data: The top Figure shows the general continuum emission of the Galaxy at an energy around $300(\pm 50)$ keV, for reference. The middle image shows an energy band around $460(\pm 60)$ keV, including the e^+ annihilation line and continuum: The e^+ emission clearly is more circular in appearance, and not dominated by the disk of the Galaxy - consistent with model fitting analyses, see left-column image). The bottom image in the energy band of the 511 keV line only, confirms this morphology. It has been suggested that such spherically-symmetric morphology may be the signature of dark-matter annihilation in the Galaxy's gravitational well.