Extension of the Source catalogue for INTEGRAL/SPI with 22 Years of Data

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Abstract

The INTErnational Gamma-Ray Astrophysics Laboratory (INTEGRAL) operated from 2002 until early 2025, concluding more than two decades of observations. As the mission enters its post-operations phase, the focus is shifting toward maximizing the scientific legacy of its archival data. We present a new pipeline for constructing astronomical source catalogues from raw data obtained with the SPectrometer on INTEGRAL (SPI), designed to provide the community with a uniform and extensible data product for future research. The original SPI catalogue, based on the first six years of observations, was published in 2008. By exploiting the full 22-year archive, the new pipeline significantly improves source sensitivity, enables the creation of a more comprehensive catalogue, and, for the first time, incorporates a systematic treatment of transient sources. We describe our whole-sky analysis strategy, performed over predefined spatial regions and time intervals, together with the methodology for reducing raw SPI data, including background modelling, goodness-of-fit evaluation, and source detection and characterization. Finally, we present the results of the pipeline's initial application to archival data, demonstrating its performance and highlighting its potential for producing the next-generation SPI source catalogue.

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