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XRISM analysis of supernova remnant Cassiopeia A: Bayesian study with UltraSPEX

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Cassiopeia A (Cas A) is the youngest known galactic core-collapse supernova remnant (SNR) and is perhaps the best-studied SNR in X-rays. Cas A was observed at two different locations by XRISM, the X-Ray Imaging and Spectroscopy Mission, for more than a total of 350 ks. This rich dataset has revealed unprecedented details in elemental abundances, their dynamics, and plasma properties. In this talk, I will share the latest XRISM results on mapping the stellar ejecta kinematics and plasma properties of Cas A. I present the challenges faced during the analysis of high-resolution XRISM data, which required updates to atomic databases and Bayesian-based fitting methods. To this end, we developed UltraSPEX —a new tool integrating the nested sampling algorithm Ultranest with SPEX spectral fitting software, which offers unique computational advantages for fitting high-resolution XRISM/Resolve data.

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