

Abstract Submitted  
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**A Comprehensive Analysis of GRB X-ray Afterglows with Deep Chandra Follow-up: Implications for Off-Axis Jets** DAVID BURROWS, Penn State University, BIN-BIN ZHANG, University of Alabama - Huntsville, HENDRIK VAN EERTEN, MPE, GEOFFREY RYAN, ANDREW MACFADYEN, New York University, JUDITH RACUSIN, NASA / Goddard Space Flight Center, ELEANORA TROJA, NASA / Goddard Space Flight Center, CRESST — We present a sample of 27 GRBs with detailed Swift light curves supplemented by late time Chandra observations. By fitting to empirical mathematical functions, we find a higher fraction of jet-break candidates (56%) than previous studies using Swift-only samples and different analysis techniques (12%). To answer the missing jet-break problem in general, we further develop a numerical simulation-based model which can be directly fit to the data using Monte Carlo methods. Our numerical model takes into account all the factors that can shape a jet break: (i) lateral expansion (ii) edge effects and (iii) off-axis effects. Comparing to the empirical function fit, our results provide improved fits to the light curves and better constraints on physical parameters. More importantly, our results suggest that off-axis effects are important and must be included in interpretations of GRB jet breaks.

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