

Swift J2058.4+0516: DISCOVERY OF A POSSIBLE SECOND RELATIVISTIC TIDAL DISRUPTION FLARE

S. BRADLEY CENKO¹, HANS A. KRIMM^{2,3}, ASSAF HOESH⁴, ARNE RAU⁵, DALE A. FRAIL⁶, JAMIE A. KENNEA⁷, ANDREW J. LEVAN⁸, STEPHEN T. HOLLAND^{2,3}, NATHANIEL R. BUTLER^{1,9}, ROBERT M. QUIMBY⁴, JOSHUA S. BLOOM¹, ALEXEI V. FILIPPENKO¹, AVISHAY GAL-YAM¹⁰, JOCHEN GREINER⁵, S. R. KULKARNI⁴, ERAN O. OFEK⁴, FELIPE OLIVARES E.⁵, PATRICIA SCHADY⁵, JEFFREY M. SILVERMAN¹, NIAL R. TANVIR¹¹, AND DONG XU¹⁰

Draft version July 28, 2011

ABSTRACT

We report the discovery by the *Swift* hard X-ray monitor of the transient source *Swift* J2058.4+0516 (Sw J2058+05). Our multi-wavelength follow-up campaign uncovered a long-lived (duration \gtrsim months), luminous X-ray ($L_{X,\text{iso}} \approx 3 \times 10^{47} \text{ erg s}^{-1}$) and radio ($\nu L_{\nu,\text{iso}} \approx 10^{42} \text{ erg s}^{-1}$) counterpart. The associated optical emission, however, from which we measure a redshift of 1.1853, is relatively faint, and this is not due to a large amount of dust extinction in the host galaxy. Based on numerous similarities with the recently discovered GRB 110328A / *Swift* J164449.3+573451 (Sw J1644+57), we suggest that Sw J2058+05 may be the second member of a new class of relativistic outbursts resulting from the tidal disruption of a star by a supermassive black hole. If so, the relative rarity of these sources implies that either these outflows are extremely narrowly collimated ($\theta < 1^\circ$), or only a small fraction of tidal disruptions generate relativistic ejecta. Analogous to the case of long-duration gamma-ray bursts and core-collapse supernovae, we speculate that the spin of the black hole may be a necessary condition to generate the relativistic component. Alternatively, if powered by gas accretion (i.e., an active galactic nucleus), this would imply that some galaxies can transition from apparent quiescence to a radiatively efficient state of accretion on quite short time scales.

Subject headings: X-rays: bursts — accretion — galaxies: nuclei — black hole physics — X-rays: individual (Sw J1644+57)