

SWIFT: Opportunities, Capabilities and Data Handling

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Abstract. A focus session was held for those wanting to familiarise themselves with the SWIFT satellite and to consider its exploitation for specific scientific goals. An overview was presented, with questions throughout. Proposal preparation and the automated science products from the X-ray Telescope were discussed. This account summarises the information given in the presentation and in the answers to the questions which were raised.

Keywords. space vehicles: instruments, methods: data analysis, X-rays: general, astronomical data bases: miscellaneous

1. Introduction and Aims

The SWIFT satellite (Gehrels *et al.* 2004) has proven a valuable tool for the exploration of the time domain. It is unique in its fast slew capability of typically 70–100 seconds, coupled with simultaneous coverage in gamma-rays, X-rays, UV and optical. All SWIFT data are immediately available in the public domain, and SWIFT responds promptly to “Target of Opportunity” requests in addition to carrying out a full Guest Investigator programme and Key Science Projects. To date, science with SWIFT has been extremely varied, ranging from studies of gamma-ray bursts, soft gamma repeaters and active galactic nuclei to X-ray binaries, supernovæ, cataclysmic variables, flare stars and comets.

The aims of this workshop were (a) to give potential SWIFT users an overview of the capabilities of each SWIFT instrument, illustrated with science highlights, (b) to outline the opportunities for observing with SWIFT, and (c) to answer any SWIFT-related questions. Discussions both on the ready-made science-grade products and on the core data analysis techniques and the data archives were invited.

2. Summary

The following topics were presented:

- SWIFT mission objectives
- Instrumentation
- Scientific capabilities: some highlights
- Observing with SWIFT: opportunities
- Access to the archive
- The UK SWIFT Science Data Centre
- Automated science-grade data products: images, astrometry, light curves, hardness ratios and spectra
- Data processing, and where to find help

The primary goal of the NASA SWIFT mission, launched in 2004, was to uncover the origins of Gamma-Ray Bursts (GRB). SWIFT reacts autonomously to GRBs triggers. It has gone on to cover a broad spectrum of astrophysics, particularly areas which benefit most from SWIFTS' fast slewing capability and simultaneous broad-band coverage. Science highlights and general information about the mission can be found at <http://swift.gsfc.nasa.gov/docs/swift/> (US site), <http://swift.asdc.asi.it/> (Italian site) and <http://www.swift.ac.uk/> (UK site).

SWIFT carries a wide-field (2 steradian) 15–350 keV gamma-ray telescope: the Burst Alert Telescope (BAT, Barthelmy *et al.* 2005), a 23×23 arcmin FOV 0.3–10 keV X-ray telescope (XRT, Burrows *et al.* 2005) and a UV/optical telescope with 7 lenticular filters and 2 grisms covering 170–650 nm (UVOT, Roming *et al.* 2005). More details can be read at <http://www.swift.ac.uk/instruments.shtml>.

Proposals are solicited for Guest Investigator (GI) and fill-in programmes yearly, while rapid observations can be requested at any time via a Target of Opportunity (ToO) request at <http://www.swift.psu.edu/too.html>. GI observations can be requested for Large Programmes, monitoring campaigns, observations coordinated with other facilities and ToOs for future events, and in addition US proposals may request funds to mine the SWIFT archives or to carry out theoretical projects.

SWIFT data are all public immediately, to facilitate scientific return. When the BAT triggers on a source, initial data products are immediately downlinked via the TDRSS network of satellites and available via the Gamma-Ray Burst Coordinates Network (GCN). Data received via ground-station passes are typically available 2 hours after downlink in a Quick-Look database. All data are subsequently archived.

The UK SWIFT Science Data Centre hosts a full SWIFT archive; it can be accessed at http://www.swift.ac.uk/swift_portal/archive.php. Science-grade X-ray data products are also available from that site. As explained in detail by Goad *et al.* (2007) and Evans *et al.* (2007, 2009), ready-made images, light curves, spectra, hardness ratios and astrometry have been created for GRBs (<http://www.swift.ac.uk/results.shtml>), while the same products can be created for any SWIFT-observed object of interest at http://www.swift.ac.uk/user_objects/.

Instructions for downloading and installing SWIFT software, and a walk-through description of the data reduction steps for all three SWIFT instruments, can be found in http://www.swift.ac.uk/proc_guide.shtml. One-day training sessions are available at the University of Leicester.

Participants raised a number of questions on the use of the UVOT, particularly for spectroscopic observations. An example of use of the UV grism is shown for GRB 081203A in Kuin *et al.* (2009). The grism calibrations are ongoing; users requesting grism observations are referred to the UVOT Software Guide on the SWIFT data analysis webpages.

Further questions should be directed to the Helpdesk at swift-help@star.le.ac.uk.

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