THE SUPERWASP ASTEROID LIGHT CURVE AND PHASE CURVE SURVEY N. R. Parley[1], S. F. Green[1], N. McBride[1], C. A. Haswell[1], A. Collier Cameron[2], T. A. Lister[2,3,4], R. G. West[5], D. L. Pollacco[6] and the SuperWASP consortium[7]. [1]PSSRI, The Open University, Walton Hall, Milton Keynes, Mk7 6AA, UK, e-mail s.f.green@open.ac.uk. [2]Department of Physics and Astronomy, University of St. Andrews, North Haugh, St. Andrews, Fife, KY16 9SS, UK. [3]Astronomy Group, School of Chemistry and Physics, Keele University, Staffordshire, ST5 5BG, UK. [4]Las Cumbres Observatory, 6740B Cortona Drive, CA93117 USA. [5]Department of Physics and Astronomy, University of Lecicester, Leicester, LE1 7RH, UK. [5]School of Mathematics and Physics, Queen's University, Belfast, University Road, Belfast, BT7 1NN, UK. [7]www.superwasp.org.

Introduction: SuperWASP is the UK's leading extra-solar planet detection programme comprising a consortium of eight academic institutions which include Cambridge University, the Instituto de Astrofisica de Canarias, the Isaac Newton Group of telescopes, Keele University, Leicester University, The Open University, Queen's University Belfast and St. Andrews University. SuperWASP-North is located on the island of La Palma amongst the Isaac Newton Group of telescopes (ING). SuperWASP-South is located at the site of the South African Astronomical Observatory (SAAO). The observatories each consist of eight wide-angle cameras with passively-cooled CCDs, which photometrically survey large numbers of stars in the magnitude range 7 to 15. Each camera covers a 7.8 x 7.8 degree field of view. The repeated observations of wide fields provide an ideal opportunity for the study of a wide variety of bright variable objects. The asteroid Survey is performed by searching for detections of numbered asteroids among the *orphans* catalogue which contains all point sources detected above the SuperWASP survey threshold that have not been associated with known stars.

Inauguration of SuperWASP-North in April 2004, with 5 cameras, was followed by six months of survey operations. Both observatories have been in almost continuous operation with a full complement of cameras since early 2006. The SuperWASP hardware and reduction techniques are described in detail by Pollacco et al.[1].

Data Reduction Pipeline: Images taken in the SuperWASP survey are processed automatically to extract point source photometric data. Individual frames are corrected for bias, dark, flat fields and correction for shutter travel time. A full astrometric solution of the FOV is performed using the Tycho2 catalogue (<15 mag) and point sources are identified using USNO-B1 catalogue. Photometry is performed using 3 separate apertures allowing a measure of object blending (the pixel size is 13.7 arcseconds). Non-matched objects may be transient outbursts, gamma-ray bursts or asteroids; flagged as orphans for later re-examination. Count rates in the broad-band SuperWASP filters (400-700 nm since 2006, white light in 2004) are converted to visual magnitudes from iterative fits to a 9-term photometric model. The point source data products are stored in a custom built MySQL archive.

Asteroid Data Processing: An orphan is tagged as an asteroid detection if it lies within 30 arcsec of a predicted position for any numbered asteroid and within a specified magnitude range. Due to the large pixel size, blending with background stars can affect the observed magnitudes so blending corrections are calculated for each observation that lies within a specified distance of a catalogued star. A user-selected blending limit is applied to remove severely blended observations (for which the calculated correction will have large uncertainties,) from light curve fits. Reduced magnitude $V(1,\alpha)$ light curves, rotation periods and amplitudes are derived using a customised version of the Fourier analysis algorithm developed by Harris [2]. Separate folded light curves are produced for each camera-field combination and for time intervals corresponding to specified aspect ranges. Phase curves are produced using light curve averaged mean magnitudes for each night of observation. Residual cross-field calibration offsets are removed using local reference stars with asteroid-like colours. Best fit H,G [3] and linear phase coefficients are determined for each asteroid.

Results: Results are presented for 2004 and 2006 data. These comprise a total of 2648 camera-nights of data in which there are 1466 asteroids with 383738 orphan matches, 378673 of which have usable photometric information. 436 asteroids have sufficient coverage for light curve analysis and 268 for production of phase curves. Example light curves and phase curves are presented.

References: [1] Pollacco, D. L. et al., (2006) PASP 118, 1407-1418. [2] Harris et al. (1989) Icarus 77, 171-186. [3] Bowell, E. et al. (1989) In Asteroids II, p524-556, Univ. Arizona Press, Tucson.