



NEWS! From the NAVAL OBSERVATORY

U.S. NAVAL OBSERVATORY

3450 MASSACHUSETTS AVE, NW

WASHINGTON, DC 20392-5420

U.S. Naval Observatory Press Release

Geoff Chester
U.S. Naval Observatory Public Affairs Office
(202) 762-1438
geoff.chester@navy.mil

Information Contact:
Dr. Norbert Zacharias
Chief, Cataloging Division,
Astrometry Department
U.S. Naval Observatory, Washington, DC
(202) 762-1423
nz@usno.navy.mil

FOR IMMEDIATE RELEASE

USNO RELEASES FINAL VERSION OF CCD ASTROGRAPH STAR CATALOG

The United States Naval Observatory (USNO) has released the Fourth Edition of its USNO CCD Astrograph Catalog (UCAC4), the most precise and comprehensive star catalog ever produced by ground-based instrumentation. The catalog contains data on about 113 million stars and is complete for all stars from the brightest, Sirius, to about 16th magnitude. Stars brighter than about 8th magnitude are supplemented from other sources, mainly the FK6, Hipparcos and Tycho Catalogs, and were not directly observed by the astrograph.

In addition to the sheer number of stars that the UCAC4 entails, it is the precision and accuracy of the stars' positions that set this catalog apart from all of its predecessors.

Astronomers measure the sky in terms of angular degrees, minutes, and seconds of arc. The apparent size of the disc of the Full Moon is approximately 30 arcminutes, or one-half of a degree. The apparent size of the disc of Mars at its most favorable oppositions is just over 25 arcseconds, slightly less than one-half of an arcminute. One arcsecond is the apparent size that a U.S. penny coin would appear if it were viewed from a distance of about 2.4 miles (3.9 kilometers).

The positions of the 10th to 14th magnitude stars in the UCAC4 are known to within an error of about 20 milliarcseconds ("mas", or 20 thousandths of a second of arc), which would be equivalent to the width of the "I" in the word "LIBERTY" on our penny about 6000 feet (2 kilometers) away!

By measuring so many stars with such precision, it is possible to re-examine older photographic star catalogs to determine the "proper motions" of the stars on the plane of the sky. UCAC4 contains data on the proper motions of most of its stars compiled from over 150 other star catalogs with significant epoch differences from the UCAC CCD observations.

The observations for the UCAC4 were conducted between 1998 and 2004 with a specially-modified 8-inch (20-centimeter) aperture telescope using a 4096 x 4096 pixel Charge-Coupled Device, or CCD.

The telescope completed its last observations of the northern hemisphere sky from the USNO Flagstaff Station (NOFS) near Flagstaff, AZ in May, 2004. Prior to its move to Flagstaff, the telescope spent over two years observing the southern hemisphere sky from Cerro Tololo Inter-American Observatory (CTIO) in Chile.

The raw data for the catalog has been compiled from over 85,000 fields of view obtained from nearly 250,000 overlapping CCD frames and contains over 4 terabytes (4×10^{12}) of compressed image data.

UCAC4 will be available to users through the astrometric catalog server at the Strasbourg Astronomical Data Center (CDS, <http://cdsarc.u-strasbg.fr/cats/I.htx>); in addition, DVD-ROMs of the catalog may be obtained directly from the USNO.

This will be the final edition of the UCAC. Work has already begun on a new CCD-based catalog based on observations made with the USNO Robotic Astrometric Telescope (URAT).

URAT uses the same “red lens” optics as the UCAC with a new optical tube assembly designed and fabricated by the USNO Instrument Shop. The state-of-the-art “4-shooter” camera consists of a mosaic of four 10k x 10k CCDs (~440 megapixels total) that covers about 28 square degrees of sky in one exposure (vs. one square degree for the UCAC sensor). The camera is cooled to an operating temperature of minus 80°C with liquid nitrogen. The mounting is designed for independent robotic operation without the need for a human observer.

URAT began its systematic survey observing in April, 2012 at NOFS. It will survey the northern hemisphere sky before being moved to CTIO to image the southern sky. It will re-survey all of the stars in the UCAC to even higher precision and extend the magnitude limit of the faintest stars to 17.5.

Founded in 1830, the U.S. Naval Observatory functions as an operational Navy unit under the Commander, Naval Meteorology and Oceanography Command and United States Fleet Forces Command, maintaining and disseminating the Department of Defense's official timescale used by GPS and other Defense satellite systems, as well as collecting astrometric information required to operate a wide variety of strategic systems such as the B2, Trident ICBMs, and ISR satellite systems.