cation of the user interface have all reduced the required workforce to run 70-meter antennas. The ALC also increases the antenna availability by reducing the time required to start up the antenna, to diagnose faults, and by providing additional insight into the performance of key parameters that aid in preventive maintenance to avoid key element failure.

The ALC User Display (AUD) is a graphical user interface with hierarchical display structure, which provides high-level status information to the operation of the ALC, as well as detailed information for virtually all aspects of the ALC via drill-down displays. The operational status of an item, be it a function or assembly, is shown in the higher-level display. By pressing the item on the display screen, a new screen opens to show more detail of the function/assembly. Navigation tools and the map button allow immediate access to all screens.

This program was written by Harlow Ahlstrom, Scott Morgan, Peter Hames, Martha Strain, Christopher Owen, and Kenneth Shimizu of Caltech; Karen Wilson, David Shaller, and Said Doktormomtaz of Modern Technologies Corp.; and Patrick Leung of Northrop Grumman Corp. for NASA's Jet Propulsion Laboratory.

This software is available for commercial licensing. Please contact Karina Edmonds of the California Institute of Technology at (626) 395-2322. Refer to NPO-44341.

Modeling Carbon and Hydrocarbon Molecular Structures in EZTB

NASA's Jet Propulsion Laboratory, Pasadena, California

A software module that models the electronic and mechanical aspects of hydrocarbon molecules and carbon molecular structures on the basis of first principles has been written for incorporation into, and execution within, the Easy (Modular) Tight-Binding (EZTB) software infrastructure, which is summarized briefly in the immediately preceding article. Of particular interest, this module can model carbon crystals and nanotubes characterized by various coordinates and containing defects, without need to adjust parameters of the physical model.

The module has been used to study the changes in electronic properties of carbon nanotubes, caused by bending of the nanotubes, for potential utility as the basis of a nonvolatile, electric-charge-free memory devices. For example, in one application of the module, it was found that an initially 50-nm-long carbon, (10,10)-chirality nanotube, which is a metallic conductor when straight, becomes a semiconductor with an energy gap of ≈3 meV when bent to a lateral displacement of 4 nm at the middle.

This program was written by Seungwon Lee and Paul von Allmen of Caltech for NASA's Jet Propulsion Laboratory.

This software is available for commercial licensing. Please contact Karina Edmonds of the California Institute of Technology at (626) 395-2322. Refer to NPO-44781.

BigView Image Viewing on Tiled Displays

Ames Research Center, Moffett Field, California

BigView allows for interactive panning and zooming of images of arbitrary size on desktop PCs running Linux. Additionally, it can work in a multi-screen environment where multiple PCs cooperate to view a single, large image. Using this software, one can explore — on relatively modest machines — images such as the Mars Orbiter Camera mosaic [92,160×33,280 pixels].

The images must be first converted into "paged" format, where the image is stored in 256×256 "pages" to allow rapid movement of pixels into texture memory. The format contains an "image pyramid": a set of scaled versions of the original image. Each scaled image is 1/2 the size of the previous, starting with the original down to the smallest, which fits into a single 256×256 page.

This program was written by Timothy Sandstrom of Advanced Management Technology for Ames Research Center. For further information, access http://opensource.arc.nasa.gov/ or contact the Ames Technology Partnerships Division at (650) 604-2954. ARC-15277-1

Imaging Sensor Flight and Test Equipment Software

Marshall Space Flight Center, Alabama

The Lightning Imaging Sensor (LIS) is one of the components onboard the Tropical Rainfall Measuring Mission (TRMM) satellite, and was designed to detect and locate lightning over the tropics. The LIS flight code was developed to run on a single onboard digital signal processor, and has operated the LIS instrument since 1997 when the TRMM satellite was launched.

The software provides controller functions to the LIS Real-Time Event Processor (RTEP) and onboard heaters, collects the lightning event data from the RTEP, compresses and formats the data for downlink to the satellite, collects housekeeping data and formats the data for downlink to the satellite, provides command processing and interface to the spacecraft communications and data bus, and provides watchdog functions for error detection.

The Special Test Equipment (STE) software was designed to operate specific test equipment used to support the LIS hardware through development, calibration, qualification, and integration with the TRMM spacecraft. The STE software provides the capability to control instrument activation, commanding (including both data formatting and user interfacing), data collection, decompression, and display and image simulation.

The LIS STE code was developed for the DOS operating system in the C programming language. Because of the many unique data formats implemented by the flight instrument, the STE software was required to comprehend the same formats, and translate them for the test operator. The hardware interfaces to the LIS instrument using both commercial and custom computer boards, requiring that the STE code integrate this variety into a working system. In addition, the requirement to provide RTEP test capability dictated the need to provide simulations of background image data with short-duration lightning transients superimposed. This led to the development of unique code used to control the location, intensity, and variation above background for simulated lightning strikes at user-selected locations.

This program was written by Kathleen Freestone, Louis Simeone, Byran Robertson, Maytha Frankford, David Trice, Kevin Wallace, and DeLisa Wilkerson of Marshall Space Flight Center. Further information is contained in a TSP (see page 1). MFS-32339-1

Processing AIRS Scientific Data Through Level 2

NASA's Jet Propulsion Laboratory, Pasadena, California

The Atmospheric Infrared Spectrometer (AIRS) Science Processing System (SPS) is a collection of computer programs, denoted product generation executives (PGEs), for processing the readings of the AIRS suite of infrared and microwave instruments orbiting the Earth aboard NASA's Aqua spacecraft. AIRS SPS at an earlier stage of development was described in "Initial Processing of Infrared Spectral Data" (NPO-35243), *NASA Tech Briefs*, Vol. 28, No. 11 (November 2004), page 39. To recapitulate: Starting from level 0 (representing raw AIRS data), the PGEs and their data products are denoted by alphanumeric labels (1A, 1B, and 2) that signify the successive stages of processing. The cited prior article described processing through level 1B (the level-2 PGEs were not yet operational).

The level-2 PGEs, which are now operational, receive packages of level-1B geolocated radiance data products and produce such geolocated geophysical atmospheric data products such as temperature and humidity profiles. The process of computing these geophysical data products is denoted "retrieval" and is quite complex. The main steps of the process are denoted microwave-only retrieval, cloud detection and cloud clearing, regression, full retrieval, and rapid transmittance algorithm.

This program was written by Robert Oliphant, Sung-Yung Lee, Moustafa Chahine of Caltech; Joel Susskind of Goddard Space Flight Center; Christopher Barnet, Larry McMillin, and Mitchell Goldberg of the National Oceanic and Atmospheric Administration; John Blaisdell of Science Applications International Corp; Philip Rosenkranz of Massachusetts Institute of Technology; and Larrabee Strow of the University of Maryland, Baltimore County, for NASA's Jet Propulsion Laboratory.

This software is available for commercial licensing. Please contact Karina Edmonds of the California Institute of Technology at (626) 395-2322. Refer to NPO-40459.

Triaxial Probe Magnetic Data Analysis

NASA's Jet Propulsion Laboratory, Pasadena, California

The Triaxial Magnetic Moment Analysis software uses measured magnetic field test data to compute dipole and quadrupole moment information from a hardware element. It is used to support JPL projects needing magnetic control and an understanding of the spacecraft-generated magnetic fields.

Evaluation of the magnetic moment of an object consists of three steps: acquisition, conditioning, and analysis. This version of existing softward was extensively rewritten for easier data acquisition, data analysis, and report presentation, including immediate feedback to the test operator during data acquisition.

While prior JPL computer codes provided the same data content, this program has a better graphic display including original data overlaid with reconstructed results to show "goodness of fit" accuracy and better appearance of the report graphic page. Data are acquired using three magnetometers and two rotations of the device under test. A clean acquisition user interface presents required numeric data and graphic summaries, and the analysis module yields the best fit (least squares) for the magnetic dipole and/or quadrupole moment of a device.

The acquisition module allows the user to record multiple data sets, selecting the best data to analyze, and is repeated three times for each of the *z*-axial and *y*-axial rotations. In this update, the *y*-axial rotation starting position has been changed to an option, allowing either the *x*- or *z*-axis to point towards the magnetometer. The code has been rewritten to use three simultaneous axes of magnetic data (three probes), now using two "rotations" of the device under test rather than the previous three rotations, thus reducing handling activities on the device under test. The present version of the software gathers data in one-degree increments, which permits much better accuracy of the fit-