Processed Lidar Data (left) and **Aerial Imagery** (right) show a one-square-kilometer area of Broward County, Florida.

eters that are required to calculate the estimated surface roughness for a specified area. By using this algorithm, aerodynamic surface roughness values in urban areas can then be extracted automatically. The user can also adjust the algorithm for local conditions and lidar characteristics, like summer/winter vegetation and dense/sparse lidar point spacing. Additionally, the user can also survey variations in surface roughness that occurs due to wind direction; for example, during a hurricane, when wind direction can change dramatically, this variable can be extremely significant.

In its current state, the algorithm calculates an estimated surface roughness for a square kilometer area; techniques using the lidar data to calculate the surface roughness for a "point," whereby only roughness elements that are upstream from the point of interest are used and the wind direction is a vital concern, are being investigated. This technological advancement will improve the reliability and accuracy of models that use and incorporate surface roughness.

This work was done by Donald Holland of Science Systems and Applications, Inc., for Stennis Space Center.

Inquiries concerning this technology should be addressed to the Intellectual Property Manager, Stennis Space Center, 228-688-1929. Refer to SSC-00296-1, volume and number of this NASA Tech Briefs *issue, and the page number.*

DSN Data Visualization Suite

NASA's Jet Propulsion Laboratory, Pasadena, California

The DSN Data Visualization Suite is a set of computer programs and reusable Application Programming Interfaces (APIs) that assist in the visualization and analysis of Deep Space Network (DSN) spacecraft-tracking data, which can include predicted and actual values of downlink frequencies, uplink frequencies, and antenna-pointing angles in various formats that can include tables of values and polynomial coefficients. The data can also include lists of antenna-pointing events, lists of antenna-limit events, and schedules of tracking activities.

To date, analysis and correlation of these intricately related data before and after tracking have been difficult and time-consuming. The DSN Data Visualization Suite enables operators to quickly diagnose tracking-data problems before, during, and after tracking. The Suite provides interpolation on demand and plotting of DSN tracking data, correlation of all data on a given temporal point, and display of data with color coding configurable by users. The suite thereby enables rapid analysis of the data prior to transmission of the data to DSN control centers. At the control centers, the same suite enables operators to validate the data before committing the data to DSN subsystems. This software is also Web-enabled to afford its capabilities to international space agencies.

This program was written by Bach X. Bui and Mark R. Malhotra of Caltech and Richard M. Kim 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-45758.