The Multi-Mission Power Analysis Tool (MMPAT) simulates a spacecraft power subsystem including the power source (solar array and/or radioisotope thermoelectric generator), bus-voltage control, secondary battery (lithium-ion or nickel-hydrogen), thermostatic heaters, and power-consuming equipment. It handles multiple mission types including heliocentric orbiters, planetary orbiters, and multiple mission types including heliopolar, planetary, and solar power-consuming equipment. It handles hydrogen), thermostatic heaters, and electric generator), bus-voltage control, (solar array and/or radioisotope thermostatic subsystem including the power source (MMPAT) simulates a spacecraft power subsystem with a graphical user interface, in batch mode, or as a library linked with other tools.

The present methods have inherent inefficiency and are not fully automatic, which heavily restricts their practical applications. The new method is based on an efficient algorithm. The new engine utilizes defeasible logic to describe communication policy constraints and priorities. Defeasible logic (see figure) is non-monotonic, and contains three different types of rules: strict rules, which are strict “if/then” statements; defeasible rules that are “if this, then probably that” statements; and defeater rules that contradict the outcomes of defeasible rules.

The policy negotiation program reads in two files specifying the policies that the user wishes to combine, and outputs a single file describing the means of communication that satisfy both input policies, if any can be found.

To implement this method, a tool called DPC (Defeasible Policy Composition) was developed. To maintain that efficiency in the DPC tool, the data structures for the individual terms of each constraint are joined in linked-list fashion to their constraints and to a parent object representing each term. This can be visualized as a linked grid, where the heads of each column are the terms, the heads of each row are the rule names, and the body of the grid is the references to the terms that make up those rules. Each term reference is linked to its neighbors in the grid, which allows the algorithm to quickly and efficiently search through, add, and delete rows, terms, and individual term references.

This work was done by Farrokh Vatan and Edward T. Chow of Caltech for NASA’s Jet Propulsion Laboratory. Further information is contained in a TSP (see page 1).

The software used in this innovation is available for commercial licensing. Please contact Daniel Broderick of the California Institute of Technology at danielb@caltech.edu. Refer to NPO-48399.
adjusting mission scenarios using power profiles generated by the model; system engineers for performing system-level trade studies using the results of the model during the early design phases of a spacecraft; and operations personnel for high-fidelity modeling of the essential power aspect of the planning picture.

This work was done by Eric G. Wood, George W. Chang, and Fannie C. Chen of Caltech for NASA’s Jet Propulsion Laboratory.

For more information, contact iaoffice@jpl.nasa.gov.

This software is available for commercial licensing. Please contact Daniel Broderick of the California Institute of Technology at danielb@caltech.edu. Refer to NPO-48152.

Jupiter Environment Tool
NASA’s Jet Propulsion Laboratory, Pasadena, California

The Jupiter Environment Tool (JET) is a custom UI plug-in for STK that provides an interface to Jupiter environment models for visualization and analysis. Users can visualize the different magnetic field models of Jupiter through various rendering methods, which are fully integrated within STK’s 3D Window. This allows users to take snapshots and make animations of their scenarios with magnetic field visualizations. Analytical data can be accessed in the form of custom vectors. Given these custom vectors, users have access to magnetic field data in custom reports, graphs, access constraints, coverage analysis, and anywhere else vectors are used within STK.

This work was done by Erick J. Sturm, Kenneth M. Donahue, James P. Biehl, and Michael Kokorowski of Caltech; Cedrick Ngalande of Microcosm, Inc.; and Jordan Boekeer of Iowa State University for NASA’s Jet Propulsion Laboratory. Further information is contained in a TSP (see page 1).

This software is available for commercial licensing. Please contact Daniel Broderick of the California Institute of Technology at danielb@caltech.edu. Refer to NPO-47998.

Jet and Tropopause Products for Analysis and Characterization (JETPAC)
NASA’s Jet Propulsion Laboratory, Pasadena, California

This suite of IDL programs provides identification and comprehensive characterization of the dynamical features of the jet streams in the upper troposphere, the lower stratospheric polar night jet, and the tropopause. The output of this software not only provides comprehensive information on the jets and tropopause, but also gives this information in a form that facilitates studies of observations in relation to the jets and tropopauses.

The programs use data from gridded meteorological analyses (including, currently, GEOS-5/MERRA and NCEP/GFS, but are designed to easily adapt to others) to identify the locations and characteristics (wind speed, temperature, wind components, potential vorticity, equivalent latitude, potential temperature, relative vorticity, and other fields) at the jet maximum and the edges of the jet regions. It also compiles detailed tropopause information based on several commonly used definitions of the tropopause, including cataloging times/locations with multiple tropopauses. These products are calculated for the complete gridded meteorological datasets, and the differences between jet locations/characteristics and measurement locations/characteristics cataloged for several satellite (currently, Aura MLS, ACE, and HIRDLS) and aircraft (currently START-08, Winter Storms, SPURT) datasets.

These products are currently being used in studies compiling jet and tropopause climatologies, and to characterize trace gas observations in relation to the jets and tropopauses. The output products will be made available to other collaborators, and eventually will be publicly available.

This work was done by Gloria L. Manney and William H. Daffer of Caltech for NASA’s Jet Propulsion Laboratory. Further information is contained in a TSP (see page 1).

This software is available for commercial licensing. Please contact Daniel Broderick of the California Institute of Technology at danielb@caltech.edu. Refer to NPO-47709.

WGM Temperature Tracker
NASA’s Jet Propulsion Laboratory, Pasadena, California

This software implements digital control of a WGM (whispering-gallery-mode) resonator temperature based on the dual-mode approach. It comprises one acquisition (dual-channel) and three control modules. The interaction of the proportional-integral loops is designed in the original way, preventing the loops from fighting. The data processing is organized in parallel with the acquisition, which allows the computational overhead time to be suppressed or often completely avoided.

WGM resonators potentially provide excellent optical references for metrology, clocks, spectroscopy, and other applications. However, extremely accurate (below micro-Kelvin) temperature stabilization is required. This software allows one specifically advantageous