

**Release Announcement and Installation Notes**  
**SPICE-Enhanced Cosmographia Mission Visualization Software**  
**Version 3.0**

21 December 2015

Dear Colleagues,

The Navigation and Ancillary Information Facility (NAIF) at JPL is pleased to announce the availability of Version 3.0 of the SPICE-enhanced Cosmographia mission visualization tool. Cosmographia may be used to create animations of the observation geometry pertaining to solar system flight projects that make use of data in SPICE formats: planet, satellite, comet and asteroid orbits; spacecraft trajectory; spacecraft orientation; instrument field-of-view "cones" and instrument footprints. Cosmographia has many user controls allowing one to manage what is seen and what vantage point to use. NAIF believes Cosmographia can be useful to scientists and engineers, and it can be useful in planning scenarios as well as in data analyses.

A summary of the changes/additions made since the last release is provided near the end of this announcement.

Cosmographia is a downloadable tool, not a web application; you must download and install the appropriate binary on your computer. The download site is given below. Executable binaries have been prepared for OSX, Windows and Linux. These executables work on modern versions of the named operating systems, and perhaps on some older versions as well.

The Cosmographia installers include generic SPICE ephemerides for the planets, their satellites, and a few asteroids. The installers also provide several complete examples of SPICE kernels and catalog files for a number of recent flight projects. To use any of these examples you'll need to download the corresponding SPICE archive from the NAIF server and install the archive on your machine as described in the aareadme.txt provided by the installer.

Additional SPICE kernels may be obtained from the NAIF server here: <http://naif.jpl.nasa.gov/naif/data.html>. This web page provides access to SPICE archives from past and on-going missions, operational SPICE kernels from flying missions, and generic SPICE kernels not tied to a single mission. SPICE archives are generally complete only up to three-to-twelve months behind real time, consistent with mission archiving schedules. Operational SPICE collections are generally complete to the current date. The NAIF server has SPICE data for a few foreign missions, but in general one must obtain SPICE data from the space agency in charge of any given mission.

Of course you may use your own, locally built SPICE data in Cosmographia. To run Cosmographia using your own SPICE data you will need to have the appropriate SPICE kernels (data files) on your computer, and you'll need to construct—or be given—a set of catalog files used to tell Cosmographia which SPICE files to use and how to use them. NAIF has prepared a User's Guide for constructing these types of catalog files, and we also provides some templates to use as starting points.

The SPICE-extended version of Cosmographia is free to all persons including commercial entities, subject to the license provisions attached below and provided with the distribution packages. The same rules that apply for getting help from NAIF regarding SPICE apply to Cosmographia. See "Getting Help from NAIF" here: <http://naif.jpl.nasa.gov/naif/rules.html>.

Cosmographia is one of a number of visualization tools developed within the worldwide planetary science community, each having unique characteristics that make it suitable to meet particular requirements. Many of these tools use SPICE to some degree, and some are available to interested parties. Names of, and contacts for, some of these tools may be found here: [http://naif.jpl.nasa.gov/naif/SPICE\\_aware\\_Tools\\_List.pdf](http://naif.jpl.nasa.gov/naif/SPICE_aware_Tools_List.pdf).

NAIF has elected to focus its own development efforts on Cosmographia for a number of reasons, including its full use of SPICE kernel types, its multi-platform availability, and our ability to freely distribute it. Those interested in space mission geometry visualization capabilities can make their own determinations about which of these tool(s), if any, to use.

Access to the Cosmographia installers is available from this web page: <http://naif.jpl.nasa.gov/naif/cosmographia.html>.

As of now NAIF is only able to provide binaries. Perhaps in the future we'll be able to offer the source code.

An on-line Cosmographia User's Guide is found here: <http://cosmoguide.org>. In addition to traditional textual instructions this User's Guide contains video tutorials on many topics.

This Release 3.0 of the SPICE-enhanced Cosmographia has many new features including a Python-based scripting interface available for only the Mac and Linux versions. (We hope to soon provide it for the Windows version as well.)

Those using Cosmographia on OSX or Linux platforms may see some of its scripting-based functionality by running one or both of two scripts included in the Cosmographia distribution to demonstrate and test the scripting capabilities. (Sorry, scripting is not yet available for Windows versions.) To do this:

- Start up Cosmographia
- Using the "File" drop-down menu select "Run script..."
- Select "cosmoguide\_example.py" (a shorter, demonstration script) or "cosmoscripting\_runall.py" (a longer, test script)
- Watch the action comments appearing briefly at the top-center of the screen that describe the next action to be taken by the script

Also available is a stand-alone Java-based tool, [jsongen](#), useful in preparing or editing the various catalog files needed to run Cosmographia. Both a GUI and a command-line version are included, but user's are recommended to stick with the GUI version. This tool was built as a summer project by a high-school student. The time available was not sufficient to make it as robust as we'd like, but it does work. Alternatively you could carefully use any text editor to prepare or revise a catalog file.

NAIF hopes to continue development of Cosmographia, but this will come at a slow pace. Its capabilities and interfaces are subject to change without notice. Also, unlike for SPICE Toolkit releases, this version of Cosmographia has had rather little use as of the release date, so there is some potential for bugs being present. Potential users of this software should carefully consider

these circumstances before embarking on use of the tool. Should you have any questions in this regard, contact the NAIF Manager: Charles.Acton (at) jpl.nasa.gov. Also read the disclaimer below.

If you believe you've found a bug, or if you have a suggestion for improved functionality, please contact the NAIF manager as noted above.

### **Installation Notes**

The Cosmographia installer will guide you through the simple installation. If you are a first-time user, that's all that is needed. Cosmographia 3.0 will be installed in a newly created folder on your machine.

If you have previously constructed, or had been given, some catalog files used in running an older version of Cosmographia there are two items for you to consider.

1a) Run the Cosmographia installer. Unless you have a reason to not do so, check the box to install the extras.

1b) If catalog files made by you or provided by a colleague were placed in the same folder as the old Cosmographia executable, you will likely want to move them to the new Cosmographia folder created during this installation.

1c) Optionally run the CosmographiaMaintenanceTool executable found in the old installation folder to remove the old version. Be aware this will remove everything located in that folder, including any catalog files you may have added to it!

2) Some old-style catalog files will not work correctly with this version of Cosmographia. If you are using your own or a colleagues catalog files created for use with version 2.0 or earlier and you encounter Cosmographia errors or warnings, [read this PDF document](#) to see if your problem is discussed.

----- **What's New and Changed in Version 3.0** -----

Here we note the more significant changes since the previous release on 27 March 2015. We do not discuss the numerous bug fixes nor some usability and appearance improvements.

Navigation

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The various menus available in Cosmographia have undergone substantial changes, hopefully resulting in better usability of the tool. Menus are found under the ribbon at the top of your screen, on the left-side toolbar, and by right-clicking on an object.

Additions

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On-line user's guide with video tutorials.  
Python-based scripting interface (available for Mac and Linux).  
Option to visualize an arbitrary frame available from a loaded SPICE kernel.  
Option to draw body-to-body vectors.  
Option to view along a selected axis or vector, in either direction.  
Option to compute and display the angle between two vectors.  
Option to customize the look/feel of a selected axis or vector.  
Option to display time-based informational messages at the top of the screen.  
Easy means to view along an instrument's boresight.  
Option to display LAT/LON grid labels.  
Option to draw the terminator.  
More information provided in SPICE data error messages.  
Built-in SPICE error log.

Catalog Compatibility Issue

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See the discussion under Installation Notes, above.

----- Credits -----

The SPICE-enhanced version of Cosmographia is an extension of the open source Cosmographia application developed by Chris Laurel of Fifth Star Labs LLC:

NAIF is pleased that Chris has agreed to allow NAIF to release the extended version of his program.

For rendering, Cosmographia uses the VESTA library from Astos Solutions. NAIF thanks Astos Solutions for permission to use the VESTA library in the SPICE-extended version of Cosmographia.

The User's Guide and templates for preparing catalog files used to connect SPICE data to Cosmographia were prepared by summer students Michelle Park and Farhan Alam, with updates by Boris Semenov and Charles Acton. Farhan Alam also built the custom catalog editor tool.

Summer student Nicholas Edington developed the prototype scripting interface which was subsequently enhanced by Eric Ferguson.

Summer student Michelle Park drafted the on-line Cosmographia User's Guide, which was subsequently tweaked by Boris Semenov to discuss additional capabilities.

Eric Ferguson, Drew Hall, and Eric Castello, supported by the NAIF Team, developed the SPICE extensions to Cosmographia.

The SPICE format generic planet, satellite and asteroid ephemerides are produced by JPL's Solar System Dynamics Group.

SPICE format planet, satellite and asteroid size, shape and orientation data are taken from the "Report of the IAU Working Group on Cartographic Coordinates and Rotational Elements: 2009."

NAIF Team members Nathaniel Bachman, Boris Semenov and Edward Wright, and their predecessors, developed the SPICE system components used extensively within this version of Cosmographia.

SPICE development occurs under the auspices of the Planetary Data System program of NASA's Planetary Science Division, for which William Knopf is the NASA Program Executive, Michael New is the Program Scientist and Thomas Morgan is the PDS Project Manager.

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