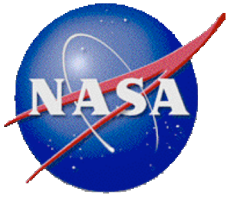

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Accessing and Using MEX SPICE Observation Geometry Data

First Mars Express Science Conference

ESTEC

Charles Acton

Jorge Diaz

Joe Zender

February 21, 2005

The SPICE system has been developed by the Jet Propulsion Laboratory, California Institute of Technology, under contract with the National Aeronautics and Space Administration.

SPICE Provides Geometry Data

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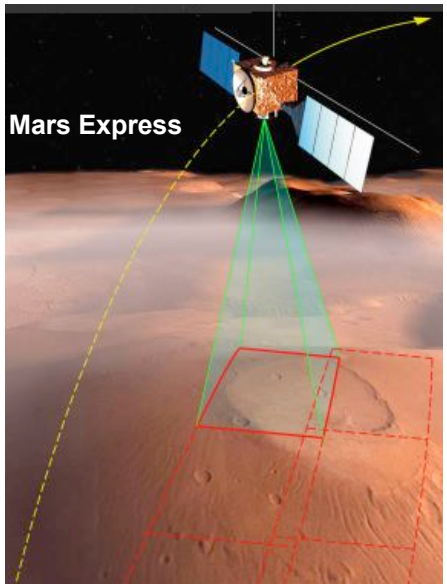

- SPICE data may be used to compute a wide assortment of observation geometry and timing information that is necessary or helpful in understanding MEX's science observations.

- Since SPICE is used on NASA's Mars missions, you may freely acquire the same kind of data and use your same or similar SPICE-based tools to analyze the NASA data, or to compare or correlate NASA and MEX data.

What Kinds of MEX SPICE Data Exist?

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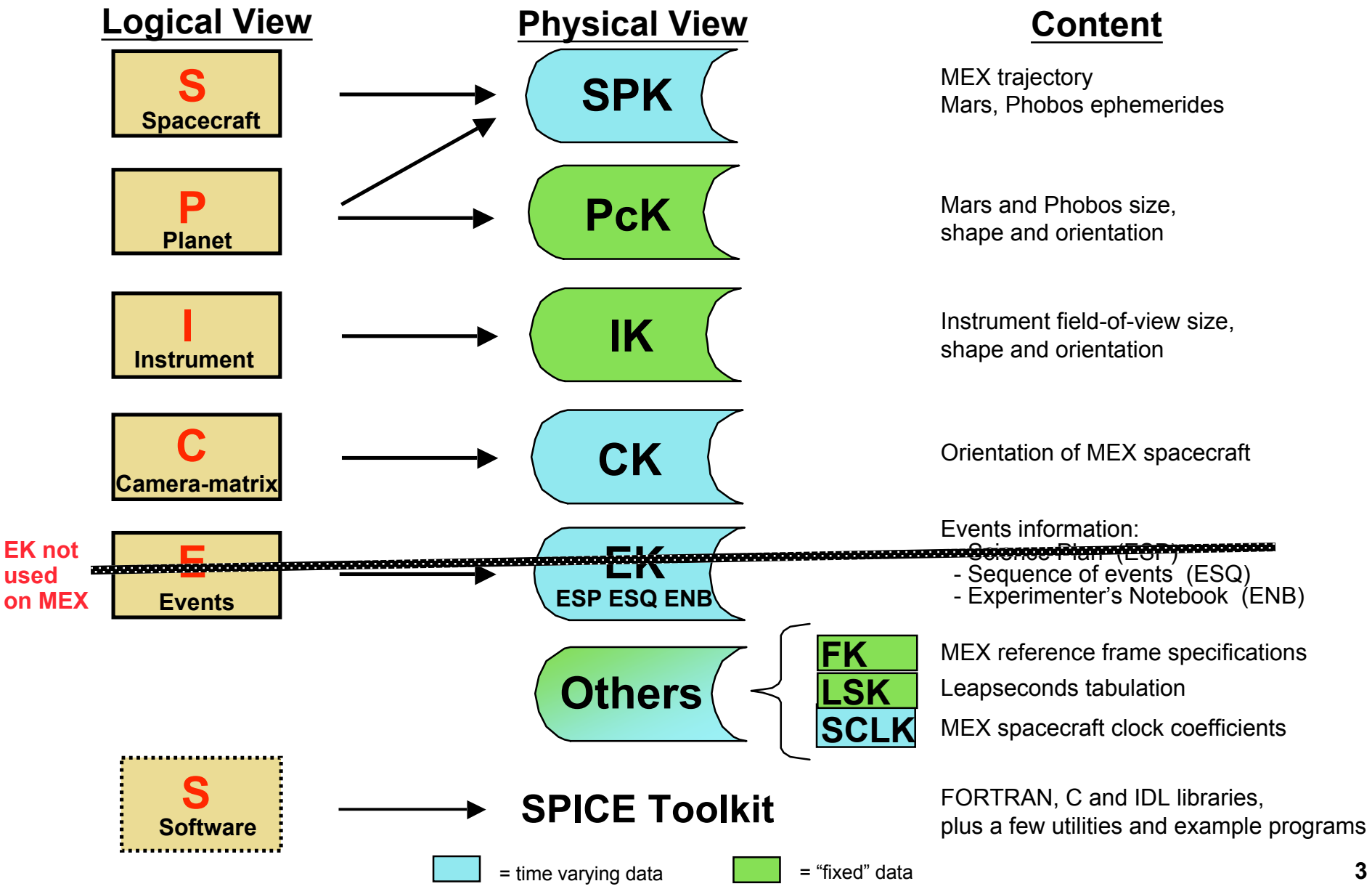

How To Use SPICE Data

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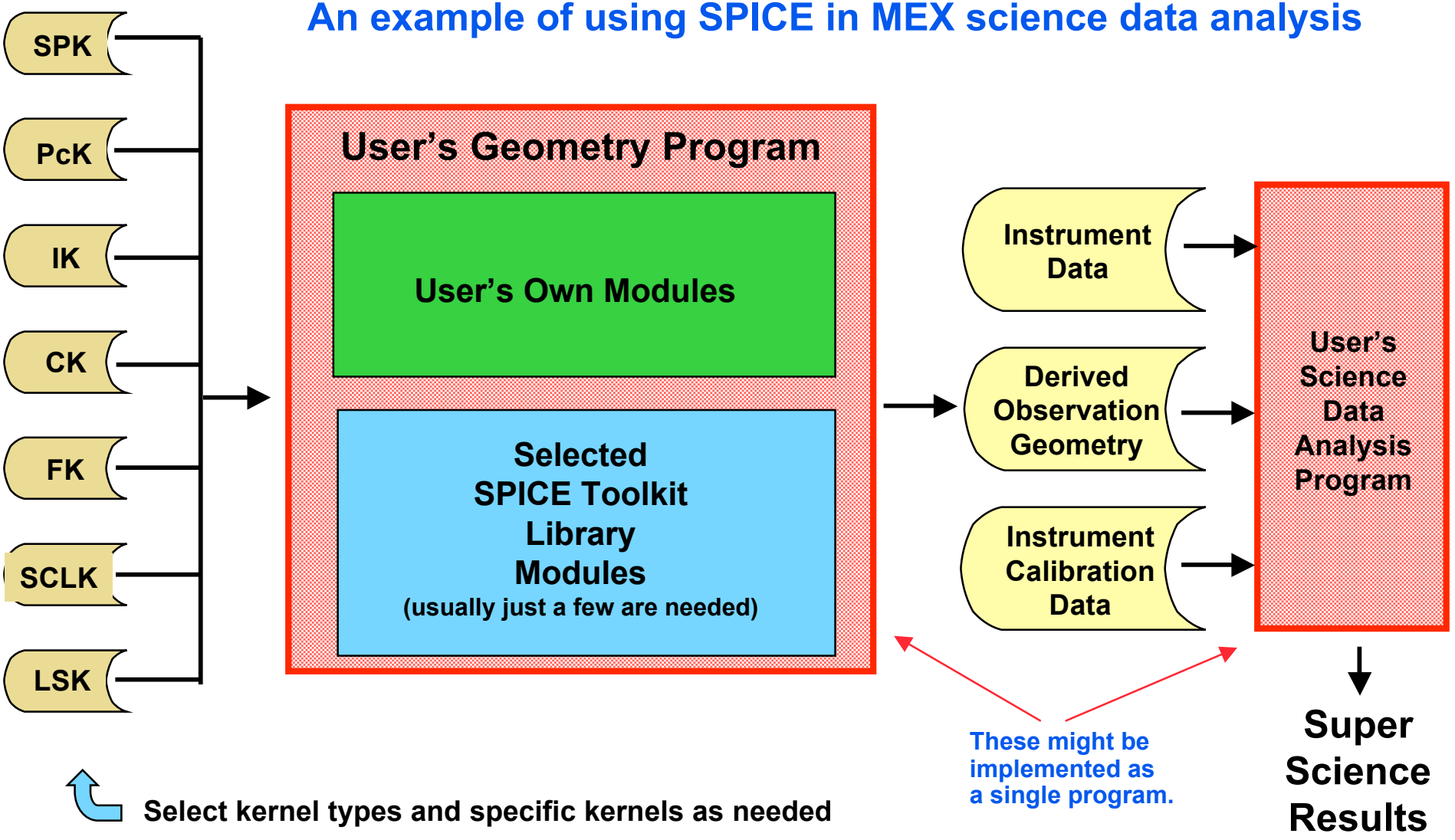
An example of using SPICE in MEX science data analysis



Kinds of Geometric Quantities That May Be Computed Using SPICE

A few examples of what can be computed using SPICE kernel files and SPICE Toolkit software.

- Positions and velocities, in any of many different reference frames and coordinate systems
- Instrument pointing direction, and intercept point on Mars (if there is one)
- Instrument footprint on Mars
- Lighting angles (phase, incidence and emission)
- Season (longitude of the sun)
- Local time on Mars
- Transformation matrices between “any” two reference frames
- Many kinds of time conversions

Organization of MEX SPICE Data - 1

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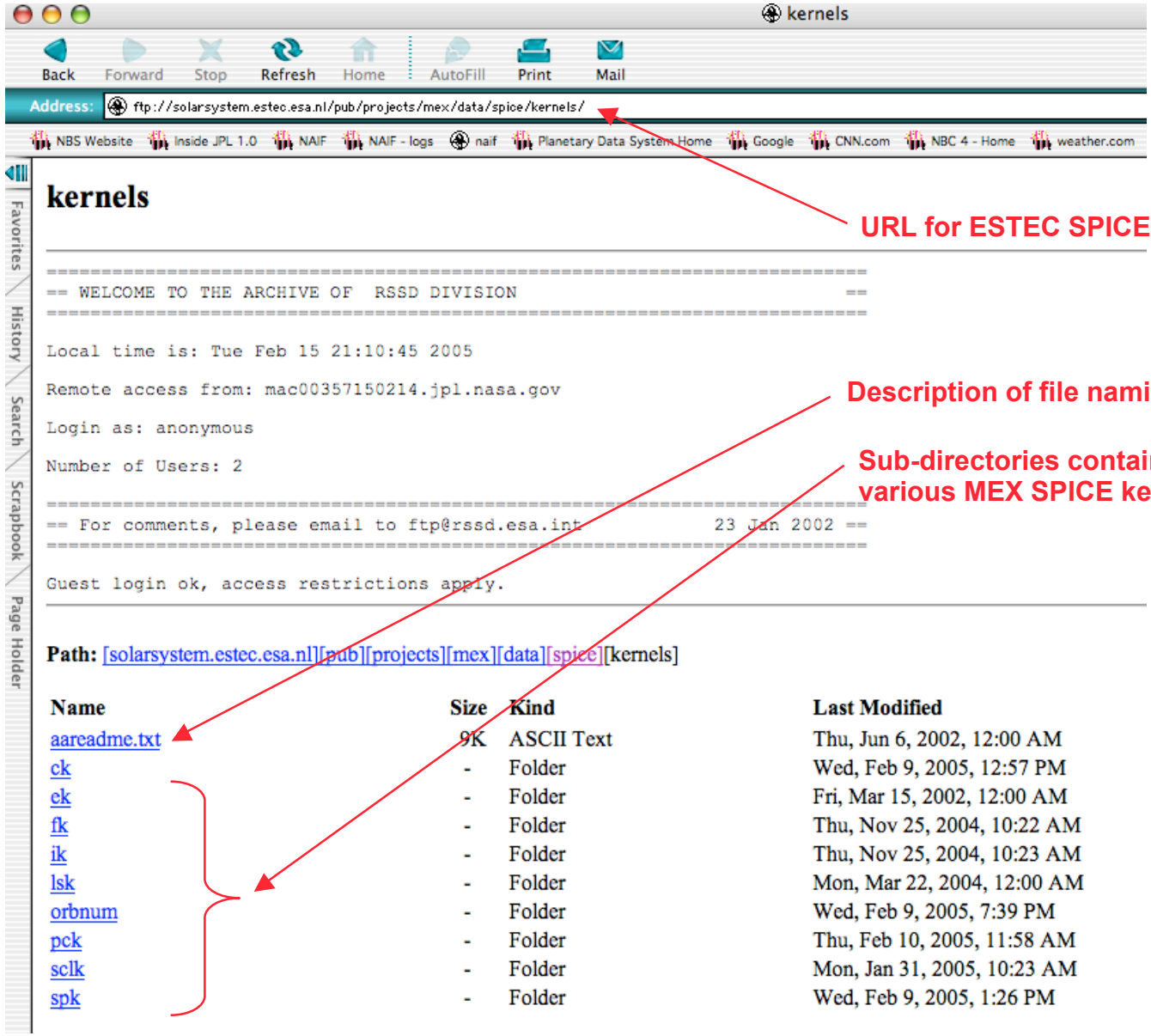

Organization of MEX SPICE Data - 2

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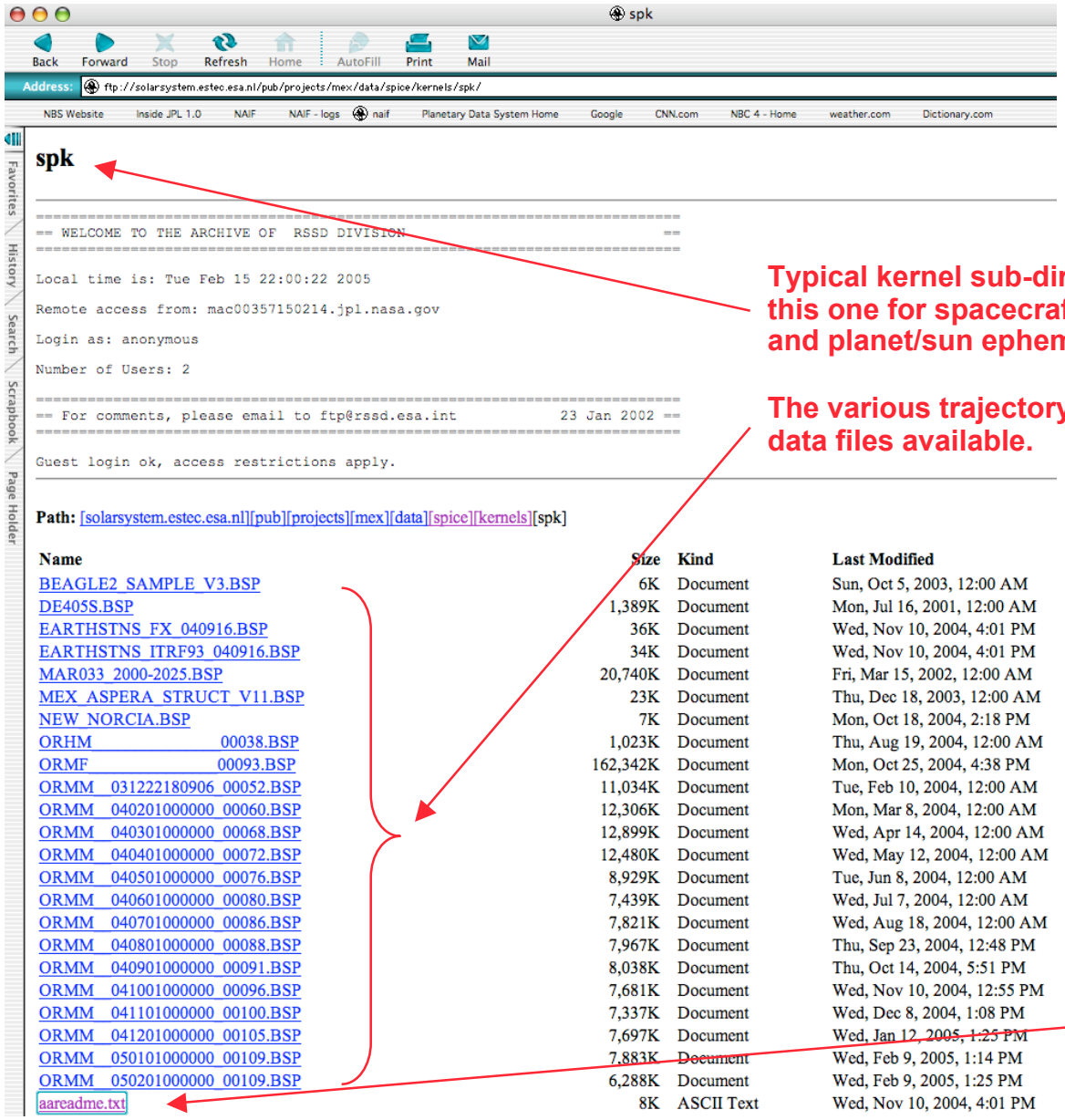

Typical kernel sub-directory, this one for spacecraft trajectory and planet/sun ephemerides.

The various trajectory/ephemeris data files available.

"aareadme" contains information about the kernels in this sub-directory.

Access to SPICE Products

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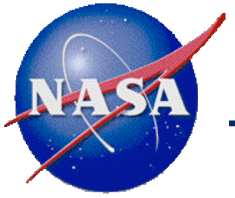
- **ESTEC SPICE server for Mars Express**
  - ftp://solarsystem.estec.esa.nl/pub/projects/mex/data/spice/
  - There exists an email list for notification of new SPICE kernels availability. Contact Jorge Diaz (jdiaz(a)rssd.esa.int) to sign up.
- **Portal to SPICE information and products for many missions, located at NASA/JPL**
  - NAIF home page
    - » http://naif.jpl.nasa.gov
  - SPICE Toolkit: for all supported computing environments
    - » http://naif.jpl.nasa.gov/naif/toolkit.html
  - SPICE data: for missions and generic types
    - » http://naif.jpl.nasa.gov/naif/data.html
  - SPICE tutorials
    - » http://naif.jpl.nasa.gov/naif/tutorials.html
  - SPICE programming lessons
    - » ftp://naif.jpl.nasa.gov/pub/naif/toolkit_docs/Lessons/



The SPICE Toolkit

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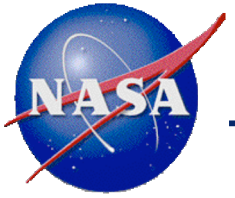
- The SPICE Toolkit is available in ANSI FORTRAN 77, ANSI C, and Interactive Data Language (IDL).
- The SPICE Toolkit is available for “all” popular computing environments.
  - See NAIF web pages for details.
- The SPICE Toolkit has been well tested on all supported platforms.
- The SPICE Toolkit is very stable.
  - NAIF does not take away or change any functionality.
- The SPICE Toolkit is offered free to individual scientists.



SPICE Training

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- **A free SPICE training class will be held at ESTEC during April 11-15.**
  - **The agenda consists of:**
    - » **Presentation and discussion of SPICE tutorials**
    - » **Guided hands-on programming lessons using exercises in FORTRAN, C and IDL**
  - **Contact Joe Zender (Joe.Zender(a)esa.int) or Jorge Diaz (jdiaz(a)rssd.esa.int) for details.**