USGS Support for Small Bodies Exploration

Timothy N. Titus
Laszlo P. Kestay
Stuart Sides

Kris J. Becker
Lisa R. Gaddis
Trent Hare
Agenda

- Astrogeology – the complete package.
- Integrated Software for Imagers and Spectrometers (ISIS)
- Capabilities of ISIS?
- Who is using ISIS?
- Current Small Bodies Mission Activities
- How to get ISIS?
SOFTWARE SERVICES
- ISIS
- GDAL (Geospatial Data Abstraction Library)
- OpenLayers Planetary Extensions

INFRASTRUCTURE
- PDS Unified Planetary Coordinates (UPC) database
- Astropedia
- Astro Web Maps

The Astrogeology Planetary Maps and Ancillary Products and Services (PMAPS) system
- Planetary Nomenclature
- Planetary Geologic Mapping
- The Planetary Image LOcator Tool (PILOT)
  - Searches using the UPC
- Map Projection on the Web (POW) service
- Map-a-Planet 2 (MAP2)
- PDS Imaging Node Annex
What is ISIS?

- USGS Software Package
- Radiometric Calibration
- Geometric Calibration
- Creation/Ingestion of Archival Products
- Controlled/Uncontrolled Maps/Mosaics
Mission Support Activities

- SPICE data maintenance and distribution
- DEM distribution
- Camera model development
- Instrument specific software development
- Radiometric calibration
- Software updates
Data ISIS can work with:

- Raw instrument data
- Map projected images
- Archived data
- Large mosaics (TB)
- Single band images
- Multiband images
- Hyperspectral images (1000s of bands)
- Calibration data (flat field, dark current, dead pixel)
- Tabular ancillary data
Who is using ISIS?

- Astrogeology
  - Scientists
  - Mosaics/Maps
- Active Mission Teams (Discovery & New Frontiers)
  - MESSENGER
  - Dawn
  - New Horizons
- General Planetary Science Community
  - Data Analysis Programs
Dawn Mission

Camera Models

• Framing Camera
• VIR

Support to Science Team

• Workshops
• Automatic Updates of SPICE
• Ingestion of Shape Models

Cartographic Engine for:

• J-Vesta (or J-Asteroid)
• PSI Dawn Viewer
Hayabusa Asteroid Multiband Imaging CAmera – Current ISIS Support

- Application **amica2isis** imports raw AMICA images stored in FITS format
  - Requires both the FITS file and the label (.lbl) file from archive

- Archive available from PDS node at [http://sbn.psi.edu/pds/resource/hayamica.html](http://sbn.psi.edu/pds/resource/hayamica.html)

- Basic camera model implemented and available in ISIS
  - Lacks Itokawa DEM in ISIS, but will be converted and installed soon

- AMICA support first available in ISIS3 3.4.5 public release

- Future additions to ISIS
  - Two new projections well-suited for irregular bodies
    - Transverse Cylindrical
    - Transverse Azimuthal
Hayabusa Mission
AMICA Camera
Astroid: Itokawa

Equatorial Radius = 274 meters
Polar Radius = 138.0 meters
Ground Resolution = ~0.75 meters/pixel (for both images)

Simple Cylindrical Projection
Planetocentric Latitude
Positive Longitude Direction = East
New Horizons

- LORRI
- MVIC
- LEISA
ROSETTA

PMDAP Funding for Camera Models
- OSIRIS
- VIRTIS

Using Publically Available Data
- 2867 Steins
- 21 Lutetia

Work will start 2nd or 3rd Qtr of FY14.
Current and Future Efforts

Improving ISIS Input/Output Formats
- Improving ISIS abilities to read/write FITS files
- Improving ISIS interfaces with ENVI/IDL

Two new projections well-suited for irregular bodies
- Transverse Cylindrical
- Transverse Azimuthal
CURRENT ISIS RELEASE

- ISIS 3.4.4 (Released June 25, 2013)
- ISIS 3.4.5 (Planned Release Jan 14, 2014)
- UNIX-based Supported Platform OS’es
  - Mac OSX 10.6 and higher (32 & 64 bit Intel)
  - Debian 6.0.2 (64 bit)
  - Debian 7 (64 bit)
  - Fedora 16 (64 bit)
  - Fedora 18 (64 bit)
  - Redhat Enterprise 6.3 (64 bit) (via SL 6.3)
  - Scientific Linux (SL) 6.3 (64 bit)
  - SUSE Enterprise Server 11 (64 bit)
  - Ubuntu 12.04 LTS (64 bit)

- Download via Internet
  - Full distribution > 200GB
  - Selective download using rsync utility
  - Java client installer