## ARCGIS (PART 1). BASIC CONVERTING AND COMBINING PLANETARY DATA SETS IN V10

-Trent Hare, Sep. 2011

# PDS, ISIS2, ISIS3 SUPPORT IN ARCMAP 10

- Recommendation: Use ISIS cubes directly or convert to new format in ArcMap
- × The good
  - + Attached, detached, tiled or raw
  - + Map projections (most).
  - + 8, 16, 32 bit
  - + Multiple bands

## × The bad

- + Only one NULL value. Means no ISIS saturation value support
- + Needs statistics to be build to show 16 and 32bit ranges
- + A couple GDAL bug fixes are not available (e.g. new continuation flag in ISIS3 label). Optional: use "labedit" to remove offender

If ISIS cubes do not work directly, then it is recommended to convert to GeoTiff/GeoJp2 using GDAL

# RULES OF THE GIS ROAD

## × For ISIS processing

- + Best to set same projection and parameters for all
  - × Note: optional to set same resolution
- + For visual (thematic) images, best to convert to 8bit
- + For "data" (e.g. DEM, Temperature -- 16,32 bit), set all ISIS Special Pixel Values to NULL (using specpix, stretch, bit2bit)
- + For global
  - × If lonsys=360, then set clon=180
  - × If lonsys=180, then set clon=0 (better supported)
- + Don't use funky projections

## **DISPLAYING 16, 32 BIT ISIS CUBES**



1.) Right click layer, Select "properties"

- 2.) Symbology tab, select stretch: Std Dev.
- 3.) Yes to "calculate stats", hit okay



## WHEN THE RANGE IS STILL BAD – AFTER STATS



# CALCULATE VALID RANGE (SETNULL)

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		used tools is provided
		for you.
	OK Cancel Environments << Hide Help	Tool Help

# BATCH SET NULL

## × USGS Image Toolbox (<u>http://bit.ly/q33Vqa</u>)

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#### written for 9.x but works for 10

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## NO NEED FOR 16, 32 - CONVERT TO 8BIT

## × ISIS

- + Isis2std easiest but
  - × Can not convert files over 2GB (except Jpeg2000)
    - × Can only convert to 8bit (except Jpeg2000 8 or 16bit)
    - × Does not support embedded projection (just worldfile)
- + Bit2bit (new @ ISIS 3.3.0)
  - × Reason: convert from 32bit to 16 or 8bit ISIS cube
  - Requires app to still support ISIS format
  - × Linear stretches only?

# NO NEED FOR 16, 32 – CONVERT TO 8BIT As of the solution of the solu

## × GDAL

- + On Astro Machines (more: http://bit.ly/oxlsQ7)
- > to8bit\_gdal\_tif.csh in.cub out.tif
- > to8bit\_gdal\_jp2.csh in.cub out.jp2
- > to8bit\_gdal\_png.csh in.cub out.png

### + Manual method (more: http://bit.ly/pprIMK)

- > gdalinfo –mm in.cub (returns min/max, now convert)
- > gdal\_translate ot byte scale min max 1 255 a\_nodata 0 in.cub out.tif
- > gdal\_translate –of PNG –ot byte –scale min max 1 255 –a\_nodata 0 in.cub out.png
- > gdal\_translate --of JP2KAK --co quality=100 --ot byte --scale min max 1 255 -a nodata 0 in.cub out.jp2

## TROUBLE WITH ISIS CUBES IN ARCMAP/GDAL?

Back-up conversion method

- + First run isis2raw or isis2std (on "in.cub") Now run
- + For raw run: isis3world.pl -e -prj in.cub
- + For png run: isis3world.pl –p –prj in.cub
- + For tiff run: isis3world.pl -t -prj in.cub
- + For jpeg: isis3world.pl –j –prj in.cub
- + For jpeg2000: isis3world.pl –J –prj in.cub

You will then need to assign the created projection to the output file using the new \*.prj file. There are batch methods available: USGS Image Toolbox (<u>http://bit.ly/q33Vqa</u>)

## **GDALDEM – 8BIT HILLSHADES AND SLOPE MAPS**

#### × <u>hillshade</u>

>gdaldem hillshade dem.img out\_hillshade.tif -z 2 (z = exaggeration of 2)

x COlOrize (using color.lut below)
>gdaldem color-relief dem.img color.lut out\_color.tif

Merging colorized image and hillshade into a colorshade use: hsv\_merge.py: http://svn.osgeo.org/gdal/trunk/gdal/swig/python/samples/

#### × merge the two files

>hsv\_merge.py out\_color.tif out\_hillshade.tif out\_color-hillshade.tif

For color mapping you need a defined mapping. Favorite so far is (rainbow). nv = NoData Value

File: <u>color.lut</u> nv 0 0 0 0% purple 20% blue 40% aqua 60% green 80% yellow 100% red

# GDALDEM WRAPPERS (@ ASTRO)

#### **×** For LMMP color-defined shades/slopes run

- > gdal\_slope\_hsv.pl inDEM.cub outSlope.tif 2

Color legends will be copied to user's directory but the ColorShade values will still need to be edited in Photoshop or other. Values will be written to screen.

# **GDALDEM RESULTS**



# **CONVERTING RAW FILES**

## × ArcMap/GDAL

- + Create ESRI detached header
- + 8,16 bit, use extension \*.bil or \*.bsq
- + 32 bit file, use extension \*.flt
- + Image & header must share filename

#### Example header (\*.hdr)

NCOLS xxx NROWS xxx XULCORNER xxx YULCORNER xxx CELLSIZE xxx NBITS 32 NODATA\_VALUE xxx BYTEORDER <MSBFIRST | LSBFIRST>

## × ArcMap

- + Can also use ERDAS detached header
- × GDAL
  - + Can also use PCI Geomatic detached header

#### ESRI Help: <u>http://bit.ly/r3kIPJ</u>

GDAL Help: <u>http://www.gdal.org/frmt\_various.html#EHdr</u> <u>http://downloads.esri.com/support/whitepapers/other\_/eximgav.pdf</u>

## × Regularly spaced

+ Add header to stream of "Z"s (filename \*.asc)

NCOLS 480 NROWS 450 XULCORNER 378922 (or XLL) YULCORNER 4072345 CELLSIZE 30 NODATA\_VALUE -32768 43 2 45 7 3 56 2 5 23 65 34 6 32 54 57 3 2 7 45 23 5 ...

ESRI Help: http://bit.ly/r2GNFA

- Irregularly spaced (randomly spaced)
  - + Usually from a table (e.g. Lon, Lat, Value)
  - + TAB or Comma delimited supported (\*.tab, \*.csv)
- Conce loaded (see next slide), you can then choose one of 10 interpolation methods in ArcMap
  - + 3D Analyst, Spatial Analyst
  - + GeoStatistical Analyst (interactive interpolation)

## × Irregularly spaced (must create points prior to interpolation)

#### Steps for adding x,y data as a layer

1. Click File > Add Data > Add XY Data.

Add XY Data 🔹 💽						
A table containing X and Y coordinate data can be added to the map as a layer						
Choose a table from the map or browse for another table:						
L 🕑 🖉						
Specify the fields for the X, Y and Z coordinates:						
X Field:						
Y Field:						
Z Field:						
Coordinate System of Input Coordinates						
Description:						
Unknown Coordinate System 🔗						
×						
Show Details Edit						
Warn me if the resulting layer will have restricted functionality						
OK Cancel						

#### http://bit.ly/psEIPz

- 2. Select the table that contains x,y coordinate data.
- 3. Identify the columns that hold the x- and y-coordinates (and, optionally, the z-coordinate).
- 4. Specify the coordinate system.

Astro users – add this to your .cshrc #GMT for csh or tcsh users: setenv GMTHOME /work/users/thare/gmt/GMT4.5.7 set path=(\$path /work/users/thare/gmt/GMT4.5.7/bin )

#### Irregularly spaced (GMT, GDAL, QGIS, etc)

#### 1.a) GMT Spherical interpolation http://gmt.soest.hawaii.edu/gmt/html/man/sphinterpolate.html

# BlockMean or xyz2grd
# http://www.soest.hawaii.edu/gmt/gmt/html/man/blockmean.html
#set R=`minmax -I2 ascii.xyz` # Calculate the extent of the points
#blockmean ascii.xyz -I0.01 -bo \$R > temp.bm
#

#If known extent set -Rxmin/xmax/ymin/ymax

#### blockmean vesta\_llr.txt -10.0625 -bo -R0/360/-90/90 -: > temp.bm

# where -I resolution, use "-:" for lat,lon order (leave off for lon, lat order)
# where -bo means binary output and -bi means binary input (optional but faster)
#
# run spherical interpolation (optionally run spherical TIN using sphtriangulate)

# Spherical "Q1" = Smooth interpolation with local gradient estimates (more options avail.)

#### sphinterpolate temp.bm -Q1 -Gvesta\_IIr\_sphInt\_Q1.grd -I0.0625 -bo -R0/360/-90/90 -bi -:

# #now convert to GeoTiff or Raw (for import to ISIS using "raw2isis") gdal\_translate -of ENVI vesta\_IIr\_sphInt\_Q1.grd vesta\_IIr\_sphInt\_Q1.raw

Astro users – add this to your .cshrc #GMT for csh or tcsh users: setenv GMTHOME /work/users/thare/gmt/GMT4.5.7 set path=(\$path /work/users/thare/gmt/GMT4.5.7/bin )

#### Irregularly spaced (GMT, GDAL, QGIS, etc)

1.b) GMT Cartesian interpolation (more typical - what MOLA//LOLA Team uses) http://www.soest.hawaii.edu/gmt/gmt/html/man/surface.html

# BlockMean or xyz2grd # http://www.soest.hawaii.edu/gmt/gmt/html/man/blockmean.html #set R=`minmax -I2 ascii.xyz` # Calculate the extent of the points #blockmean ascii.xyz -I0.01 -bo \$R > temp.bm # #If known extent set -Rxmin/xmax/ymin/ymax

#### blockmean vesta\_llr.txt -10.0625 -bo -R0/360/-90/90 -: > temp.bm

# where -I resolution, use "-:" for lat, lon order (leave off for lon, lat order)
# where -bo means binary output and -bi means binary input (optional but faster)
#
#run spline interpolation (optionally run TIN using triangulate)

#### surface temp.bm -Gvesta\_IIr\_surface.grd -I0.0625 -bo -R0/360/-90/90 -bi -:

#now convert to GeoTiff or Raw (for import into ISIS using raw2isis):
gdal\_translate -of ENVI vesta\_IIr\_surface.grd vesta\_IIr\_surface.raw

# **MOSAIC RASTER TYPE**

A mosaic dataset is a collection of raster datasets (images) stored as a catalog & viewed as a dynamically mosaicked image.



# MOSAIC DATA TYPE

× Demo Raster Riser

# VIRTUAL IMAGE FUNCTIONS

Mosaic Dataset Pr	roperties						? <b>X</b>	
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#### Demo: Hillshade