# PDS Review of EPOXI observations of Earth

Calibrated HRIV and MRI images

dif-e-hriv-3/4-epoxi-earth-v2.0
dif-e-mri-3/4-epoxi-earth-v2.0

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# HRIV DOCUMENTATION

**Spacecraft Mission and Instrument:**
- Narrow-band filter images (350-950 nm) of Earth taken by Deep Impact High Resolution Visible CCD (HRIV)

**Observation Sequence:**
- Images taken in March, May, June 2008 and March, October 2009
- Each observing period lasted for 24 hours
- Images taken hourly at 350, 750 and 950 nm
- Images taken every 15 minutes at 450, 550, 650 and 850 nm

**Geometry (May 2008):**
- In image labels, target listed as "EARTH", but derived geometry listed as "UNK" (PHASE_ANGLE, TARGET_CENTER_DISTANCE, SUB_SPACECRAFT_LONGITUDE, I/F scaling, etc.)
- Geocentric distance given as 0.3315 AU = 49.59 million km in "document/epoch_earth_geom_2008may.asc"
- Pixel 2 microradians, so pixel = 99 km for HRIV
- Diameter of Earth is 127 pixels and Moon is 35 pixels on the 512x512 sub-frame

**Calibration:**
- Calibrated data in units of $W/m^2/ster/\mu m$ with conversion to I/F provided

# HRIV DIRECTORY STRUCTURE

Main Directory:
    calib/
    catalog/
    data/
    document/
    DOWNLOAD/
    index/
    aareadme.txt    <-  Nice that this is shown on directory page
    dataset.html    <-  Not explained, somewhat cryptic name
    voldesc.dat

data/ Directory:
    rad/
    radrev/

    Data further organized by year/doy/

Other than "dataset.html", directory structure was as expected for a PDS archive. All necessary files and directories were present. Organization of data was easy to understand and navigate, especially with aareadme.txt shown. HTML homepage very helpful as well.

Sanity Checks

Maximum I/F ~ 0.55

650 nm

Size of Earth Disk

Size of Moon Disk

W/m²/ster/µm

Sky = zero radiance
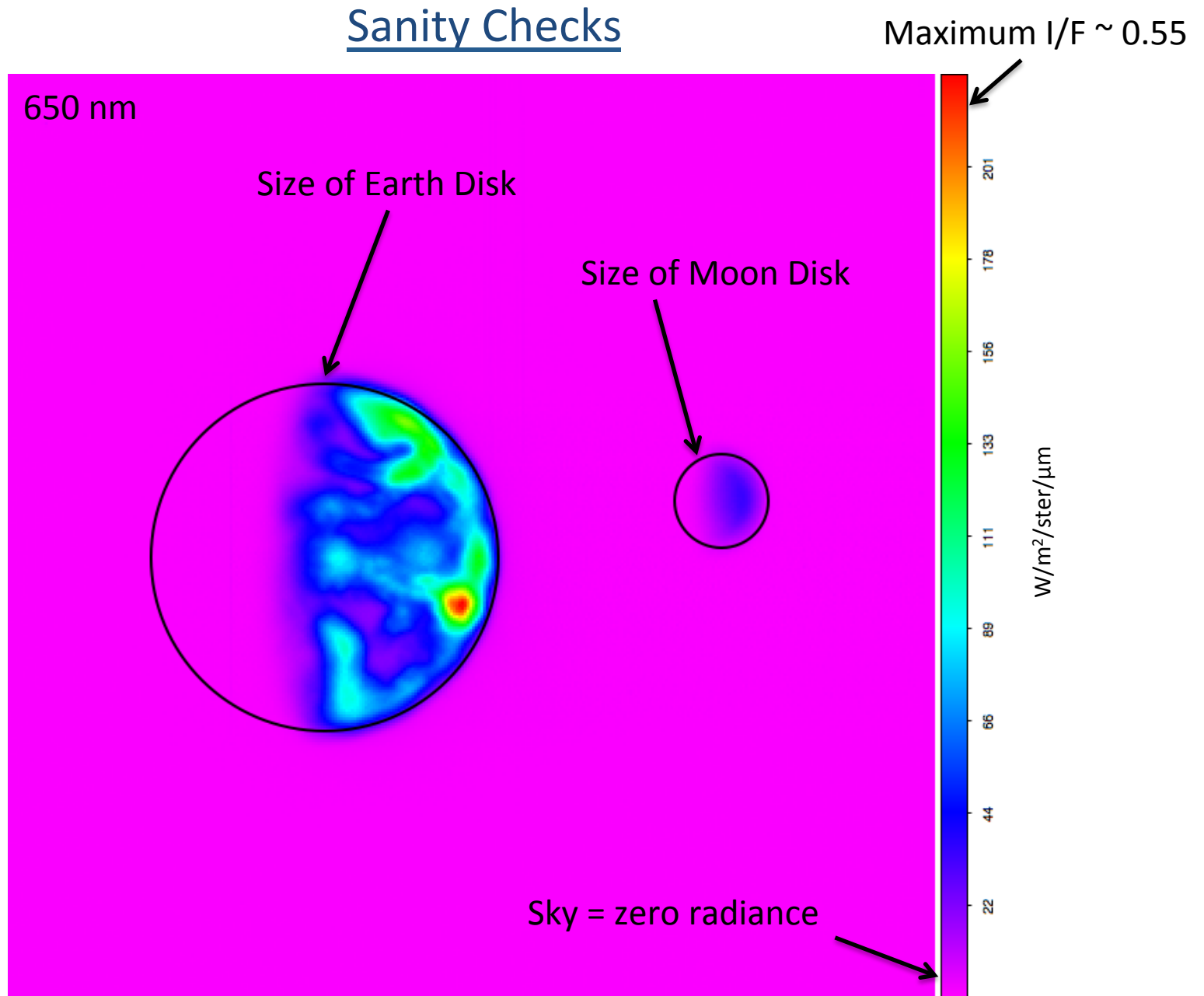
I was able to read, display and manipulate the HRIV images without problem.
Basic parameters of image appear reasonable.

# Wavelength Dependence
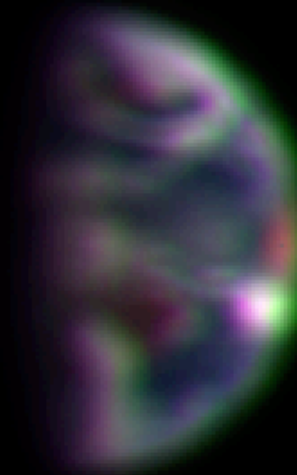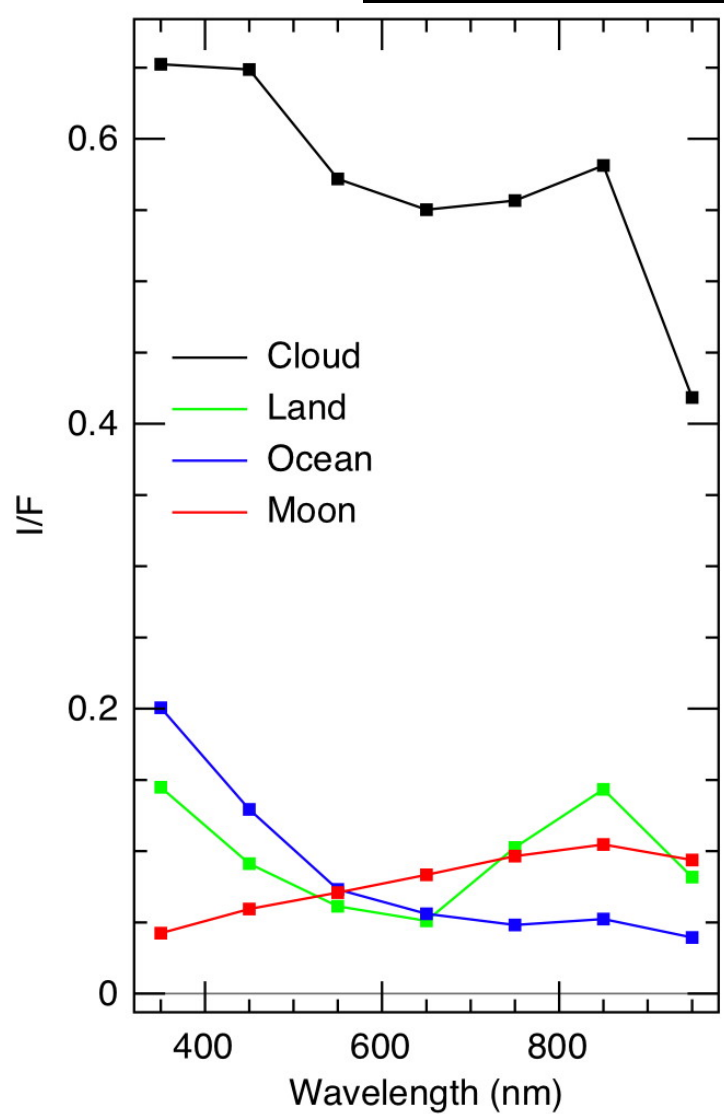


As expected, clouds bright and white, Moon dark and red, oceans blue.

# MRI DOCUMENTATION

**Spacecraft Mission and Instrument:**
- Calibrated 750-nm filter images of Earth taken by Deep Impact Medium Resolution Visible CCD (MRI)

**Observation Sequence:**
- Images taken in March 2008 and October 2009
- Each observing period lasted for 24 hours
- Images taken every 30 minutes as context for HRI IR spectrometer observations

**Geometry (March 2008):**
- Target listed as "EARTH", but derived geometry listed as "UNK" (PHASE_ANGLE, TARGET_CENTER_DISTANCE, SUB_SPACECRAFT_LONGITUDE, I/F scaling, etc.)
- Geocentric distance given as 0.182 AU = 27.23 million km in "document/epoch_earth_geom_2008mar.asc"
- Pixel 10 microradians, so pixel = 272 km for HRIV
- Diameter of Earth is 47 pixels on the 512x512 (sub-framed) image

**Calibration:**
- Calibrated data in units of $W/m^2/ster/\mu m$ with conversion to I/F provided

# MRI DIRECTORY STRUCTURE

Main Directory:
    calib/
    catalog/
    data/
    document/
    DOWNLOAD/
    index/
    aareadme.txt    <-  Nice that this is shown on directory page
    dataset.html    <-  Not explained, somewhat cryptic name
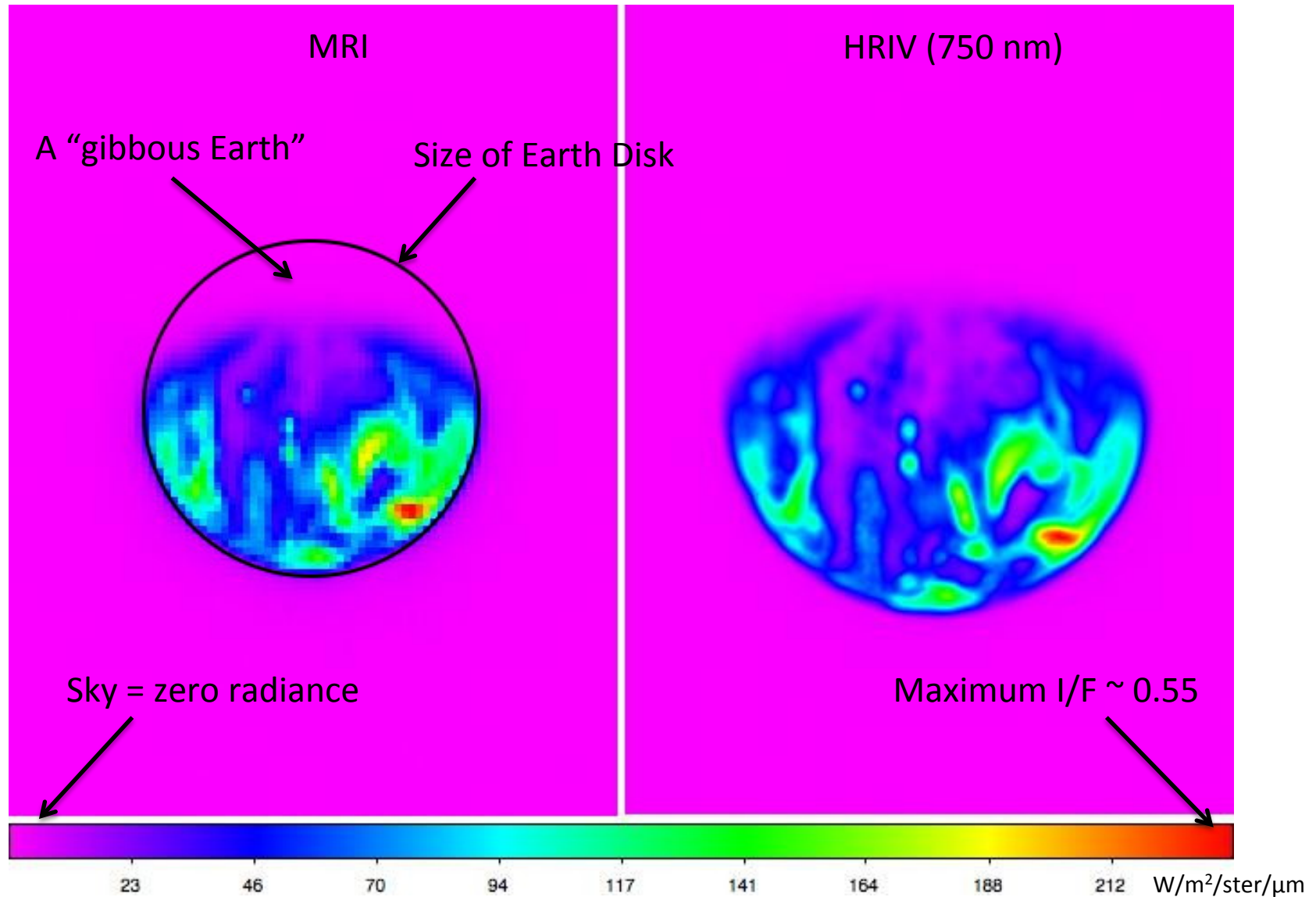    voldesc.dat

data/ Directory:
    rad/
    radrev/

    Data further organized by year/doy/

Other than "dataset.html", directory structure was as expected for a PDS archive. All necessary files and directories were present. Organization of data was easy to understand and navigate, especially with aareadme.txt shown. HTML homepage very helpful as well.

# Comparison of MRI with HRIV



I was able to read, display and manipulate the MRI images without problem.
MRI and HRIV images look very similar given different pixel size.

# CONCLUSIONS

File Structure:
- All files appear to be in place
- Data structure easy to understand and navigate

Documentation:
- Sufficient documentation for scientific work

Data:
- Calibrated (reversible), and calibrated versions of image data available
- Necessary calibration images and data available
- Support files available
- Target information (i.e., identification of Earth) MISSING from FITS files and associated label files. This makes all derived quantities "Unknown".

Image Quality:
- Calibrated image data pass sanity checks
- Calibrated radiance appears to follow expected wavelength trends

Submitted PDS archive of EPOXI HRIV images of Mars in good shape and ready for acceptance after correction of target information and derived quantities.