

Responses to individual review comments are given in [Green]. Details of additional corrections made to the peer review version are given at the end of the document.

Avis

I think it is a magnificent collection and future users will appreciate the comprehensive and careful approach you've taken. Personally, now I don't have to remember all that stuff anymore, you've documented it all. I know this report is kinda slim, but there was not much to take issue with. Congratulations to the team for a great job!

1. There are a few misspellings:
 - a) 'metadata' in PROCESSING.TXT (in the last section, I think), [FIXED]
 - b) 'discrepancy' in ERRATA.TXT section 6, and [FIXED]
 - c) 'intrinsic' in the _GEOMED.LBL's. [FIXED]
2. The TUTORIAL and DATASET.CAT indicate that 'ADESPIKE' was used. PROCESSING.TXT says 'DESPIKE'. [FIXED; 'DESPIKE' is correct.]
3. I was impressed by the thorough understanding and handling of the dark current issue. The techniques used to provide the proper dark currents for all conditions were very well thought out and implemented. The description of the complexity of the issue (particularly with Neptune) was well done.
4. The usage of quality control steps was good to see (I don't remember that from Saturn). The method used was good and this gives me confidence that the set has consistent quality and that special cases have been caught/handled.

Culver

I'm impressed at all the work that has gone into these volumes! Overall I think they look very good.

Completeness & Documentation:

1. The documentation, seems clear, accessible, consistent and complete. It's very comprehensive given the age of the data, and processing descriptions are accessible and useful, both now and for future image-processing savvy users. I found it very easy to get familiar with the data set layout and dig into the data.

2. The ancillary data provided with the data sets seems complete. From browse products to calibration support files, the files are easy to locate and straightforward to use.
3. In the TUTORIAL.TXT, user is directed to ignore the 224 line prefix bytes in RAW files as not useful, but perhaps a reference to the documentation on the raw CD volumes would be helpful (especially because that structure isn't described elsewhere on the new volumes.)
[NO CHANGE. We reviewed the documentation from the original CDs. The documentation describes a 243-byte engineering table and 36-byte line suffix (not prefix) structure, which are part of the compressed (.IMQ) files. These structures bear no obvious relationship to the contents of the engineering table and prefix bytes in the uncompressed files. We have added a comment to TUTORIAL.TXT and to the raw image labels noting that the structures of these objects are undocumented.]
4. MIPL is now the Multimission "Instrument" Processing Lab, no longer "Image". Several documents need to be updated. [CORRECTED in AAREADME.TXT, PROCESSING.TXT, TUTORIAL.TXT, and DATASET.CAT]

Compliance with PDS Standards: I ran vtool on VGISS_7207.

5. When using pdsdd.text from the DOCUMENT directory, Vtool failed due to the TEXT object starting on line 6. When that object was removed, there were still numerous warnings (see attached, uniquely sorted list of warnings). Given that keywords aren't explicitly addressed elsewhere in the documentation (as would otherwise occur in a modern Software Interface Specification (SIS)), I suggest these warnings be resolved. [NO CHANGE. The file PDSDD.TXT is included for documentation purposes and was never intended to support Vtool. It only contains information already in pdsdd.full. We have added comments in the PDS object description and in DOCINFO.TXT to make this clear. Sorry for the confusion.]

For reference, here's how I called Vtool (the pdsdd.full is the 7/11/13 version):

```
vtool-2.3.0/bin/VTool VGISS_7207_peer_review/DATA/C27*/*LBL -d pdsdd.full,  
VGISS_7207_peer_review/DOCUMENT/PDSDD.TXT -I  
VGISS_7207_peer_review/DOCUMENT/ -a -v 2 -r VGISS_7207_peer_review_vtool.rpt
```

6. In the INDEX.TAB, the *RESLOC.DAT/.TAB products are mis-identified as *RESLOC.IMG. Recommend they be handled the way the *GEOMA.DAT/.TAB products are treated in the index (i.e. a single entry for the .DAT file), or somehow explained. Also, it would be helpful to clarify the single index entry for the .DAT/.TAB products in the INDXINFO.TXT. [FIXED. We have corrected the tables. We have also expanded the

description of the PRODUCT_ID in every index label to explain how we handle .DAT/.TAB file pairs that use the same combined-detached label.]

Compatibility with VICAR software:

7. I tested a sampling of .IMG, .DAT and blemish files using VICAR. All worked as expected with a variety of programs.

Assessment of image processing:

8. Sometimes the "cleaned" version of the image exacerbates artifacts and removes detailed information due to interpolation. For example, on VGISS_7207, the C2700224* cleaned image (and those subsequently processed) include smear along the limb of Uranus due to reseau removal; on VGISS_5106, the C1559058* cleaned image (and those subsequently processed) intensify the corrupted lines at the top of the image, replace good pixels with edge effects in the lower left of the image, and remove the moon (or possible Death Star) in the lower right of the image.

These flaws are not too surprising, given the difficulty involved in this type of systematic processing, and as long as the raw image is preserved, the information isn't lost. However, a warning to the user about this should be included somewhere on the volume, perhaps in the processing notes or errata.

[Thank you for giving us specific examples of "cleaning" that has gone awry. We have investigated the specific examples you cited.

In the case of the Jupiter image C1559058, the moon/"Death Star" feature you mentioned is a known blemish, visible at the same image location in adjacent raw images, even though the pointing is different. It was correct for it to have been removed during the processing from RAW to CLEANED. Second, the processing did not "intensify corrupted lines" because an examination of the raw files revealed the modified lines to be all zeros in the raw file, meaning that the pixels were lost in transmission. When this happens, the cleaning process attempts to interpolate across the lost pixels. This appears to exacerbate a problem in this case, but in fact the processing only changes pixels that were already lost.

In the case of the Uranus image C2700224, this is an illustration of a well-known situation that occurs when a reseau marking lands atop a sharp brightness transition. Once again, however, the processing only changes pixels that were already lost; it does not modify valid pixels.

We agree that these issues need to be explained better, and TUTORIAL.TXT has been updated to note these possibilities.]

Rages

- Are you sure the "Note" field will do more good than harm?

I've looked at three Uranus images so far (admittedly all from the same sequence), and they all contained the same egregiously wrong information in the Note field of the .LBL file.

```
NOTE          =  
"1 OF 46 FRAMES IMAGING RING STRUCTURE AND SHEPHERD SATELLITES."
```

Noooo.

2681942, 2681948, and 2681954 are 3 of 6 frames imaging Uranus at 19 deg phase angle. 2682000, 2682006, and 2682012 are the other three, and yes, I just checked, their NOTE field is wrong too.

[NO CHANGES. The NOTE fields are from the original CDROMs and we are not able to maintain or validate this information directly. Instead, we have included expanded caveats in ERRATA.TXT and TUTORIAL.TXT, pointing out that the TARGET_NAME and NOTE fields are not 100% reliable, and that OPUS should provide more reliable search results.]

- Target mis-identifications"

"Please be aware that some targets have been found to be mis-identified in the index files. We have corrected those that have been brought to our attention, but some mis-identifications are likely to remain. Please report any known errors to the PDS Rings Node."

[The above quote is from the errata.txt of the 6xxx volumes, it is item (4) in the errata of the 7xxx volumes and is not included in the 5xxx nor the 8xxx volumes. In these images the target is identified as Uranus, but the note is wrong. We expanded the caveat to include the note fields and included it in ERRATA.TXT and TUTORIAL.TXT on all volumes.]

- High-pass-filtered Uranus images

I've put two Uranus images with the average of an 11x11 surrounding box subtracted from each pixel in the krages/public directory on files.seti.org. And if you remember how to get to krages/public without first logging in as krages and giving my password, would you please remind me, because I've forgotten.

The files are boxc2681948.fits and boxc2681954.fits. That's right. FITS. For reasons that pass understanding, xv has decided to stop working for real and halfword VICAR images; I have no intention of actually trying to install VICAR; and don't get me started on Nasaview. If I want to create them and then look at them, they have to be .fits.

The images show the "instrumental" structure that is not removed by the standard calibration. (They also show a bright feature at 35deg S which may have lasted until 2011, but that's another subject.) The part that is relevant here is the noticeable quasi-periodic line-to-line and column-to-column variation. [NO CHANGE. We reviewed the images and found that the artifacts are present in the raw images. As a result, we do not feel that we are in a position to address them. We have to trust users to recognize that any digital data can contain instrumental artifacts.]

- These images (C1138739_GEOMED, C1138746_GEOMED, C1138755_GEOMED)
 - a. open with a severely wrong stretch -- essentially all black. [NO CHANGES. The JPEG versions of these images demonstrate that the images are fine (although it should be noted that the second image of the three is essentially blank anyway). We suspect that the files contain scattered bright pixels that are not obvious to the eye but which can throw off the auto-stretching algorithm of Nasaview.]
 - b. Attempting to obtain a histogram frequently causes Nasaview to crash.

I've already mentioned my lack of enamoration with Nasaview. I can't see any significant difference between the .LBL files for these images and 1138727 or 1138733, which it opens fine. But if you know anybody involved with Nasaview, you might want to try and find out what it's choking on. [NO CHANGES. We will contact the Nasaview developers but this does not indicate problems with the data set.]

- Attached image, 1139221.tiff

Image on the right: your C1139221_GEOMED.IMG

Image on the left: my own copy of the same image

Both have the same stretch (-0.02 to 0.32). Same region of both is shown [_FITS_ coordinates 200,625 (upper left) to 400,500 (lower right); also shown by the blue rectangle in

the thumbnail at the upper right of the window]. Your version has a lot of bright speckles in it that don't have to be there. The region I selected contains three. [FIXED. This was the result of ADESPIKE having been inadvertently used on some images rather than the superior DESPIKE. All images have been re-processed using DESPIKE.]

West

General comment: It is great to have these new photometrically and geometrically calibrated images available – a valuable service to the community.

1. Why isn't the Danielson et al calibration report in the reports folder?
Danielson, G. E., et al., Radiometric Performance of the Voyager Cameras, JGR 86, 8683-8689, 1981. However, if the above reference is truly superseded by Danielson et al. 1990, then this is not needed.

Should be on this page:

http://pds-rings.seti.org/volumes/VGISS_5xxx_peer_review/VGISS_5101/DOCUMENT/REPORTS/

Also here:

http://pds-rings.seti.org/volumes/VGISS_5xxx_peer_review/VGISS_5115/DOCUMENT/DOCINFO.TXT

And similarly for Uranus and Neptune documentation. [We agree that this article should be included. However, JGR has not generally given the PDS permission to reproduce its articles in our archive products.]

I did not find files with tabulated filter/optics/vidicon_response factors as listed in the Danielson et al. 1981 paper. It would be helpful to include these as an ascii file in the documentation or somewhere so the user doesn't have to type them in by hand. [We have now added transcriptions of all the tables from the article to DOCUMENT/REPORTS.]

2. I wonder about the calibration of the Neptune images. Uranus and Neptune should have very similar I/F values at the same phase angle given their very similar geometric albedos (Karkoschka 1998) and atmospheric structure. Neptune [Uranus - mkg] in image C2602506_GEOMED.IMG has maximum I/F near 0.6, whereas Neptune in image C1087638_GEOMED.IMG has maximum I/f less than 0.3. Both are GREEN filter. Neptune seems too low in GREEN and also in VIO where Karkoschka's spectrum indicates

high albedo and little or no methane absorption. Although the phase angles are not the same I don't think that difference is enough to account for the ~factor of 2 difference in the maximum. This should be checked. [THANK YOU for pointing this out! A review of the process revealed that our copy of input file "VGRSCF.DAT" contained the exact same scaling factors for Neptune as for Uranus, so that all I/Fs from the Neptune encounter were small by a factor of ~ 2.5. We have repaired the error in VGRSCF.DAT and have re-calibrated the entire Neptune data set. We have also run the quality tests and the end again to ensure everything is OK. Checks of the image in question confirm that I/Fs for Uranus and Neptune are now similar. The correction is documented in PROCESSING.TXT, and we have also archived the corrected version of VGRSCF.DAT in the CALIB subdirectory on the last Neptune volume.]

Chen

1. */CATALOG/*INST.CAT

INSTRUMENT_TYPE = "VIDICON CAMERA". EN currently has this as "CAMERA". Not sure which is better. [NO CHANGE. Our reasoning is that VIDICON CAMERA is already a standard value for INSTRUMENT_TYPE, and it is more specific than, simply, CAMERA. There are many calibration and geometry issues unique to vidicons, so it seems worthwhile to emphasize that these are vidicons cameras.]

2. */CATALOG/MISSION.CAT

The current version at EN has many more targets (e.g. the various moons) and 1 more reference, KOHLHASE&PENZO1977. If you want the latest version, I can retrieve it. [REPLACED]

3. */DATA/*/*.LBL

INSTRUMENT_NAME = "IMAGING SCIENCE SUBSYSTEM - WIDE ANGLE CAMERA" should be

INSTRUMENT_NAME = "IMAGING SCIENCE SUBSYSTEM - WIDE ANGLE", and

INSTRUMENT_NAME = "IMAGING SCIENCE SUBSYSTEM - NARROW ANGLE CAMERA" should be

INSTRUMENT_NAME = "IMAGING SCIENCE SUBSYSTEM - NARROW ANGLE"

Keyword INSTRUMENT_HOST_NAME is required but missing. [ALL FIXED Note: We had been using SPACECRAFT_NAME instead of INSTRUMENT_HOST_NAME. We also changed SPACECRAFT_ID to INSTRUMENT_HOST_ID and changed the corresponding columns names in the labels of all the indices.]

4. */DATA/C14993XX/C14993_GEOMA.LBL (and maybe all _GEOMA.LBL)

ROWS = 576 for both the binary and the ascii tables. However, the ascii file has only 552 rows. The binary file also has odd values starting in row 551, very likely wrong especially at row 576. [CORRECTED. The extra rows were the result of VICAR needing to pad records to a fixed length. 552 is the correct number of rows in both tables. We have added a note in the VICAR file description about the padding needed for the table to match the record length of the file.]

5. */DOCUMENT/VICAR.LBL

Line 13: DOCUMENT_FORMAT = ASCII is legal but new. Use TEXT? [CHANGED TO "TEXT"]

6. VGISS_5*/CATALOG/DATASET.CAT

TARGET_NAME = "THETACAR": this target is unknown, i.e. it needs a target.cat [FIXED. THETACAR became THETA CAR. For consistency with the other data sets, all other STAR targets were replaced by the name of the object targeted (which was indicated in the NOTE field). New added targets are ARCTURUS, ORION, TAURUS, SCORPIUS, and VEGA. The index files and data labels were all updated in a consistent manner.]

7. VGISS_5*/CATALOG/REF.CAT

- "and" before final author of SMITHETAL1979A, SMITHETAL1979B, SMITHETAL1981, SMITHETAL1982, SMITHETAL1986B, SMITHETAL1989
- SMITHETAL1989 has an extra comma right after the first author [ALL FIXED]

8. VGISS_5119_peer_review/DATA/C16730XX/C1673012_CALIB.LBL and 800+ others
VGISS_5120_peer_review/DATA/C17363XX/C1736313_CALIB.LBL and 800+ others
VGISS_5214_peer_review/DATA/C20759XX/C2075939_CALIB.LBL and 900+ others
TARGET_NAME = "CALLAMPS" is unknown. Probably replace with "CAL LAMPS" [FIXED in data labels and indices.]

9. VGISS_5120_peer_review

VGISS_5214_peer_review

VGISS_7207_peer_review

VGISS_8210_peer_review

To verify, only these volumes have directory CALIB/. [THIS IS CORRECT.]

10. VGISS_5214_peer_review/CALIB/MIPL/FICOR77_VG2_WA_CH4_U.LBL

FILTER_NAME = "CH4_U". I assume this is correct, but please verify since no other labels in VGISS_5* use this. [FILES DELETED. Thank you for noting that the CH4_U filter was not used at Jupiter--it was only used at the other planets. We also deleted the references to the CH4_U filter in PROCESSING.TXT and TUTORIAL.TXT. We did not delete the

information about this filter from the DOCUMENT directory, because it remains valid information about the instrument.]

11. VGISS_7*/CATALOG/DATASET.CAT

TARGET_NAME = "1985U1" is unknown. Create a TARGET.CAT.

TARGET_NAME = "CALLAMPS" is unknown. Probably replace with "CAL LAMPS"

TARGET_NAME = "OTHER" is also unknown. Can you choose an existing one?

[FIXED ALL. OTHER was never listed as a target in the data set, so it was deleted from DATASET.CAT. 1985U1 is now PUCK.]

12. VGISS_7*/DOCUMENT/FILTERS/DOCINFO.TXT

Line 43: VGn_cc_name.HTM

Line 45: VGn_cc_name.GIF

You could change to VG2_..., as VGISS_8*/DOCUMENT/FILTERS/DOCINFO.TXT

[NOT CHANGED. In fact, we revised the DOCUMENT directory so that all information about the cameras is identical across all volumes. The only files that are different from one volume set to the next are PROCESSING.TXT and TUTORIAL.TXT. We now note in DOCINFO.TXT that this may mean some instrument information is not applicable to a given volume. We believe that it is simpler to maintain a single collection of Voyager ISS documentation rather than to customize it for each data set.]

13. VGISS_720[567]_peer_review/DATA/.../*.LBL

TARGET_NAME = "U_RINGS" should be "U RINGS" [FIXED in data labels and indices.]

14. VGISS_7207_peer_review/DATA/C27190XX/C2719055_CALIB.LBL and many others

TARGET_NAME = "CALLAMP" should be "CAL LAMPS" [FIXED in data labels and indices.]

15. VGISS_8*/CATALOG/DATASET.CAT

TARGET_NAME = "1985N1" is unknown. Create a TARGET.CAT

TARGET_NAME = "1985N2" is unknown. Create a TARGET.CAT

TARGET_NAME = "BETACMA" is unknown. Probably replace with "BETA CMA"

TARGET_NAME = "CALLAMPS" is unknown. Probably replace with "CAL LAMPS"

TARGET_NAME = "SIGMASGR" is unknown. Probably replace with "SIGMA SGR"

[FIXED. 1985N1 is now PROTEUS; 1985N2 is now LARISSA]

16. VGISS_8*/CATALOG/REF.CAT

- SMITHETAL1989 has a space between some authors' initials and is missing "and" before the final author.

- SCIENCEV246N4936 was published in 1989, not 1986 [FIXED]

17. VGISS_8201_peer_review/DATA/C09027XX/C0902741_CLEANED.LBL & 7 others
VGISS_82*/DATA/* have ~150 other such files
REFLECTANCE_SCALING_FACTOR = 2.3900E+00 exceeds max of 1.0 [NO CHANGE.
Based on the definition, there is no reason why the value of this parameter cannot exceed one. (Reflectance cannot exceed one, but the scaling factor is arbitrary.) The values listed in the labels are correct. The PDS-defined maximum value is incorrect.]
18. VGISS_8207_peer_review/DATA/C11384XX/C1138406_CALIB.LBL & 173 others
TARGET_NAME = "SIGMASG" is unknown. Replace with "SIGMA SGR"? [FIXED; also in indices]
19. VGISS_8207_peer_review/DATA/C11396XX/C1139643_CALIB.LBL & 29 others
TARGET_NAME = "BETACMA" is unknown. Probably replace with "BETA CMA" [FIXED in data labels and indices.]
20. VGISS_8210_peer_review/CALIB/MIPL/CALINFO.TXT
DATA_SET_ID = "VG1/VG2-N-ISS-2/3/4/6-PROCESSED-V1.0" should be
DATA_SET_ID = "VG2-N-ISS-2/3/4/6-PROCESSED-V1.0" [FIXED]
21. VGISS_8210_peer_review/DATA/C12048XX/C1204820_CALIB.LBL & others
TARGET_NAME = "SCORPIU" is unknown. Replace with "SCORPIUS"? [FIXED; also in indices]
22. VGISS_8210_peer_review/DATA/C12050XX/C1205010_CALIB.LBL & others
TARGET_NAME = "PLEIADE" is unknown. Replace with "PLEIADES"? [FIXED; also in indices]
23. VGISS_8210_peer_review/DATA/C12414XX/C1241445_CALIB.LBL & others
TARGET_NAME = "CALLAMP" is unknown. Probably replace with "CAL LAMPS" [FIXED in data labels and indices.]

new data dictionary values:

DOCUMENT_TOPIC_TYPE:

"FILE DESCRIPTION"

"FILTER DESCRIPTION"

FILTER_NAME:

"CH4_JS"

"CH4_U"

"SODIUM"

"UV"

PRODUCT_TYPE:

"BLEMISH_TABLE"

"CALIBRATION_CORRECTION"

"DARK_CURRENT_IMAGE"

"GEOMETRICALLY_CORRECTED_IMAGE"

"RESEAU_TABLE"

"TIEPOINT_TABLE"

SCAN_MODE_ID

"1:1"

"2:1"

"3:1"

"5:1"

"10:1"

[These all appear to be correct.]

Additional changes:

- It was found that many of the Uranus and Neptune images had inadvertently been calibrated using ADESPIKE instead of DESPIKE. The latter is newer and produces superior results. Also, some Uranus and Neptune images were not processed using VGRFILLIN, which resulted in horizontal stripes near the edges of some images. All Uranus and Neptune images were re-processed using VGRFILLIN and DESPIKE. Note that the Neptune images were also calibrated using the corrected version of VGRSCF.DAT, as discussed above. All quality tests were then repeated. Side-by-side comparisons of the new and old versions of selected images confirm that the new versions are distinctly cleaner and that the Neptune scale factors are correct.
- PRODUCT_CREATION_TIMES were updated to reflect the new processing.
- The labels for the raw files did not include the (undocumented) ENGINEERING_TABLE object, which occupies the second and third record of each file. The labels have been corrected.
- We transcribed the tables from Danielson et al. 1981 and added them to the DOCUMENT/REPORTS subdirectory. We also standardized the DOCUMENT directory across all volumes except for the encounter-specific files PROCESSING.TXT and TUTORIAL.TXT. This is explained in DOCINFO.TXT.