CASSINI UVIS MAJOR DATA PRODUCT UPGRADE

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Introduction: We give a status update on our PDART project to upgrade the Cassini UVIS dataset [1].

Section-1: The original Cassini mission contract for delivering data to the PDS did not include a requirement to deliver calibrated data, but only to deliver all required information to "self-calibrate" the data, following exhaustive instructions that were a deliverable as well.

The UVIS dataset isn't the easiest to work with though. Background and flatfield are time-dependent, so that each observation has its dedicated calibration matrices that needs to be applied to the data to end up with physical units.

An additional complexity for currently working with UVIS data is, that previously delivered reading routines relied on very old and obsolete Java and IDL versions, so that the user would have to figure out on their own how to read the data by investigating the PDS3 label files.

Section-2: The proposed remedies to this situation are: 1) to create a new PDS4-compatible FITS-based data product with a default calibration applied, and with the calibration matrices contained as backplanes in the same FITS file. In addition, additional metadata with improved cadence will be added into the FITS file as well.

Our team which consists of several previous UVIS team members also use this opportunity to improve the flatfielding and other calibration-related algorithms. Among the most important task is to come up with a usable scheme to make use of previously removed weak or high-variance pixels. Our intend is to assign a lesser weight to less reliable pixels instead of completely removing them.

Conclusion:

The new all-in-one data FITS format containing pre-calibrated data will greatly enhance usability of the Cassini UVIS dataset. The FITS format is very well supported by many analysis systems, and we will provide a reading and basic plotting routine in Python, for make it even easier to start working with UVIS data.

References:

[1] Esposito, Larry W., Charles A. Barth, Joshua E. Colwell, George M. Lawrence, William E. McClintock, A. I. A. N. F. Stewart, H. Uwe Keller, et al. 2004. "The Cassini Ultraviolet Imaging Spectrograph Investigation." In *The Cassini-Huygens Mission: Orbiter Remote Sensing Investigations*, edited by Christopher T. Russell, 299–361. Dordrecht: Springer Netherlands. https://doi.org/10.1007/1-4020-3874-7_5.

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