LUCY L'Ralph MVIC Data Review

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1. Datasets overview

- PDS version: PDS4
- 4 sets from L'Ralph MVIC.

  Lucy.mvic:data_donaldjohanson_raw::1.0

  Lucy.mvic:data_donaldjohanson_calibrated::1.0

  Lucy.mvic:calibration::2.0

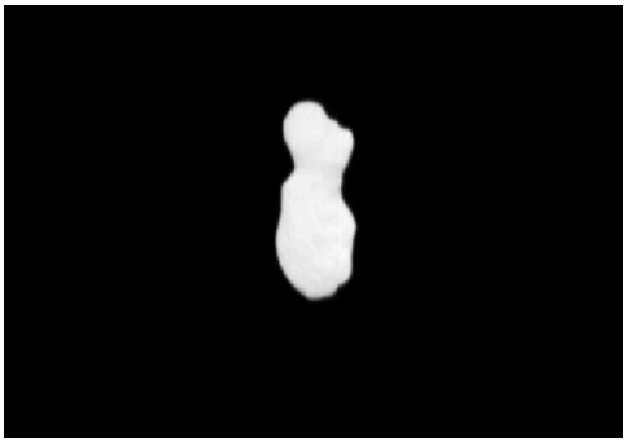
  Lucy.mvic:document::2.0

- Mission phases:

  the Lucy Mission Donaldjohanson encounter mission phase

- Datasets comparison:
  10 raw fits
  5 calibrated fits

- Summary of the review:
  Quick view of the target, calibrated image, mvi_0798443136_02609_sci_03



  Small issues.

2. Review process

- Use astropy fits.open and DS9 exam all fits

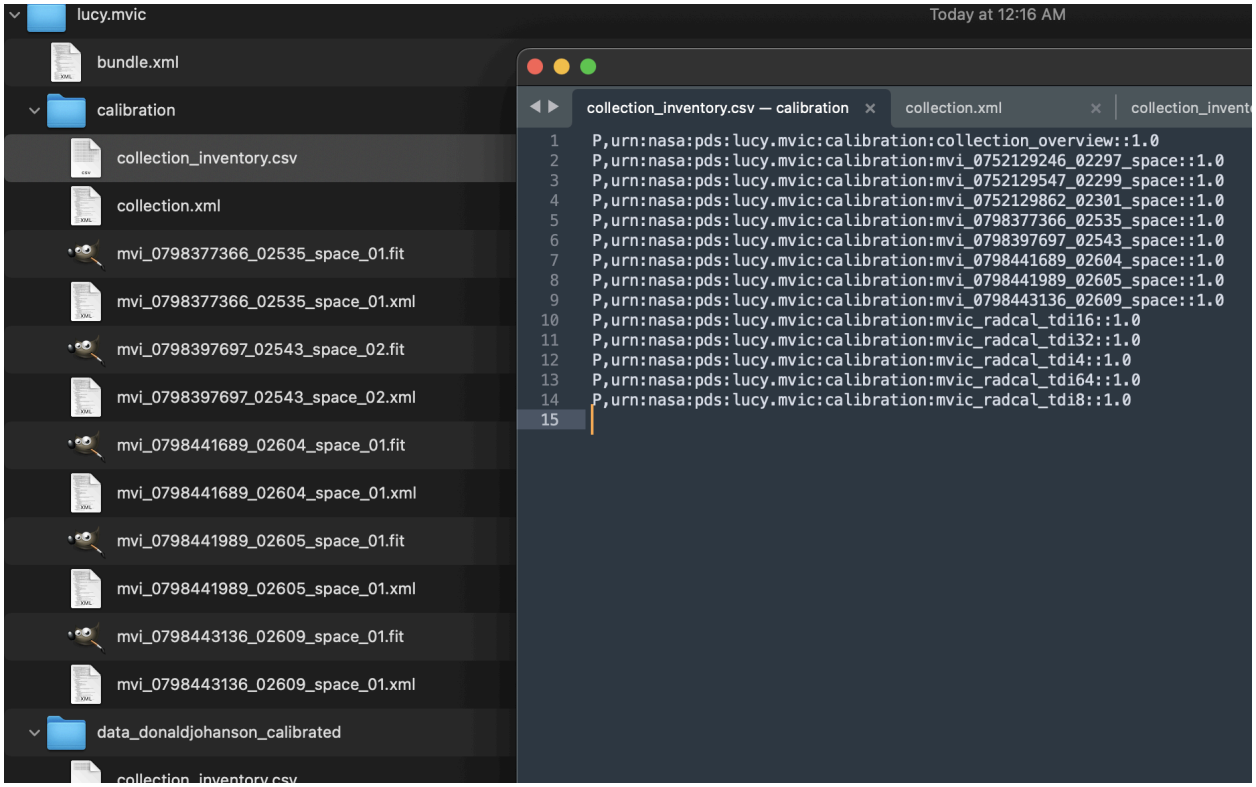
- Test files with pds4_tools: Read all .fit and label files to check image content (**all can be read correctly**)
- Check consistency between levels with tools:

  Diff Files 23.1 and Beyond Compare 4.4.1

- Check the headers and compare the labels between sets
- Compare and review labels and sis file
- Compare and review document
- Collect aspect data from all images

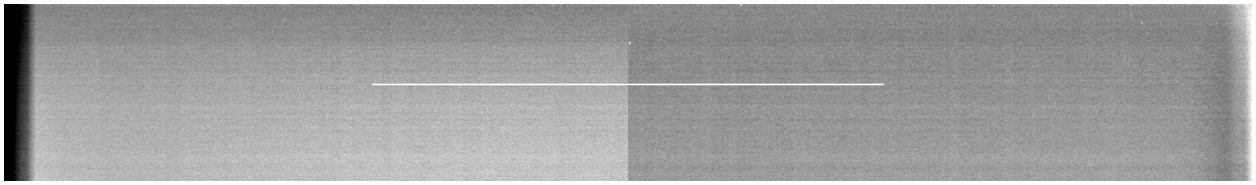
3. Document/Calibration

- No mvic_radcal_tdi* data files in the Calibration folder.

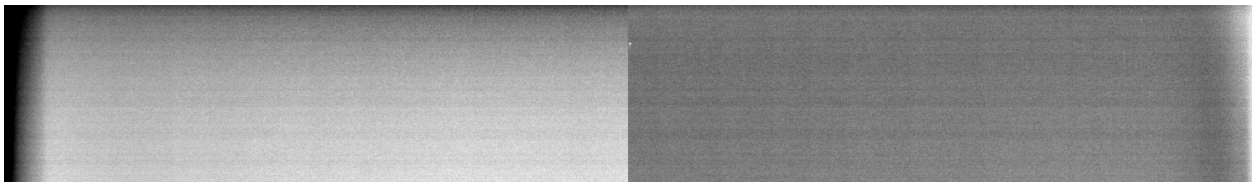


- In the “readme.txt” of the bundle. They listed the Raw and Calibrated data sets of MVIC Dinkinesh. And in the document folder, there is only the activities description file. No SIS and Calibration anymore. *Are these because this data bundle will be joined as one big bundle when all the fly by are finished?*
- Could not find the detailed image selection reasoning, why only calibrate five images?
- Explain this in calibrated images, (maybe add a calibration note):

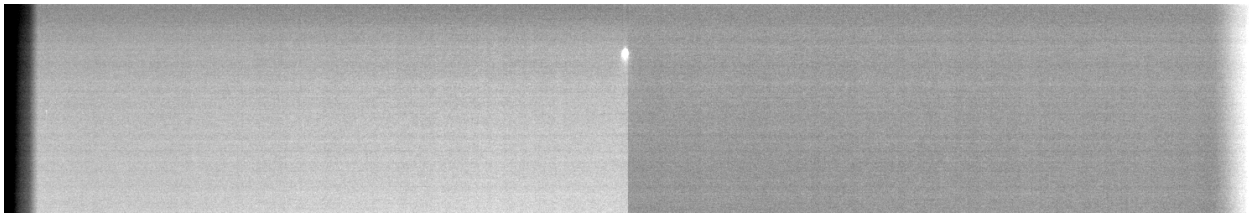
  mvi_0798377366_02535_sci_03



Mvi_0798397697_02543_sci_04



Mvi_0798441989_02605_sci_03



4. **Data and label**
    - Files can be correctly read by python, pds4 python tool and ds9.
    - SPICE data are available and included in the label completely
    - Labels can be all validated. But I saw a typo, which means the typo is in the Lucy schema

mvi_0798377366_02535_sci_03.xml

Product_Observational Observation_Area Mission_Area lucy:LRalph_Instrument_Com ... lucy:mce_start_postion

```
127                 <lucy:m4_blackbody_setting>0</lucy:m4_blackbody_setting>
128                 <lucy:m4_filament_setting>0</lucy:m4_filament_setting>
129                 <lucy:fpe_drop_frames>6076</lucy:fpe_drop_frames>
130                 <lucy:mce_scan_rate unit="rad/s">0.0004</lucy:mce_scan_rate>
131                 <lucy:first_packet_timestamp unit="s">798377366.264</lucy:first_packet_timestamp>
132                 <lucy:last_packet_timestamp unit="s">798377413.102</lucy:last_packet_timestamp>
133                 <lucy:xsum_error_flag_status>false</lucy:xsum_error_flag_status>
134                 <lucy:lr_acquisition_start_block>50</lucy:lr_acquisition_start_block>
135                 <lucy:mce_start_postion>-9651</lucy:mce_start_postion>
136                 <lucy:mce_end_postion>9651</lucy:mce_end_postion>
137                 <lucy:board_selection>FM1</lucy:board_selection>
138                 <lucy:blocks_allocated>12</lucy:blocks_allocated>
139             </lucy:LRalph_Instrument_Common_Parameters>
```

    - Other instrument kernel listed: Under geom:SPICE_Kernel_Files, an IK called lcy_**lorri**_v03.ti is included.
    - Please explain the time difference in image label: “**mvi_0798377366_02535_sci_03.xml**”

```
<img:Exposure>
   <img:exposure_duration unit="microseconds">9622630.0</img:exposure_duration>
</img:Exposure>
```

```
<start_date_time>2025-04-19T23:31:28.586Z</start_date_time>
<stop_date_time>2025-04-19T23:32:15.424Z</stop_date_time>
```

```
<lucy:mvic_observation_allocation unit="s">48</lucy:mvic_observation_allocation>
        <lucy:mvic_tdi_row_integration_time unit="microseconds">67765.0</lucy:mvic_tdi_row_integration_time>
```

- Unit of the main image array was not defined in the label for the calibrated data. Is it I/F?

```
<Array_3D_Image>
    <name>MVIC Observational Image</name>
    <local_identifier>image</local_identifier>
    <offset unit="byte">20160</offset>
    <axes>3</axes>
    <axis_index_order>Last Index Fastest</axis_index_order>
    <Element_Array>
        <data_type>IEEE754MSBSingle</data_type>
        <scaling_factor>1</scaling_factor>
        <value_offset>0</value_offset>
    </Element_Array>
    <Axis_Array>
        <axis_name>Band</axis_name>
        <elements>6</elements>
        <sequence_number>1</sequence_number>
    </Axis_Array>
    <Axis_Array>
        <axis_name>Line</axis_name>
        <elements>706</elements>
        <sequence_number>2</sequence_number>
    </Axis_Array>
    <Axis_Array>
        <axis_name>Sample</axis_name>
        <elements>5024</elements>
        <sequence_number>3</sequence_number>
    </Axis_Array>
</Array_3D_Image>
```

- For all the *_eng_03.xml labels, same problems as above, except image array unit.
- Why all the raw images are eng instead of some 5 raw and 5 eng images?

5. **Conclusion: Certifiable.**