



CHARA Data Reduction Machine Demo: How to Connect and Run Software

Jeremy Jones, CHARA Data Scientist



Important Links

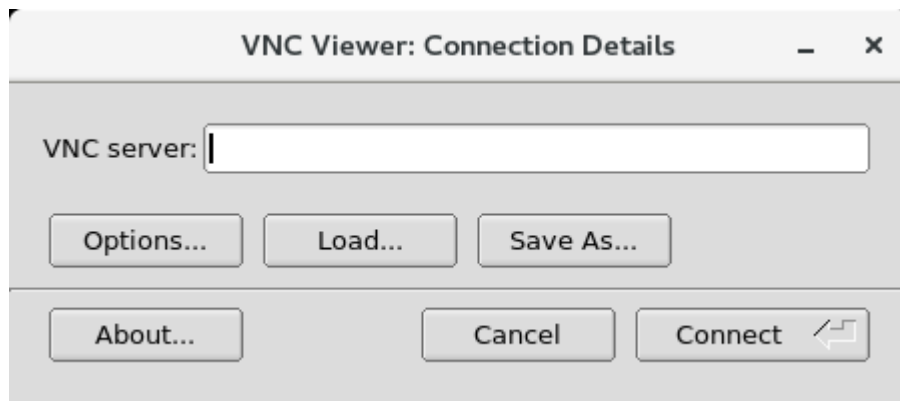
- Information about the Data Reduction Machine and How to Access It
 - <https://www.chara.gsu.edu/observers/data-reduction-software>
- Quick Guide for Running the Software at the Workshop
 - https://chara.gsu.edu/files/2023Meeting/2023_Imaging_Workshop_Software_Instructions.pdf
- A List of the Course Materials and Tutorials We are Using
 - <https://www.chara.gsu.edu/meetings/chara2023/2023-workshop-course-material>
- Downtown Dining Options (obviously less important for remote participants and future people reading these slides 😊)
 - <https://chara.gsu.edu/meetings/chara2023/chara2023-dining>



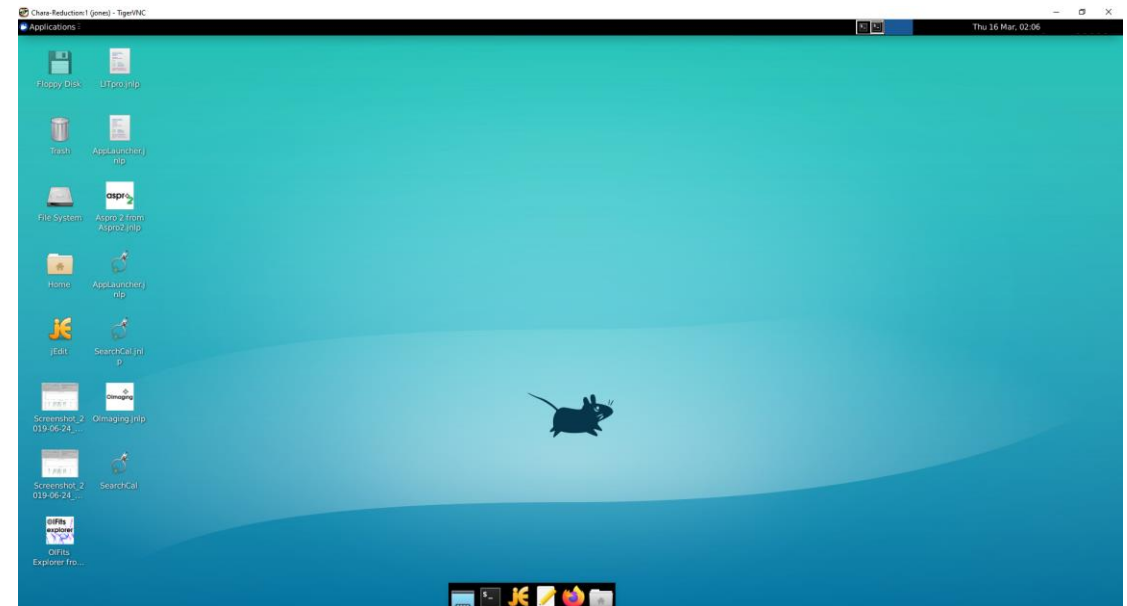
VNC – Virtual Network Computing



- Our VNC servers are running with TigerVNC
 - <https://tigervnc.org/>
- You can connect with any VNC viewer, but TigerVNC should give best results



Note: Do not log off. It will kill your VNC session. Instead, just close the VNC viewer.



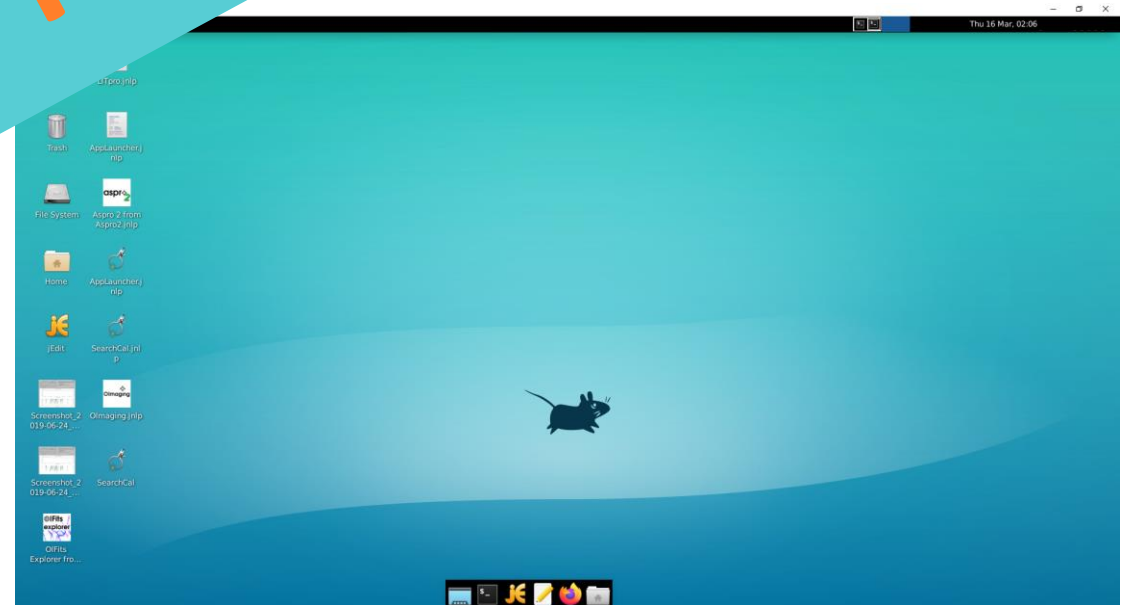
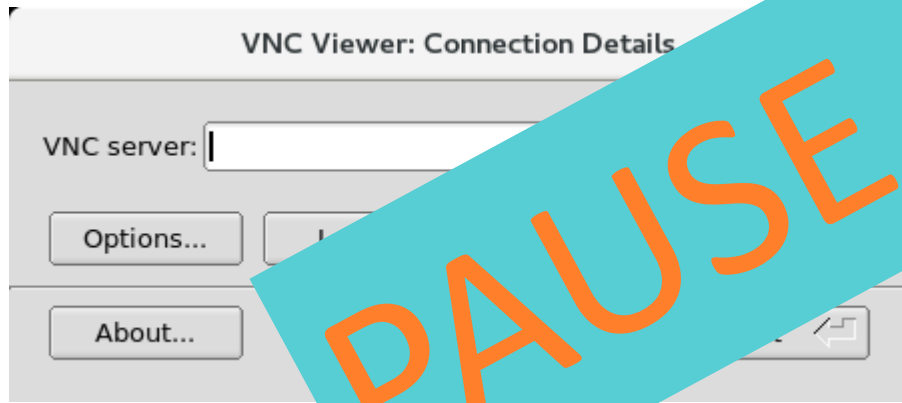


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PAUSE FOR DEMO



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The Workshop Virtual Environment

- Virtual Environments in Python let you easily install packages without worrying about conflicts
- I have created the “workshop” virtual environment with all the packages we will need for the workshop
- Running the command “source workshop” will activate the workshop virtual environment AND will set up useful shortcuts and PATH definitions for us.

The magic of virtual environments

```
jones@Chara-Reduction:~$ python
Command 'python' not found, did you mean:
  command 'python3' from deb python3
  command 'python' from deb python-is-python3
jones@Chara-Reduction:~$ source workshop
(workshop) jones@Chara-Reduction:~$ python
Python 3.10.9 (main, Mar 1 2023, 18:23:06) [GCC 11.2.0] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>> exit()
(workshop) jones@Chara-Reduction:~$ conda deactivate
jones@Chara-Reduction:~$
```

The workshop PATH and virtual environment

```
jones@Chara-Reduction:~$ more /usr/local/bin/workshop
#!/bin/sh
export MIRCX_PIPELINE=/git_repos/
export PYTHONPATH=$MIRCX_PIPELINE:$PYTHONPATH
export PATH=$MIRCX_PIPELINE/mircx_pipeline/bin:$PATH
export PATH=/git_repos/JMMC/:$PATH
export PATH=/home/gallenne/CANDID/:$PATH
export PATH=/home/jones/workshop_commands/:$PATH
export PATH=/git_repos/SQUEEZE/bin:$PATH
export PATH=/git_repos/SQUEEZE/PYTHON:$PATH
export PATH=/git_repos/SQUEEZE/JULIA:$PATH
alias julia="/git_repos/julia-1.8.5/bin/julia"
source /opt/anaconda/anaconda3/bin/activate workshop
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Without active environment

With active environment



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```

Commands:

- source workshop – Activates the virtual environment
- conda deactivate – Deactivates the virtual environment



Guide to Running the Software

- JMMC Software
- MIRC-X/MYSTIC Data Reduction and Calibration
- PMOIRE
- OITTOOLS.jl
- CANDID
- IDL Binary Grid Search
- SQUEEZE



JMMC Software

- Activate the workshop virtual environment
- Each software package from the JMMC is accessed with its name (case-sensitive)
 - Aspro2
 - SearchCal
 - OIFitsExplorer
 - LITpro
 - Olmaging
- Each shortcut accesses the version of the software online
- Example: Aspro2 shortcut runs the command
 - `javaws http://apps.jmmc.fr/~swmgr/Aspro2/Aspro2.jnlp`



See the presentations:

- Observation Planning Software
 - Laurent Bourgès
- Data Visualization with OIFitsExplorer
 - Laurent Bourgès & Isabelle Tallon-Bosc
- Model Fitting with LitPro
 - Laurent Bourgès, Isabelle Tallon-Bosc, & Michel Tallon
- Imaging with Olmaging (MIRA, BSM, WISARD, SPARCO)
 - Ferréol Soulez, Isabelle Tallon-Bosc, & Laurent Bourgès



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 - Aspro2
 - SearchCal
 - OIFitsExplorer
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- Each shortcut to the software
- Example of the command
 - `javaws http://www.jmmc.org/Aspro2/Aspro2.jnlp`

PAUSE FOR DEMO

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MIRC-X/MYSTIC Data Reduction and Calibration

- Activate the workshop virtual environment
- Important Commands:
 - `mircx_reduce.py`
 - Runs the python reduction pipeline
 - `mircx_calibrate.py`
 - Runs the calibration pipeline
 - `mircx_idl`
 - Runs an IDL startup file that points to the MIRCx IDL reduction pipeline



Note: Do not reduce data in your home directory. If you would like to reduce data, I will set up a directory for you on a larger disk.

Note 2: If you have data you want to reduce today, please wait until the end of the workshop to start it so it doesn't take up too much CPU while we're using the machine.

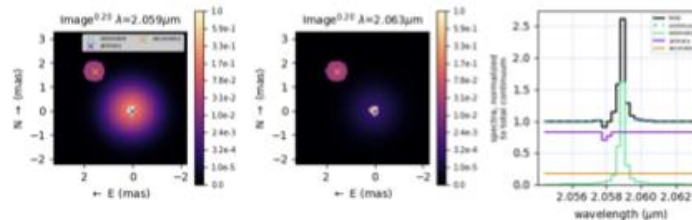
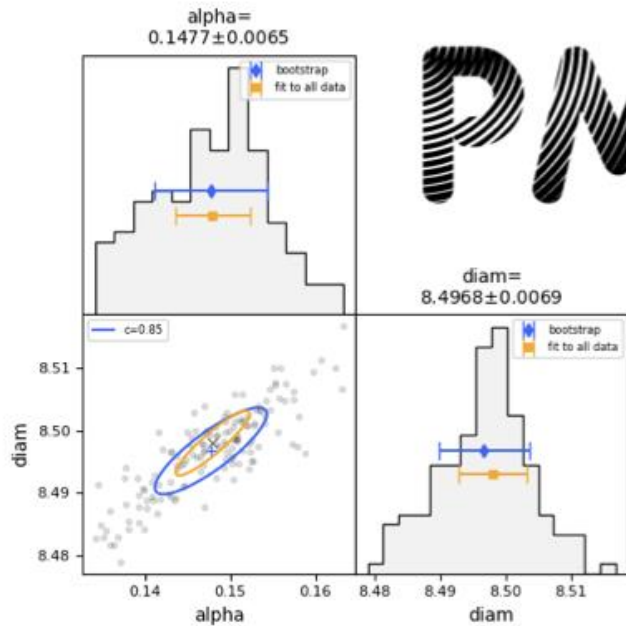
See the presentation:

- Data Reduction Overview: `mircx/mystic` pipeline, OIFITS data format
 - Narsi Anugu

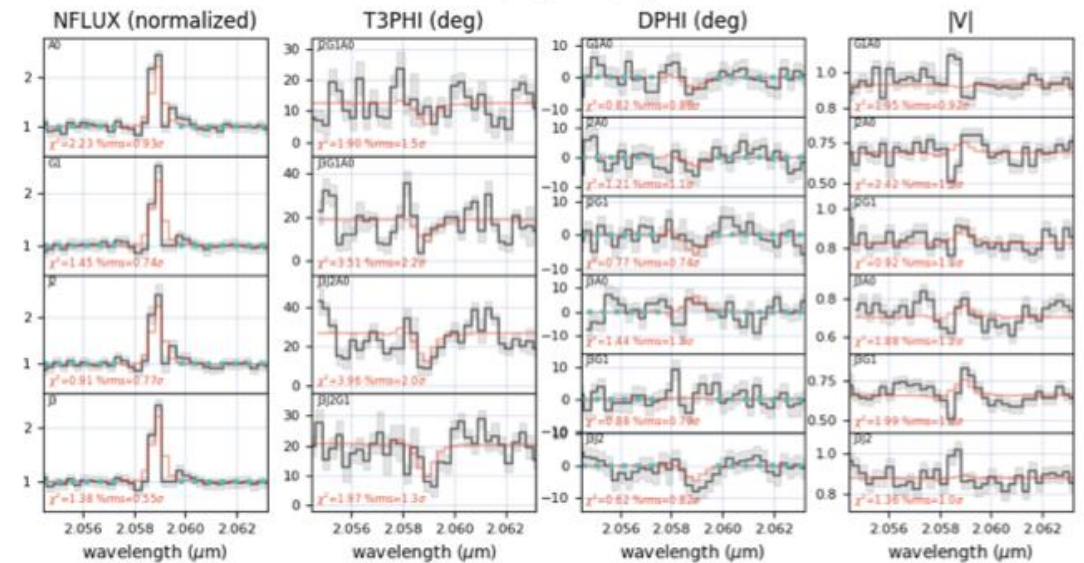


PMOIRE

Parametric Modeling of
Optical Interferometric Data



GRAVI.2018-02-04T06:26:34.133_singlescivis_singlesciviscalibrated.fits



- Activate the workshop virtual environment
- Run `cp_pmoired_tutorial`
 - This will copy the PMOIRE tutorial files to a new directory at your current location
- Go to the new directory (`pmoired_tutorials`)
- Run jupyter notebook
- Access the tutorials

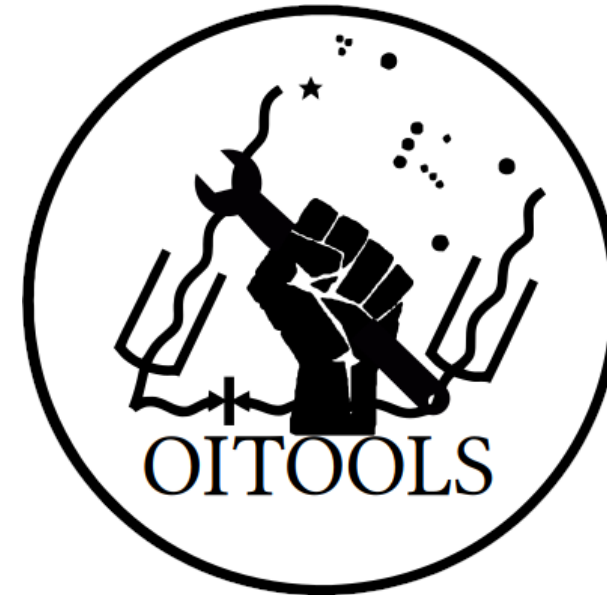
See the presentation:

- Model Fitting with PMOIRE
 - Antoine Mérand



OITTOOLS.jl

- Activate the workshop virtual environment
- Run `cp_julia_depot`
 - This will copy the packages installed in a central location to your `.julia` directory so you can access them.
 - If you already have a `.julia` folder in your home directory, it will be moved to `.julia_old`
- Run `julia` to start the Julia REPL
- Running “using OITTOOLS” in the Julia REPL will load the OITTOOLS package
 - The first time will take a few minutes to precompile OITTOOLS, but will be faster after this is done



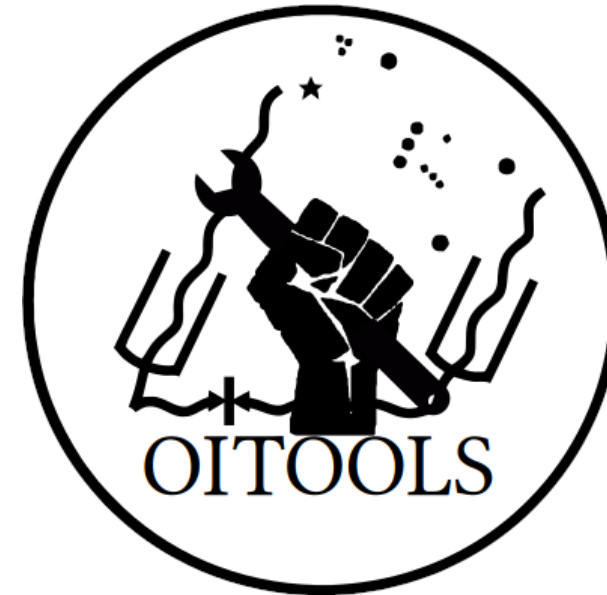
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OITTOOLS.jl

Update – Fixed Instructions on Running OITTOOLS tutorial

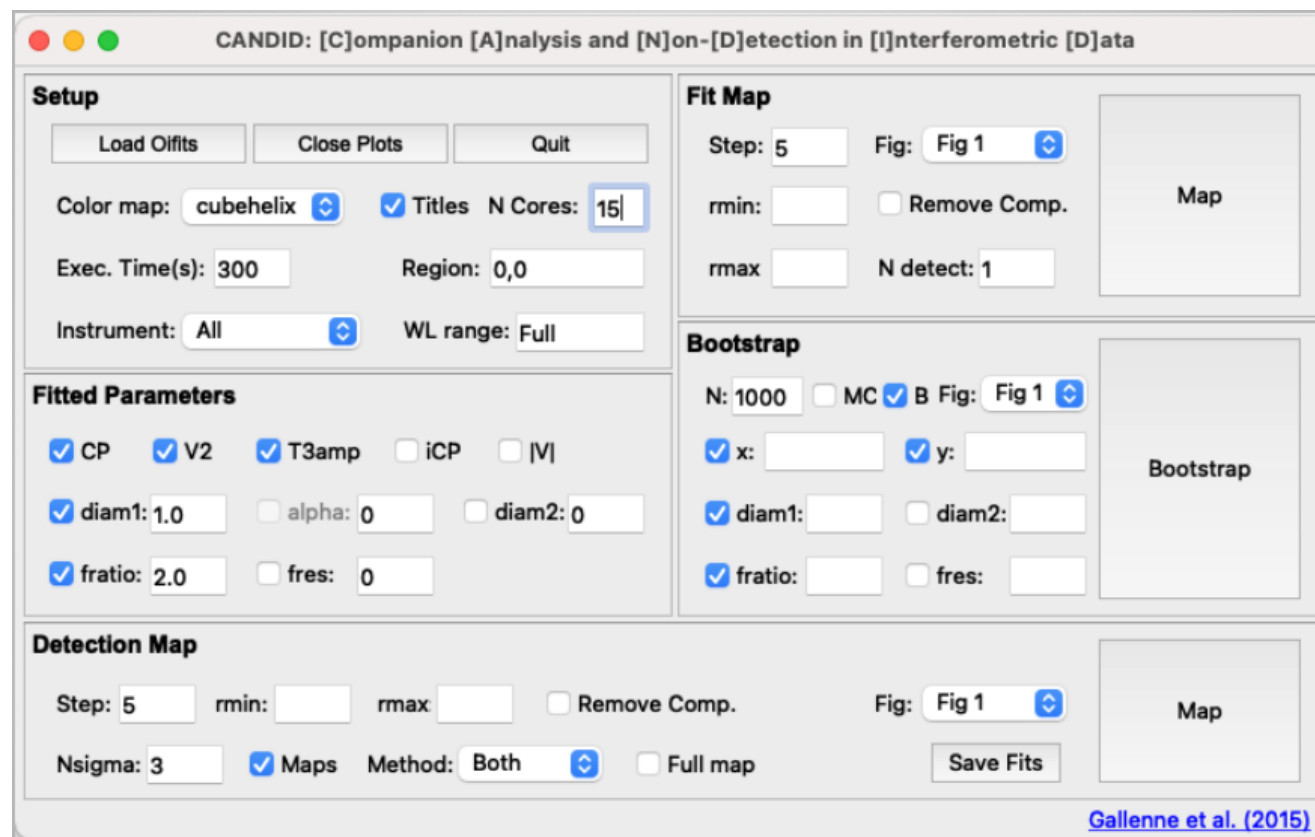
- Activate the workshop virtual environment
 - Command: source workshop
- Copy over the julia depot (barring updates, you will only need to do this once)
 - Command: cp_julia_depot
- Copy the OITTOOLS.jl tutorials
 - Command: git clone <https://github.com/fabienbaron/OITTOOLS.jl>
- Launch julia
 - Command: julia
- Within Julia:
 -] (enters package mode)
 - update (update packages)
 - Build IJulia (sets up IJulia so you can use julia in the notebook)
 - (backspace) (exits package mode)
 - Using OITTOOLS, IJulia (activates packages)
 - notebook() (runs the notebook)
- You can then run the .ipynb files located in OITTOOLS.jl/demos



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CANDID



- Activate the workshop virtual environment
- Run “GUIcandid”

See the presentation:

- Binary Fitting with CANDID and IDL grid search
 - Alexandre Gallenne & Gail Schaefer



IDL Binary Grid Search

- Start IDL with `binarygs_idl`
- In the IDL REPL, run: `gridsearch_binary_oifits_gui`

See the presentation:

- Binary Fitting with CANDID and IDL grid search
 - Alexandre Gallenne & Gail Schaefer

Grid Search Parameters

Open Paran File: []

Select Data File: 2011Sep29_01_MIRC_sig0r1_Schaefer_2016.oifits

Initial Binary Parameters

sepRA (mas): 0.0 Fix Companion is located at (sepRA, sepDEC) in mas.

sepDEC (mas): 0.0 Fix

f1: 0.5 Fix Flux contribution of star 1 (values from 0 to 1). $f1 + f2 + f3 = 1.0$

f2: 0.5 Fix Flux contribution of star 2 (values from 0 to 1).

f3: 0.0 Fix Incoherent Flux (values from 0 to 1). Fix to 0 if no incoherent flux.

Diam1 (mas): 0.0 Fix Diameters of star 1 and star 2 (in mas)

Diam2 (mas): 0.0 Fix For unresolved diameters, fix to 0 or fix to estimated size.

w1: 0.0 Fix Limb-darkening coefficients.

w2: 0.0 Fix For uniform disk diameter, fix to 0.

Grid Search Parameters

RA range (mas): 20.0 RA step (mas): 0.5

IEC range (mas): 20.0 IEC step (mas): 0.5

For an adaptive grid search, leave sepRA and sepDEC as free parameters.

For a grid search at fixed intervals, check the boxes to fix sepRA and sepDEC.

Pseudo-adaptive grid At each grid point, optimize position within a fixed box set by the step size.

Grid center at (0,0) Check to center grid search at (0,0) rather than (sepRA, sepDEC).

Include bandwidth shearing

Fit V2 only Fit T3 only If unclicked then fit to both V2 and T3 data.

Save Paran File: temp_paran.txt

Run Grid Search



SQUEEZE

- Activate the workshop virtual environment
- Run squeeze with the appropriate flags (squeeze -h shows the help page)

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General Data Access

- Workshop data are in /dbstorage/workshop_data/
- Archival CHARA data can be found in the /dbstorage/ directory organized by beam combiner:
 - CI_CL_JF/ – Classic, CLIMB, JouFLU (plus general CHARA logs e.g., wfs, weather, etc.)
 - PAVO/ – PAVO data
 - Old_Fluor/ – FLUOR data
 - mircs/ – Old MIRC, MIRC-X, MYSTIC data
 - VEGA/ – Incomplete archive of VEGA data



Other Data Reduction Software Available

- Classic/JouFLU – redfluor
- CLIMB – redclimb
- PAVO – IDL startup shortcut: pavo_idl
 - idl> l0_l1_gui
 - idl> l1_l2_gui
- Old MIRC IDL startup shortcuts:
 - mirc6b_idl – Starts pipeline_mirc6b that reduces MIRC 6T data and accounts for cross-talk
 - mirc6T_idl – Starts pipeline_mirc6 that reduces MIRC 6T data. It does not account for cross-talk
 - mirc4T_idl – Starts pipeline_v2 that reduces MIRC 4T data.

Many tutorials can be found here: <https://www.chara.gsu.edu/observers/data-reduction-software>



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