



Coronagraphic Imaging of the Exoplanet TWA 7 b

Mahdi Mousavi

COSPAR 2025 - A Hands-on Workshop with JWST-UVIT
CHRIST (Deemed to be University)
20-31 Oct 2025



James Webb Telescope's First Direct Image of a New Planet ...

YouTube · Sakshi TV · 10 Jul 2025

James Webb Telescope discovers first direct image of exoplanet TWWA7B, a gas giant 110 light-years away, showing its ability to find smaller, colder planets.

Scientists Spot Young Saturn-Mars Planet TWA 7b | WION ...

YouTube · WION · 26 Jun 2025

James Webb Telescope discovers a young exoplanet, **TWA 7b**, orbiting a star 110 lightyears away. It is 10x lighter than imaged planets and offers insights into planetary formation.

JWST's New Exoplanet - TWA 7b!

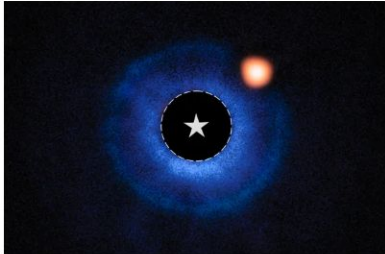
YouTube · Your Space Journey · 15 Jul 2025

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Webb may have found its first exoplanet. Saturn-mass world seen sculpting the region around nearby star

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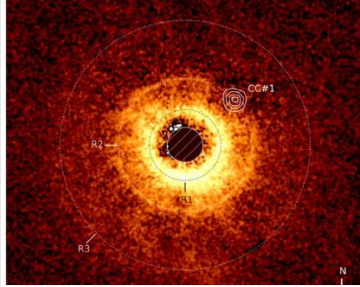
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James Webb space telescope

This article is more than 4 months old

James Webb telescope captures direct images of Saturn-sized exoplanet

TWA 7b is 110 light years away and by far the smallest-mass planet to be observed by direct imagery



The image of the disc around the star TWA 7, with the exoplanet at CCR1. Photograph: Anne-Marie Lagrange et al.

Hannah Devlin Science correspondent
Wed 25 Jun 2023 16:00 BST

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- England at risk of 2027 World Cup embarrassment and in need of ODI upswing

Evidence for a sub-jovian planet in the young TWA7 disk

A.-M. Lagrange^{1,2*}, C. Wilkinson¹, M. Mâlin³, A. Boccaletti¹, C. Perrot¹, L. Matrà⁴, F. Combes⁵, D. Rouan¹, H. Beust², A. Chomez^{1,2}, B. Charnay¹, S. Mazevet⁶, O. Flasseur⁷, J. Olofsson⁸, A. Bayo⁸, Q. Kral¹, G. Chauvin⁶, P. Thebault¹, P. Rubini⁹, J. Milli², F. Kiefer¹, A. Carter¹⁰, K. Crotts¹⁰, A. Radcliffe¹, J. Mazoyer¹, T. Bodrito¹¹, S. Stasevic¹, P. Delorme², M. Langlois⁷

Under revision at Nature

Initial version submitted on July, 25th, 2024

Revised version submitted on January, 19th, 2025

The following cell will run the `CoronIPipeline` for all input data in the spaceKIP database, saving the output to a subdirectory named `stage1`. This can take a long time to run, so be patient.

```
[ ]: spaceKIP.coronPipeline.run_obs(database=database,
steps={'group_scale': ('skip': False),
      'dq_init': ('skip': False, 'save_results': False),
      'saturation': {'n_pix.grow_sat': 1,
                    'grow_diagonal': False},
      'ipc': ('skip': True),
      'firstframe': ('skip': False),
      'lastframe': ('skip': False),
      'reset': ('skip': False),
      'linearity': ('skip': False),
      'rscd': ('skip': False),
      'dark_current': ('skip': True),
      'refpix': ('skip': False,
                'odd_even_columns': True,
                'jump': ('n_pix.grow_sat': 1,
                        'four_group_rejection_threshold': 8.,
                        'maximum_cores': '1'),
                        'ramp_fit': ('save_calibrated_ramp': False,
                                    'maximum_cores': '1'),
                        'gain_scale': ('skip': False)),
                subdire='stage1')

[spaceKIP.coronPipeline:INFO] --> Concatenation JWST_MIRI_MIRIMAGE_F1140C_NONE_40PM_1140_MASK1140
[spaceKIP.coronPipeline:INFO] --> CoronIPipeline: processing jw03662001001_04101_00001_mirimage_uncal.fits

We can now examine the updated database, which shows that all available files for each filter have been processed to Stage 1.

Note: The Stage 0 files are automatically removed from the database since there is no further processing required for them. However, the files remain on disk.

[ ]: #database.summarize()
```

Display Stage 1 Reductions

Let's examine the science and reference PSF data in the F1550C filter we processed through the `CoronIPipeline`. You can use the built-in plotting function `spaceKIP.plotting.display`

Stage 1



IP database, saving the o

ults=False),

o,

```
chrst@chrst-System-Product-Name: ~
0[1.3] 3[0.0] 6[0.7] 9[4.1] 12[8.1] 15[0.0] 18[0.0] 21[0.0]
1[1.3] 4[1.3] 7[0.0] 10[4.7] 13[0.0] 16[0.0] 19[1.0] 22[0.0]
2[1.3] 5[0.0] 8[5.0] 11[4.0] 14[1.0] 17[0.0] 20[0.0] 23[0.0]
Mem[|||||]|||||12.9G/1.4G Tasks: 146, 991 thr; 4 running
Sup[|||||]|||||18.0M/2.0M Load average: 4.19 4.98 4.40
Uptime: 08:57:18
```

| PID | USER | PR | NI | VM | RES | SHR | D | CPN | MEM | TIME | Command |
|-------|-------|----|----|-------|-------|-------|---|------|------|----------|-------------------|
| 1113 | chrst | 20 | 0 | 12.4G | 8988K | 2796K | 0 | 1.4 | 0.5 | 33:16.11 | /snap/firefox/7 |
| 42337 | chrst | 20 | 0 | 21.9G | 11.9G | 3000 | 0 | 33.5 | 75.8 | 0:40.34 | /home/chrst/ml |
| 6901 | chrst | 20 | 0 | 3384M | 209M | 10904 | 0 | 24.3 | 1.3 | 11:12.94 | /snap/firefox/7 |
| 3454 | chrst | 20 | 0 | 12.4G | 80696 | 27404 | 0 | 9.2 | 0.5 | 0:50.36 | /snap/firefox/7 |
| 4467 | chrst | 20 | 0 | 953M | 11300 | 3804 | 0 | 5.3 | 0.1 | 2:01.23 | /usr/bin/nautilus |
| 3506 | chrst | 20 | 0 | 12.4G | 80696 | 27404 | 0 | 4.6 | 0.5 | 2:17.59 | /snap/firefox/7 |
| 3492 | chrst | 20 | 0 | 12.4G | 80696 | 27404 | 0 | 3.9 | 0.5 | 5:56.99 | /snap/firefox/7 |
| 7482 | chrst | 20 | 0 | 703M | 19448 | 4416 | 0 | 3.9 | 0.1 | 1:30.66 | /home/chrst/ml |
| 6917 | chrst | 20 | 0 | 3384M | 209M | 10904 | 0 | 2.6 | 1.3 | 0:02.96 | /snap/firefox/7 |
| 41886 | chrst | 20 | 0 | 12440 | 4224 | 2112 | 0 | 2.6 | 0.0 | 0:25.73 | htop |
| 16157 | chrst | 20 | 0 | 2548M | 23280 | 2508 | 0 | 2.0 | 0.1 | 0:44.60 | /snap/firefox/7 |
| 42019 | chrst | 20 | 0 | 12.4G | 80888 | 27596 | 0 | 2.0 | 0.5 | 0:02.03 | /snap/firefox/7 |
| 3449 | chrst | 20 | 0 | 12.4G | 80696 | 27404 | 0 | 1.3 | 0.5 | 3:18.99 | /snap/firefox/7 |
| 3929 | chrst | 20 | 0 | 7209M | 28848 | 2869 | 0 | 1.3 | 0.1 | 1:08.59 | /snap/firefox/7 |

F1help F2Setup F3Search F4Filter F5Proc F6Sortby F7Info F8Filter F9All F10Exit

```

odd_even_rows: True,
'mlower': 0,
'mupper': 0,
'left': 0,
'right': 0,
'mrow_off': 0,
'recol_off': 0,

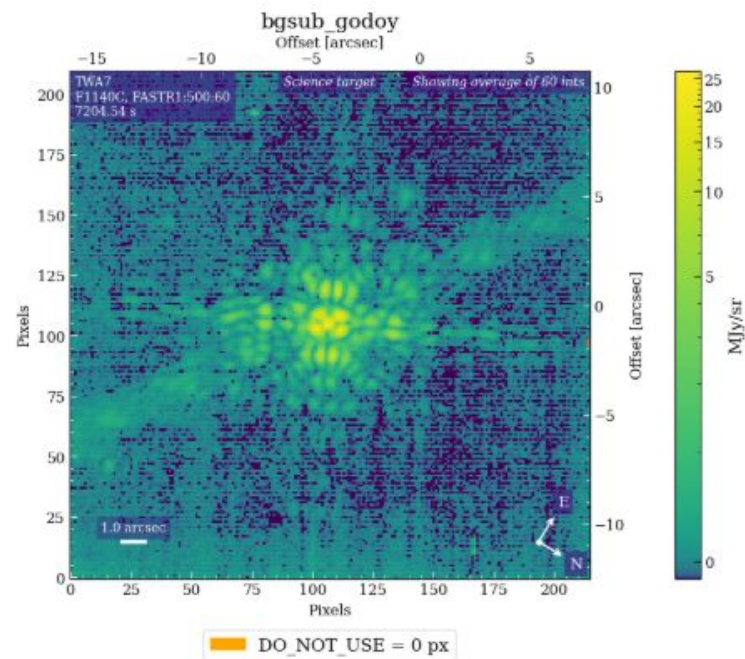
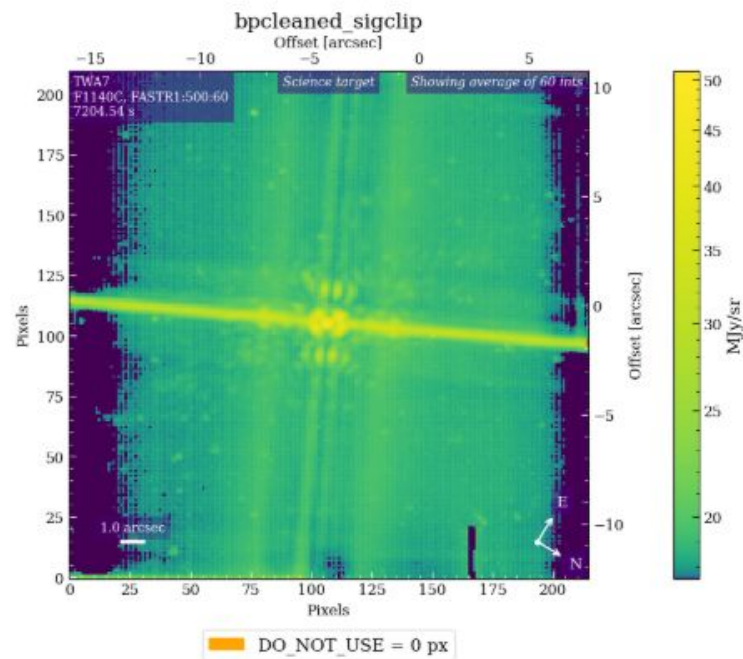
'jump': ('rejection_threshold': 8.,
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        'four_group_rejection_threshold': 8.,
        'maximum_cores': '1'),
'ramp_fit': ('save_calibrated_ramp': False,
            'maximum_cores': '1'),
'gain_scale': ('skip': False)),
subdire='stage1')

[spaceKIP.coronPipeline:INFO] --> Concatenation JWST_MIRI_MIRIMAGE_F1140C_NONE_40PM_1140_MASK1140
[spaceKIP.coronPipeline:INFO] --> CoronIPipeline: processing jw03662001001_04101_00001_mirimage_uncal.fits

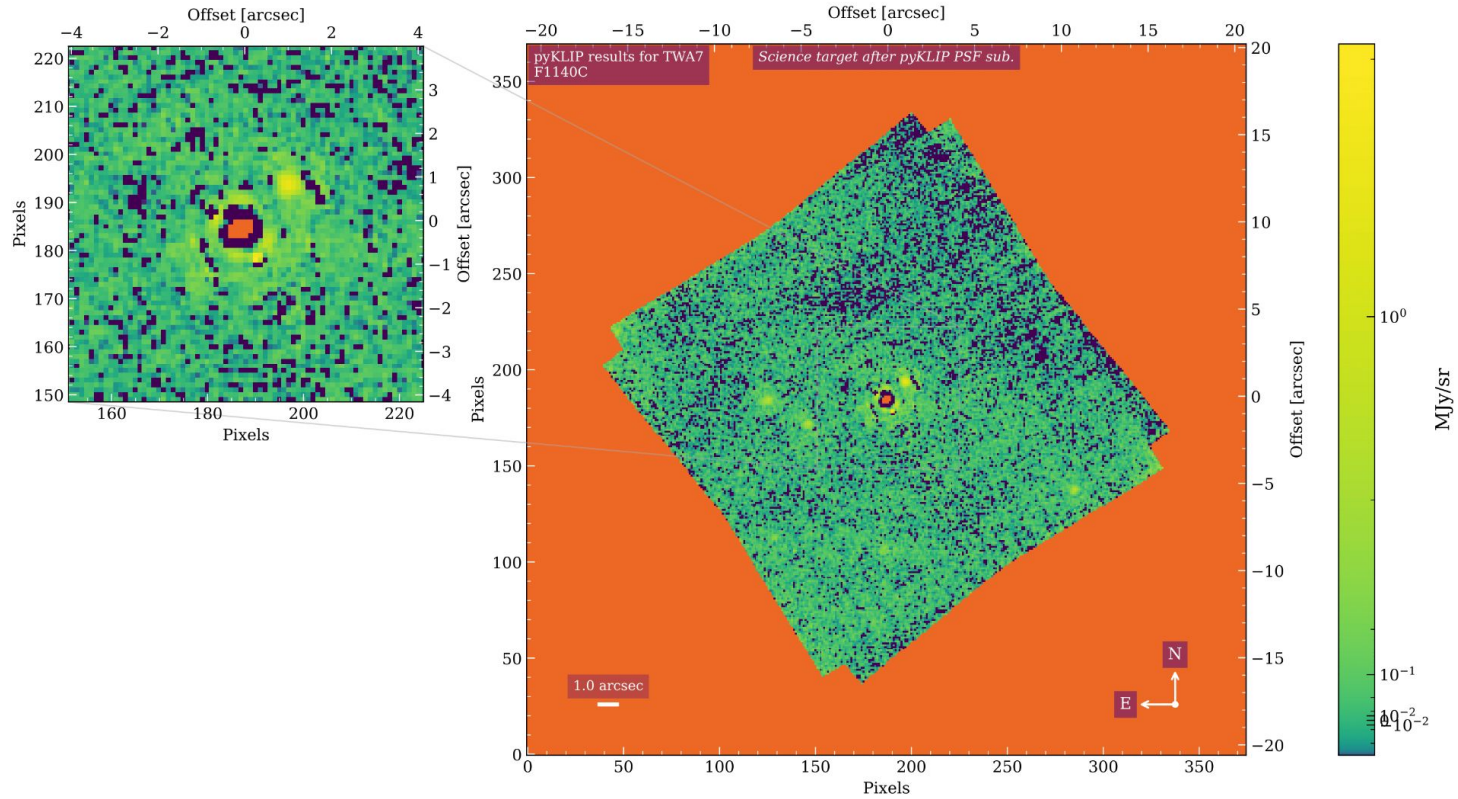
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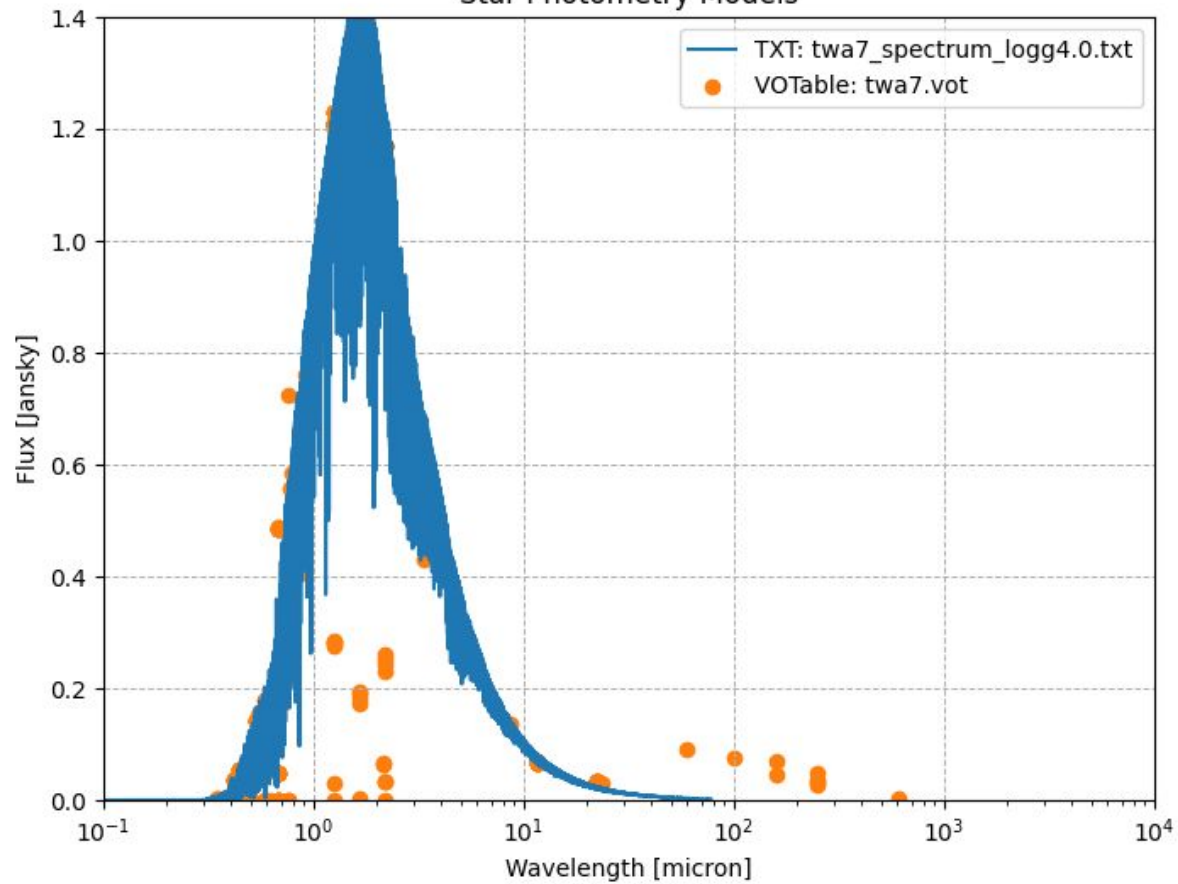
[ ]: #database.summarize()
```

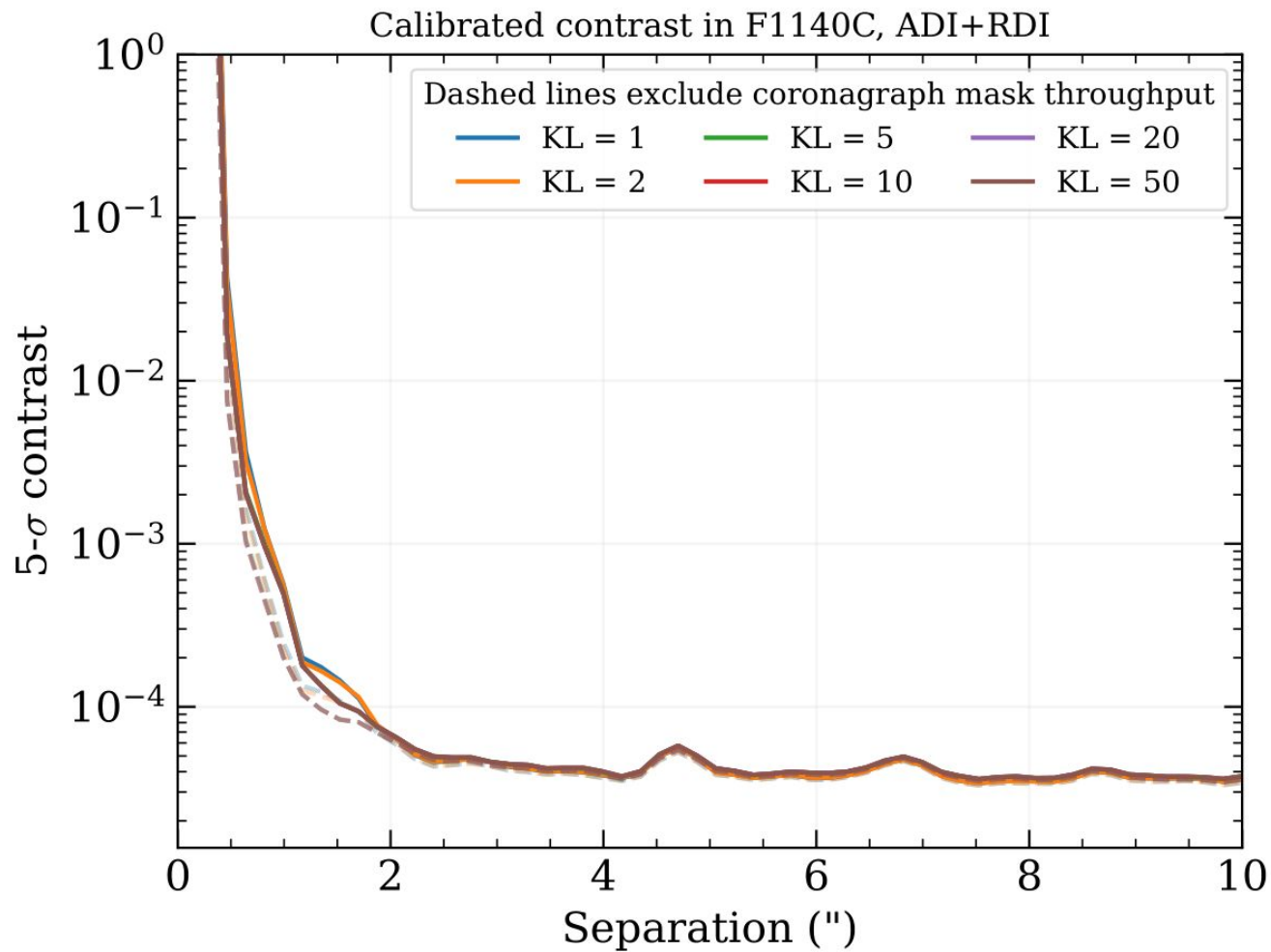



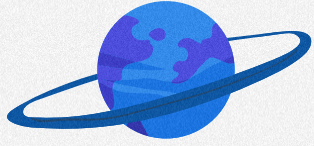
ADI+RDI_NANNU1_NSUBS1_JWST_MIRI_MIRIMAGE_F1140C_NONE_4QPM_1140_MASK1140-KLmodes-all.fits



Star Photometry Models







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Thank You!