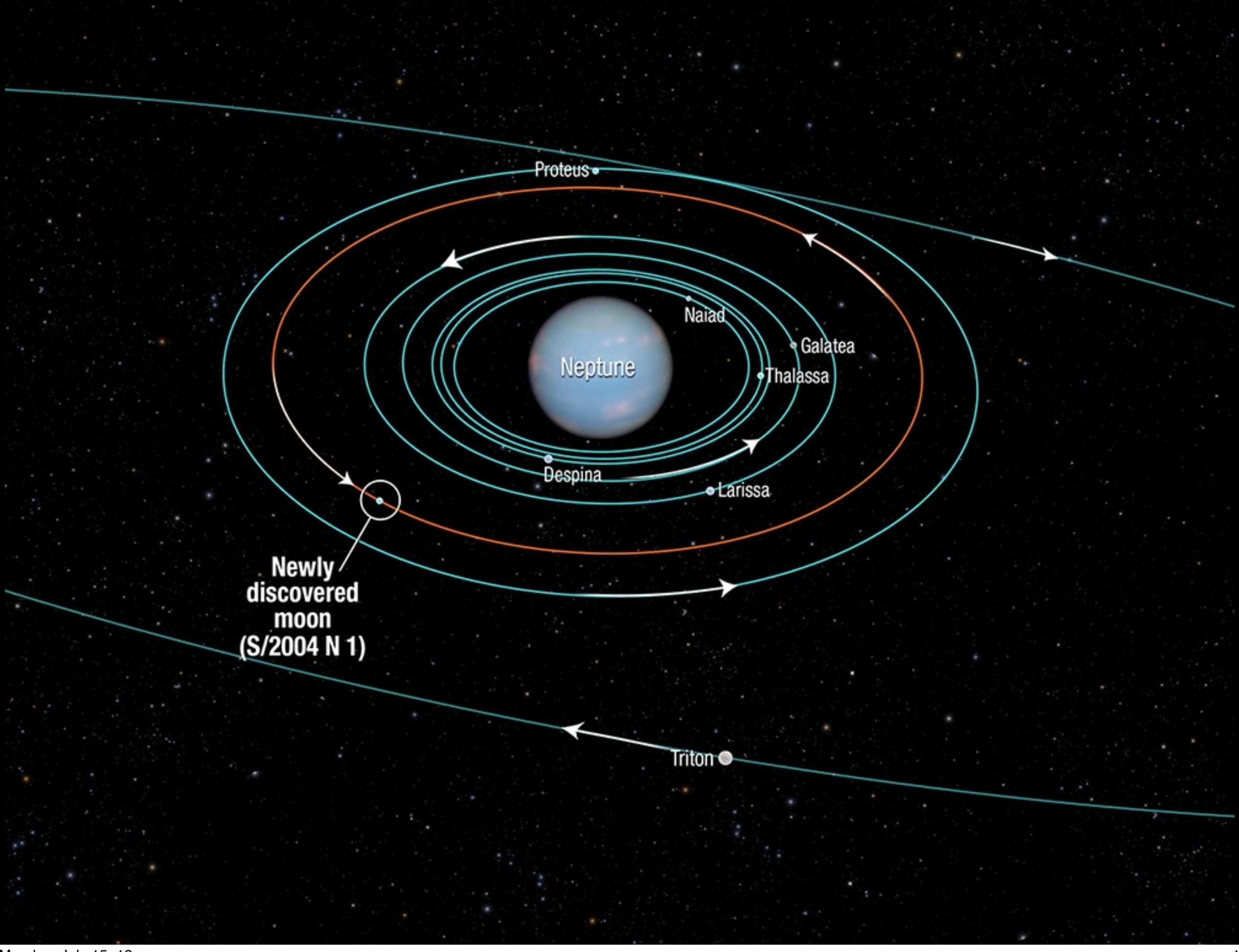
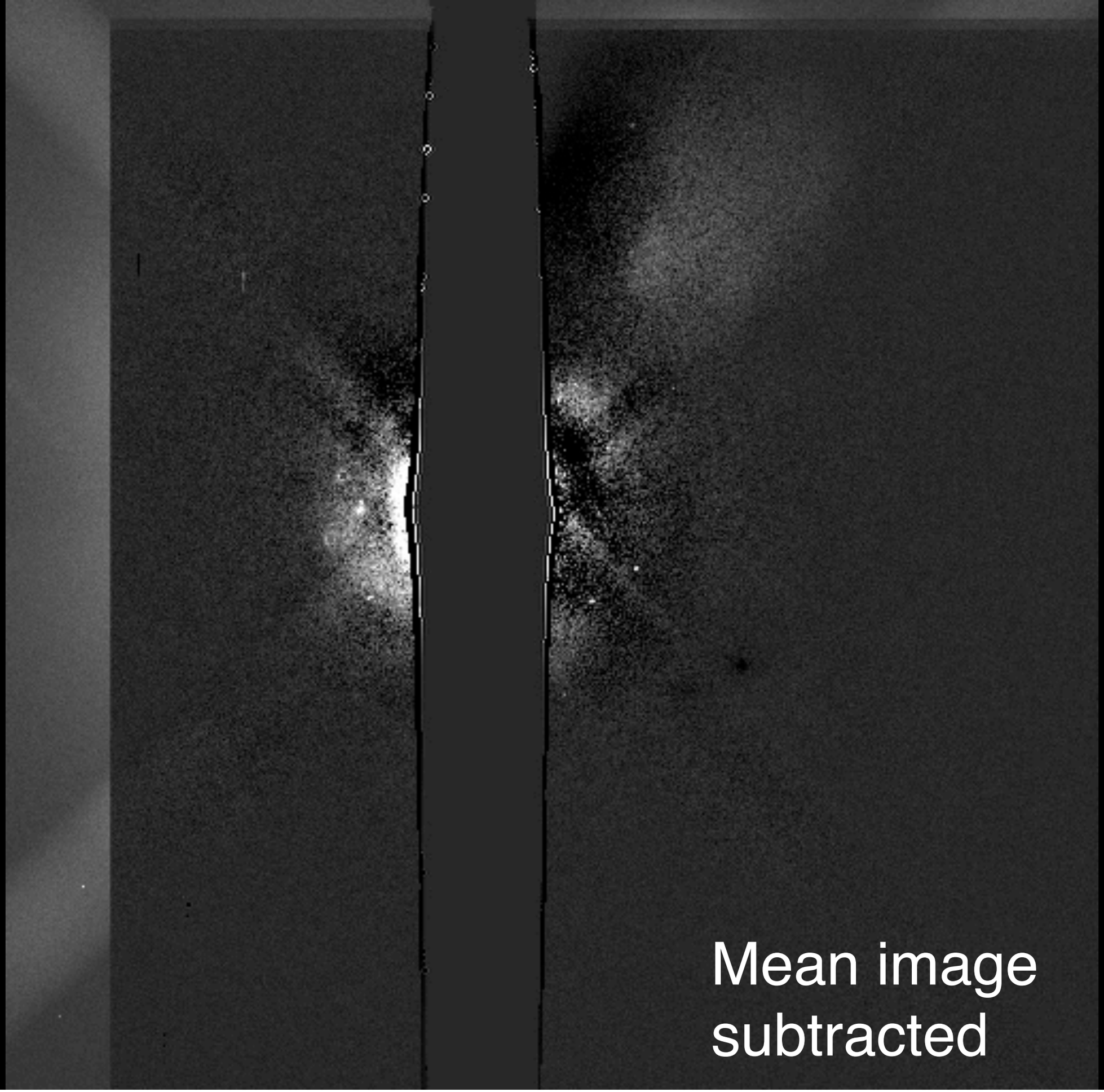
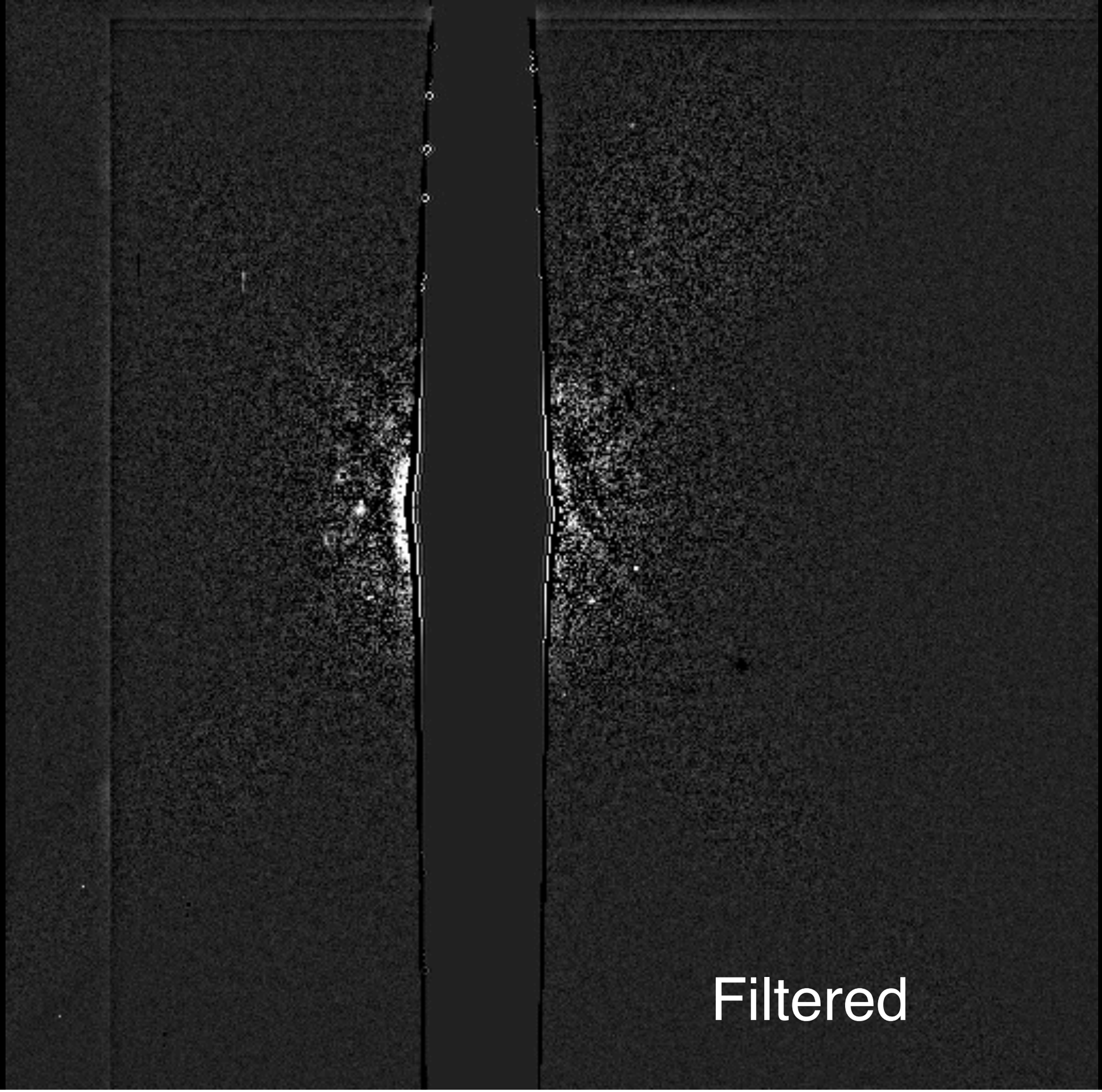
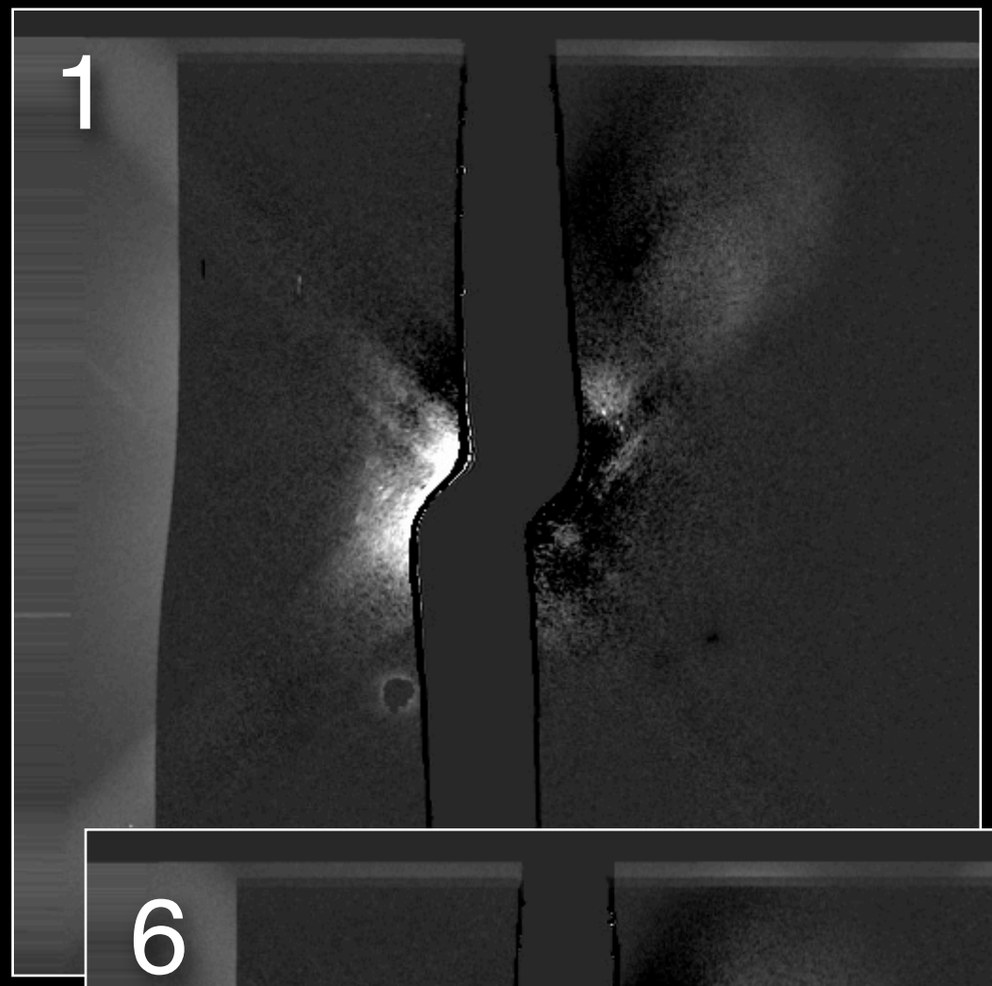

Proteus
Naiad
Galatea
Neptune
Thalassa
Despina
Larissa
Newly
discovered
moon
(S/2004 N 1)
Triton

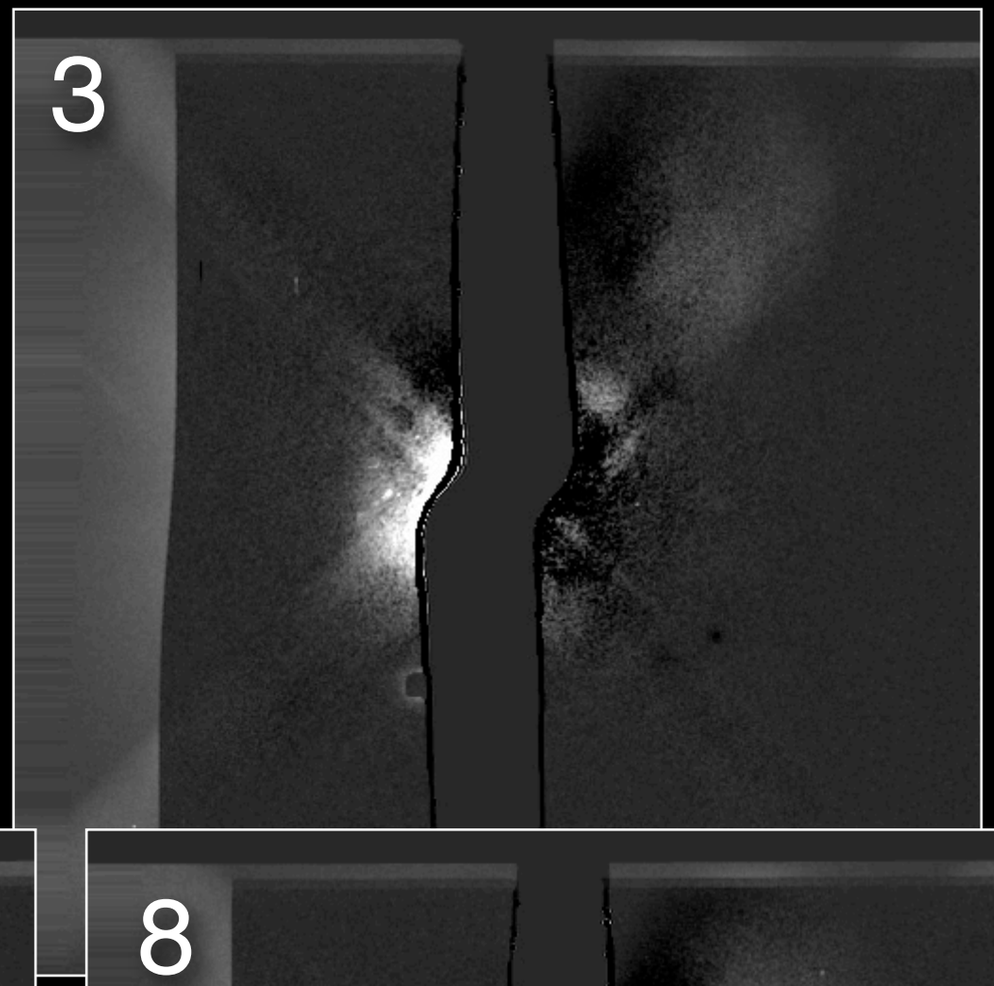

August 16, 2009
5 HST orbits
8 images/orbit
Unprocessed image

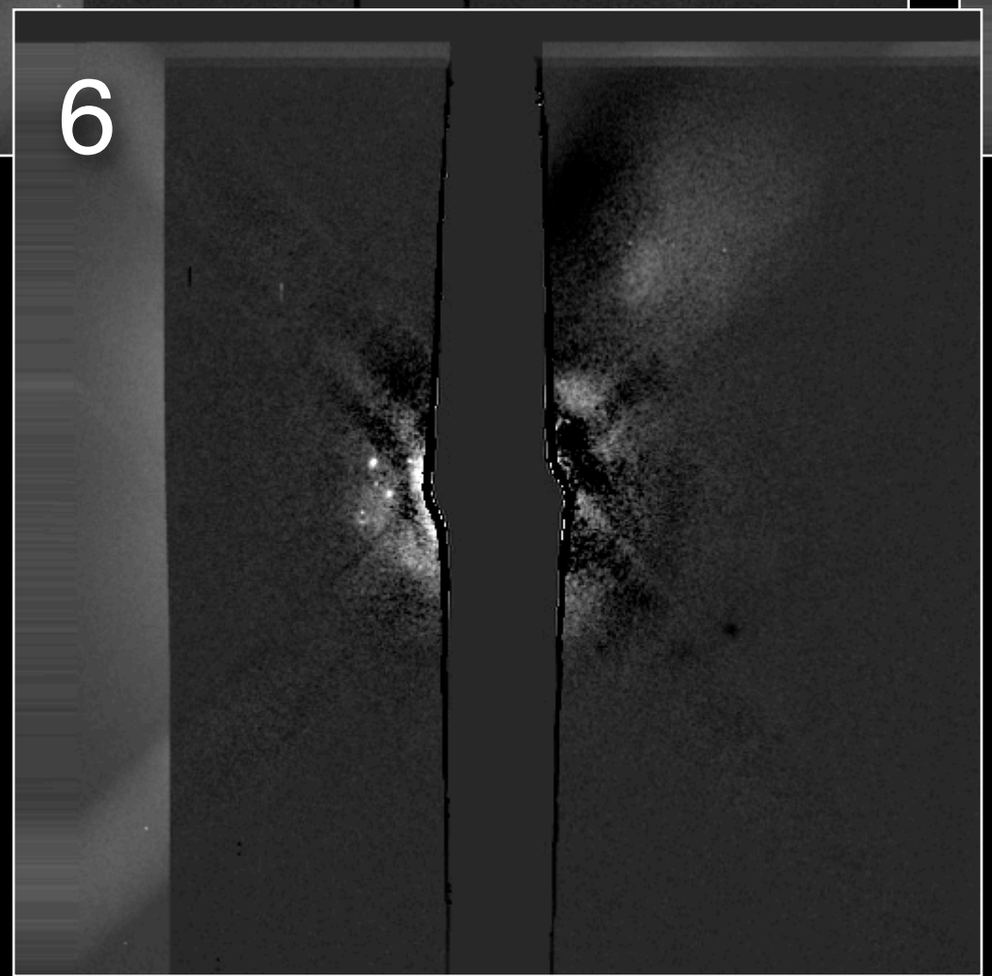
Cosmic ray hits removed

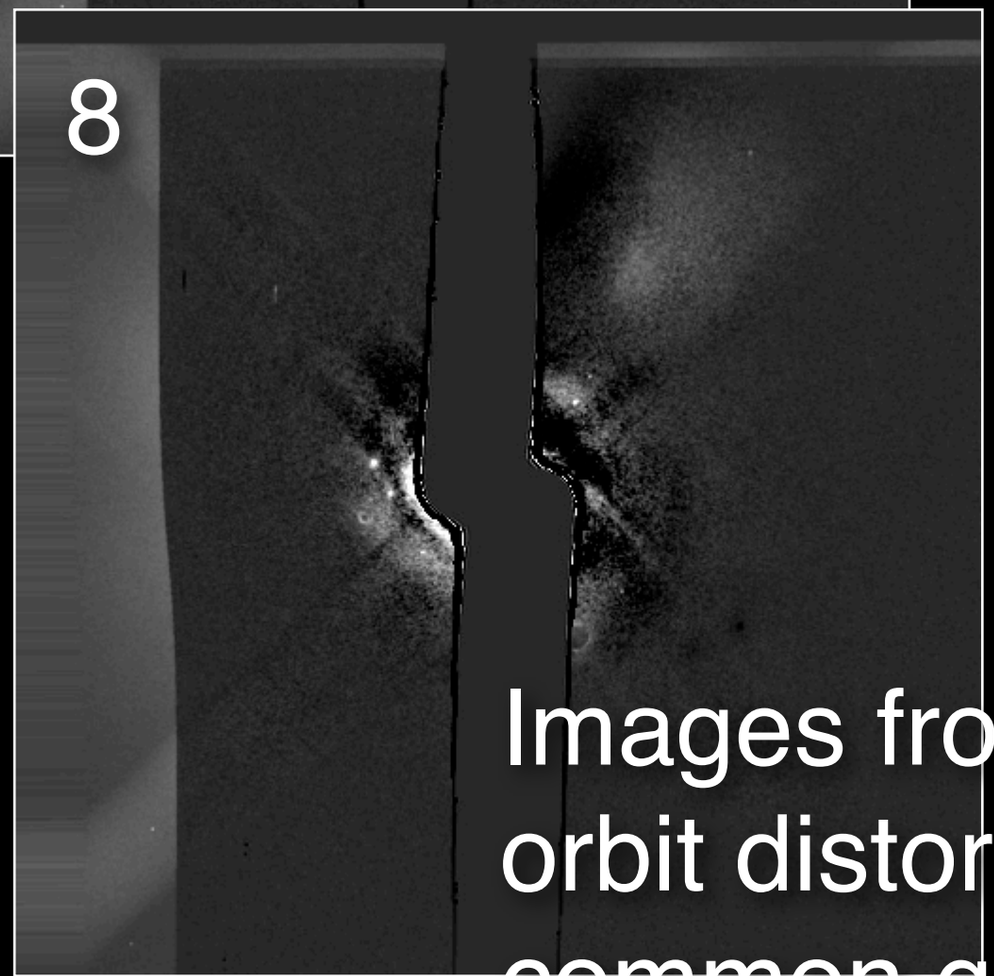

Mean image
subtracted


Filtered

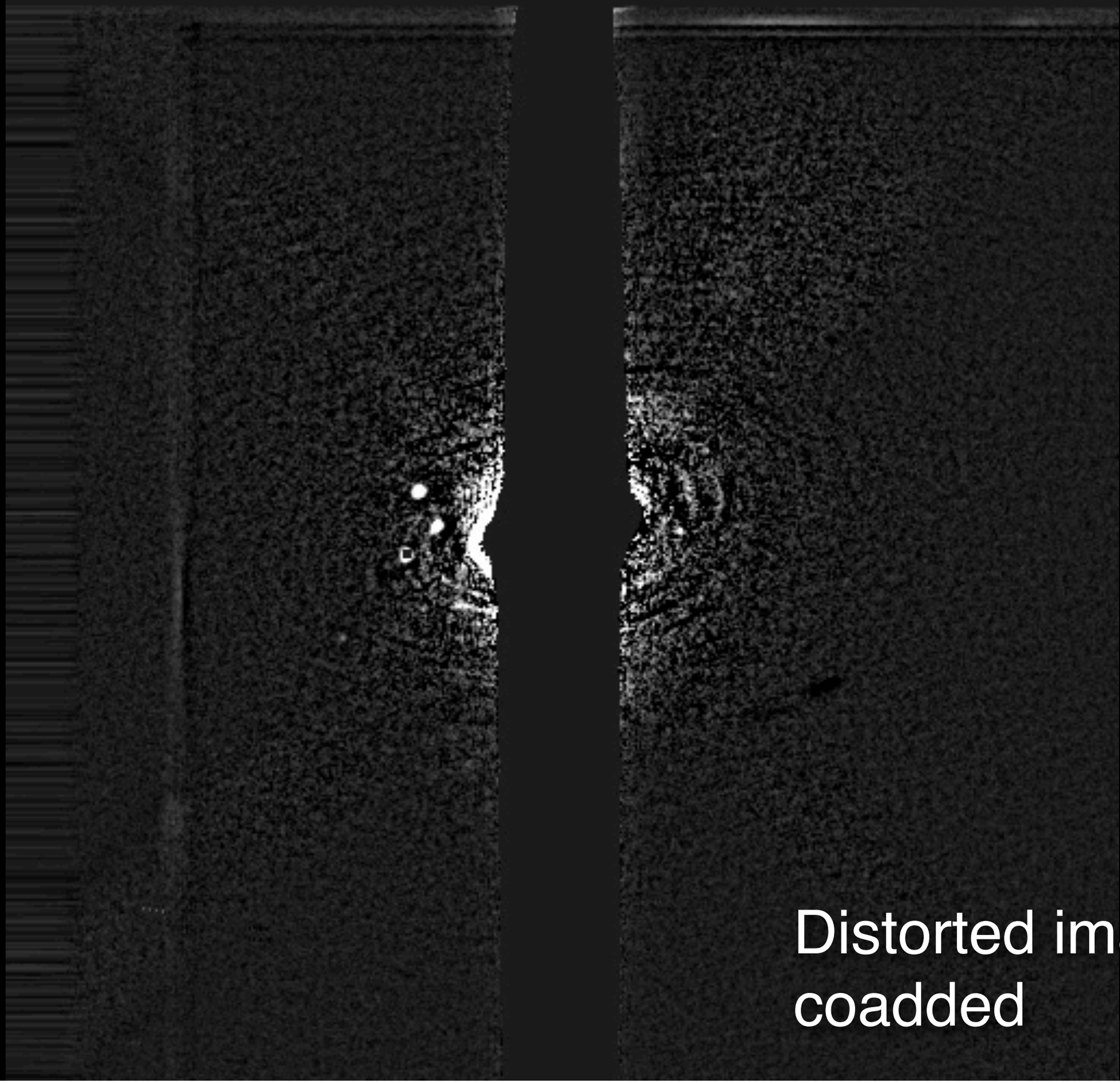


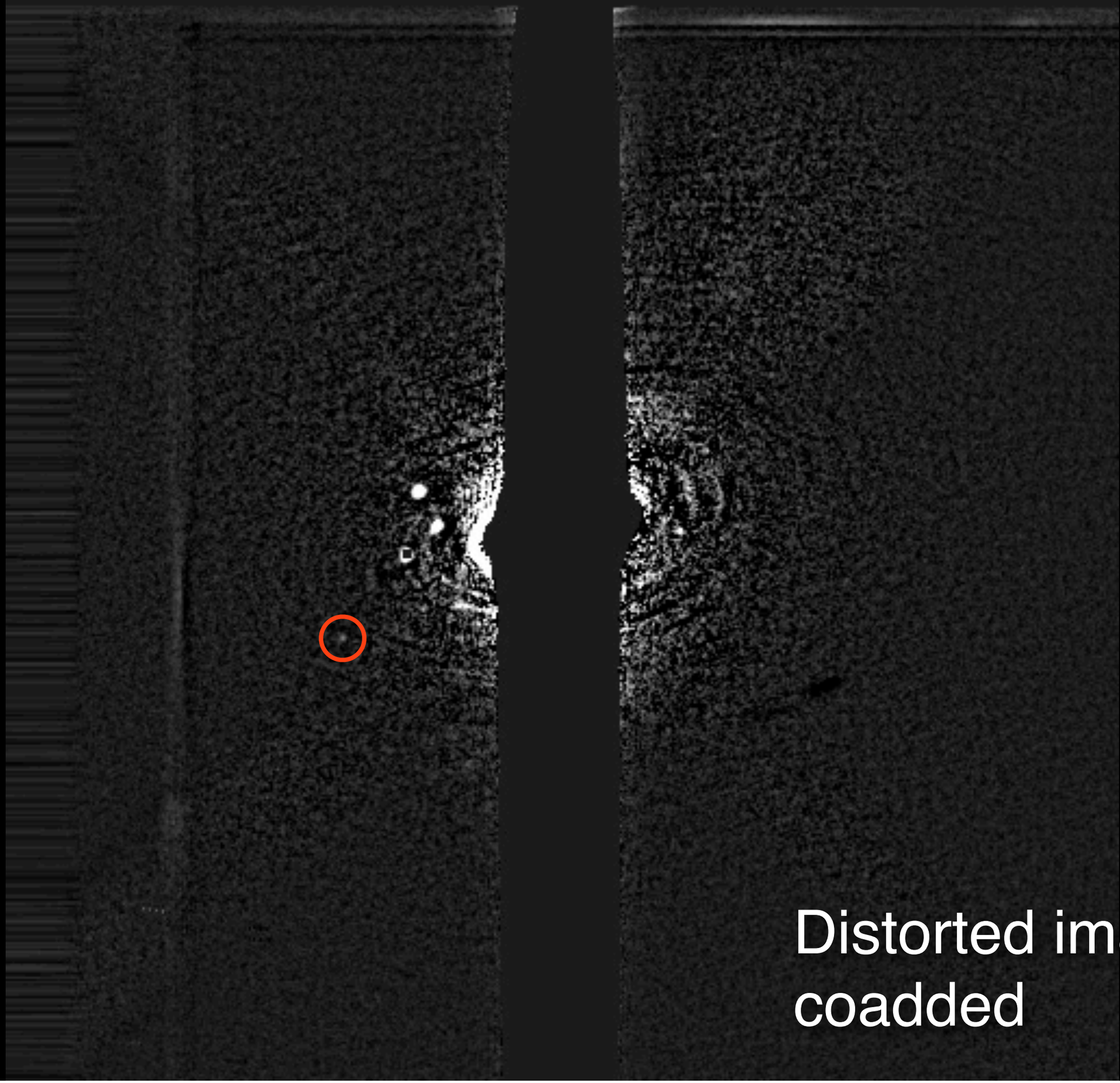



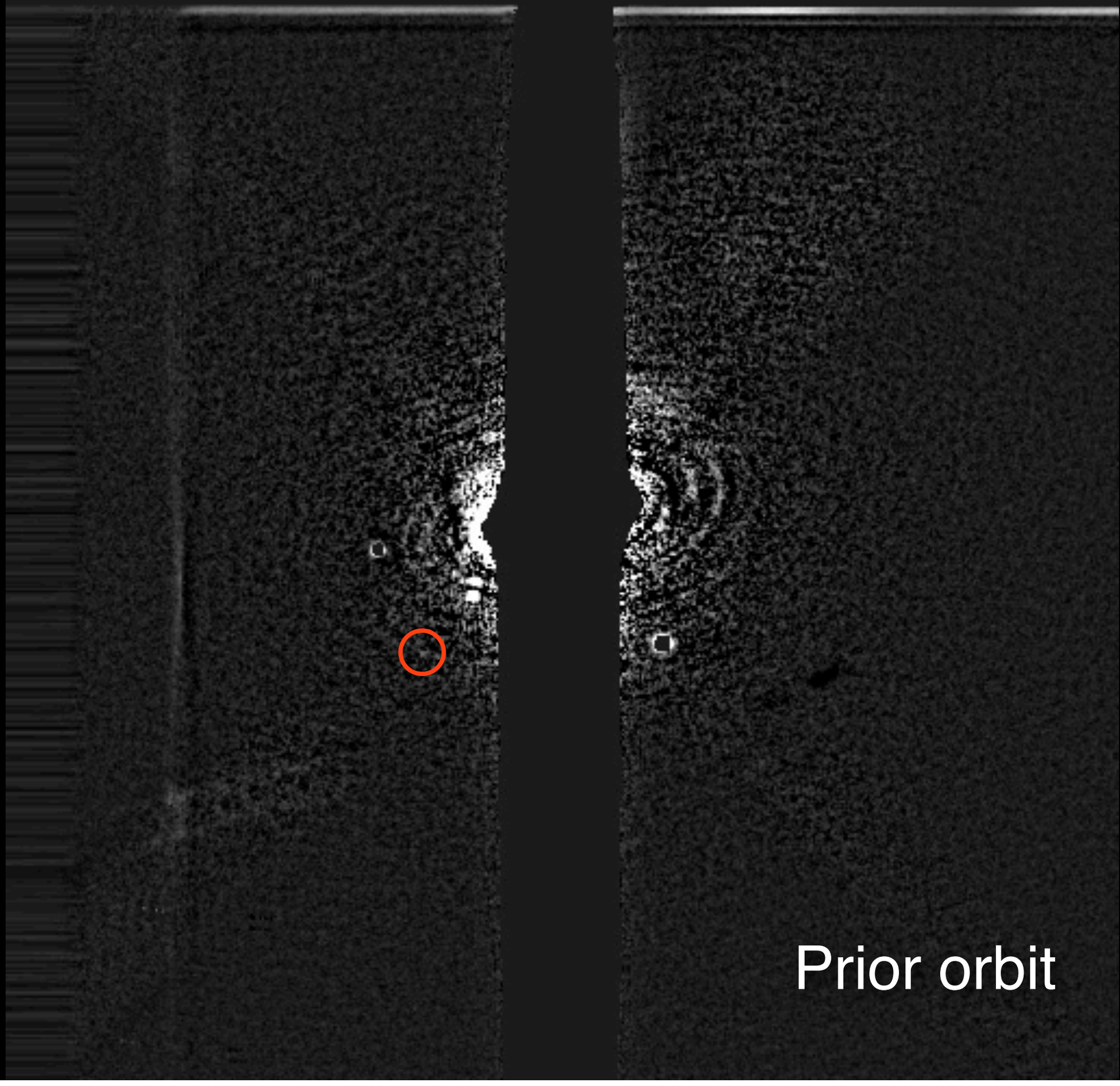




Images from each orbit distorted to a common geometry

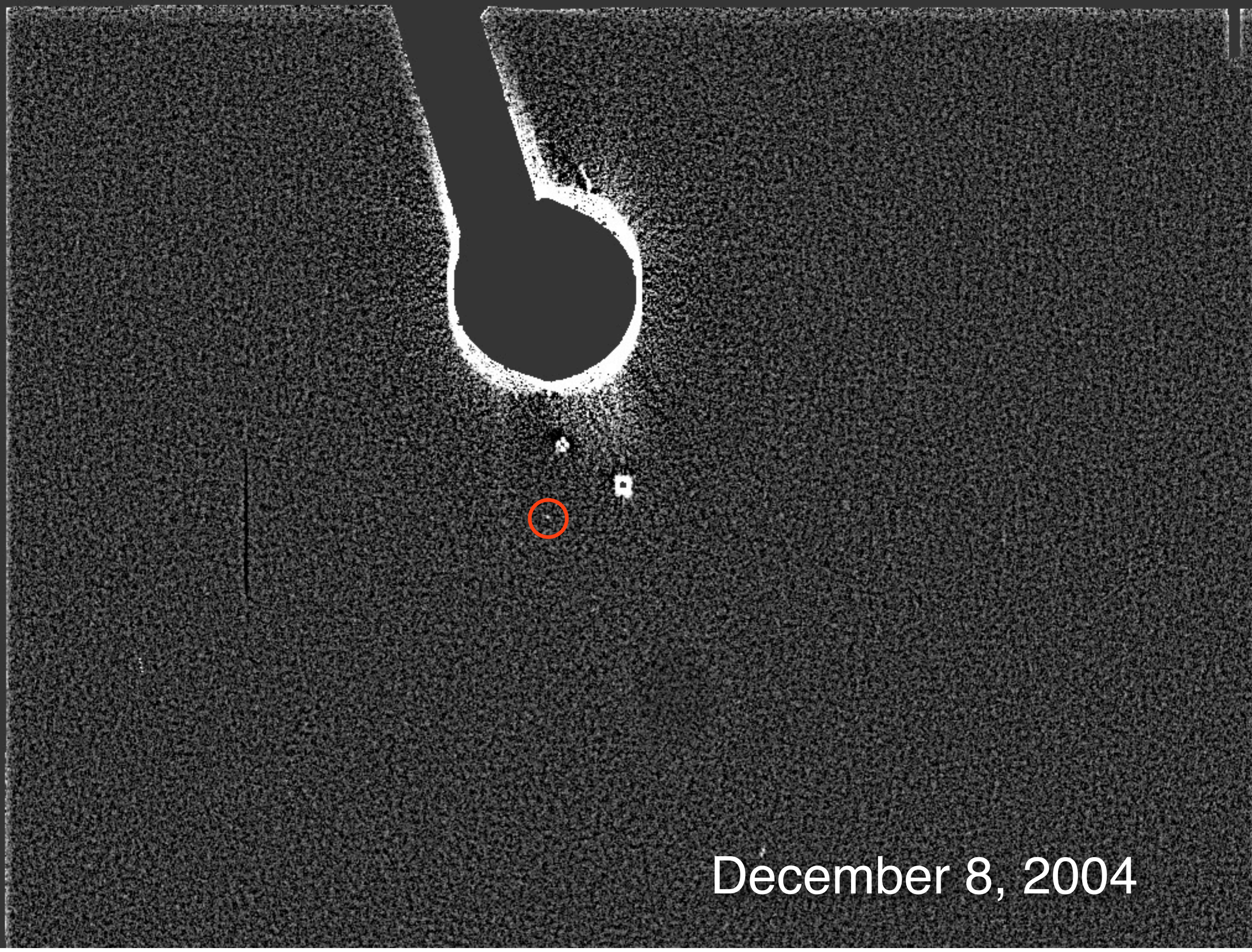

Distorted images
coadded

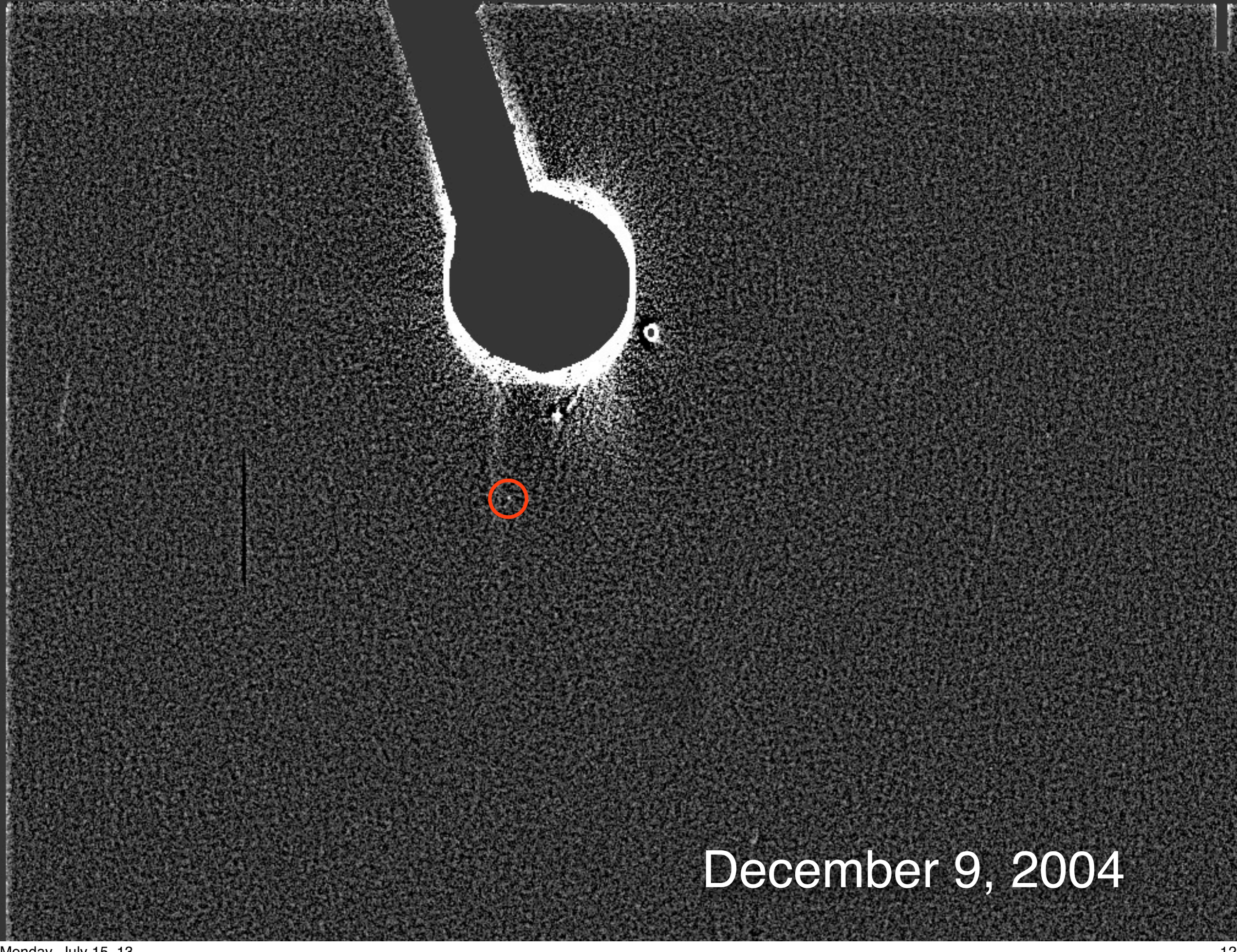


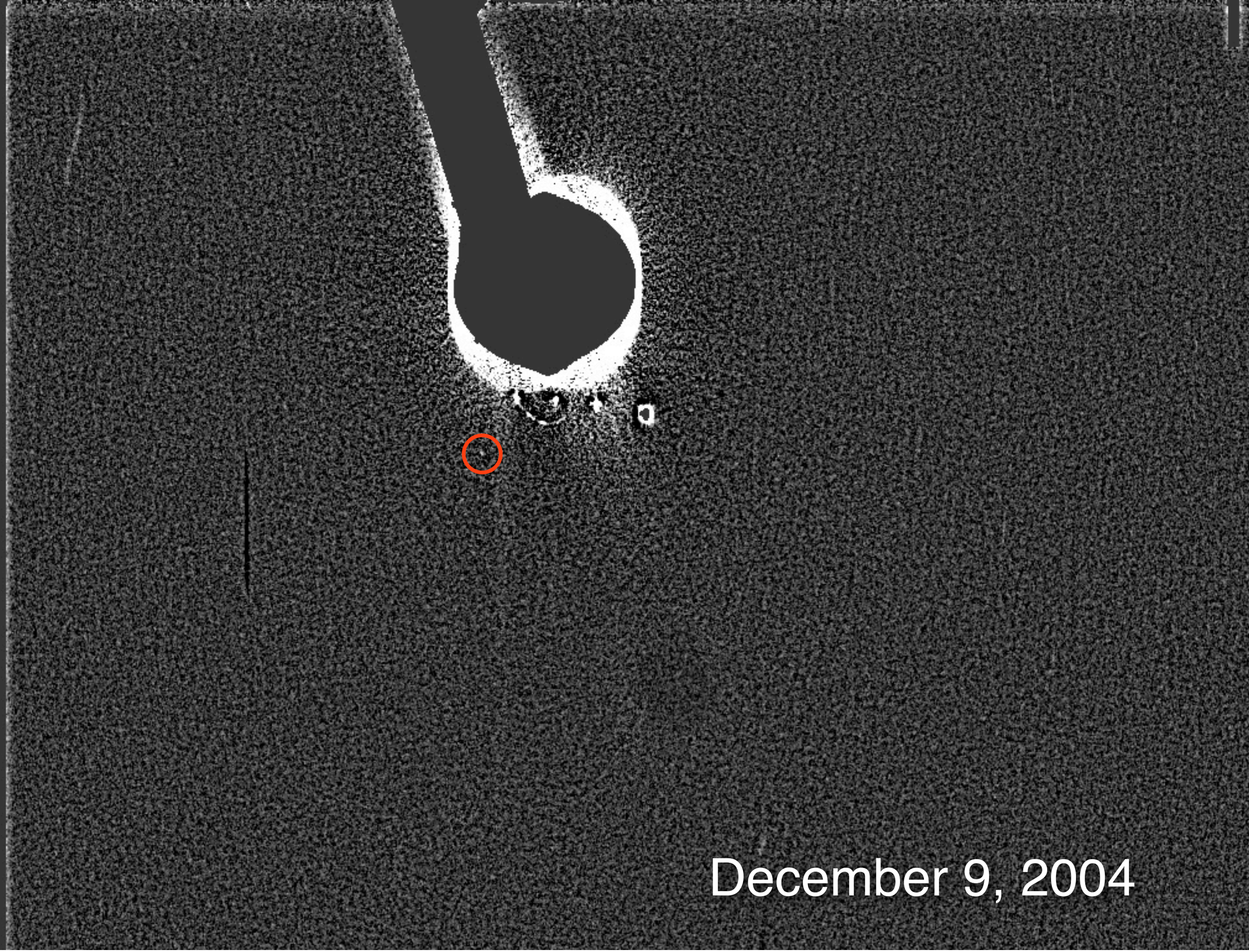
Distorted images coadded

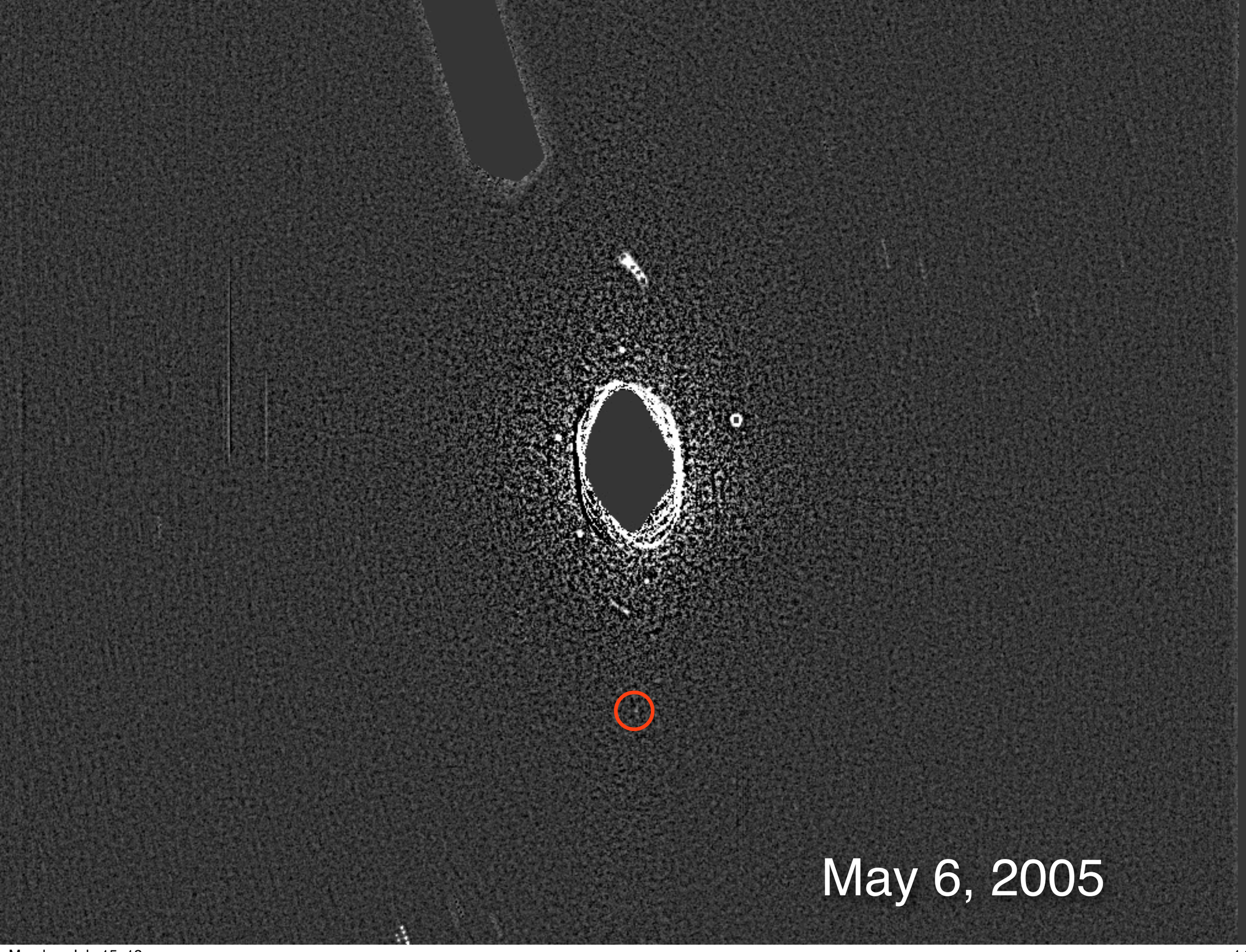

Prior orbit

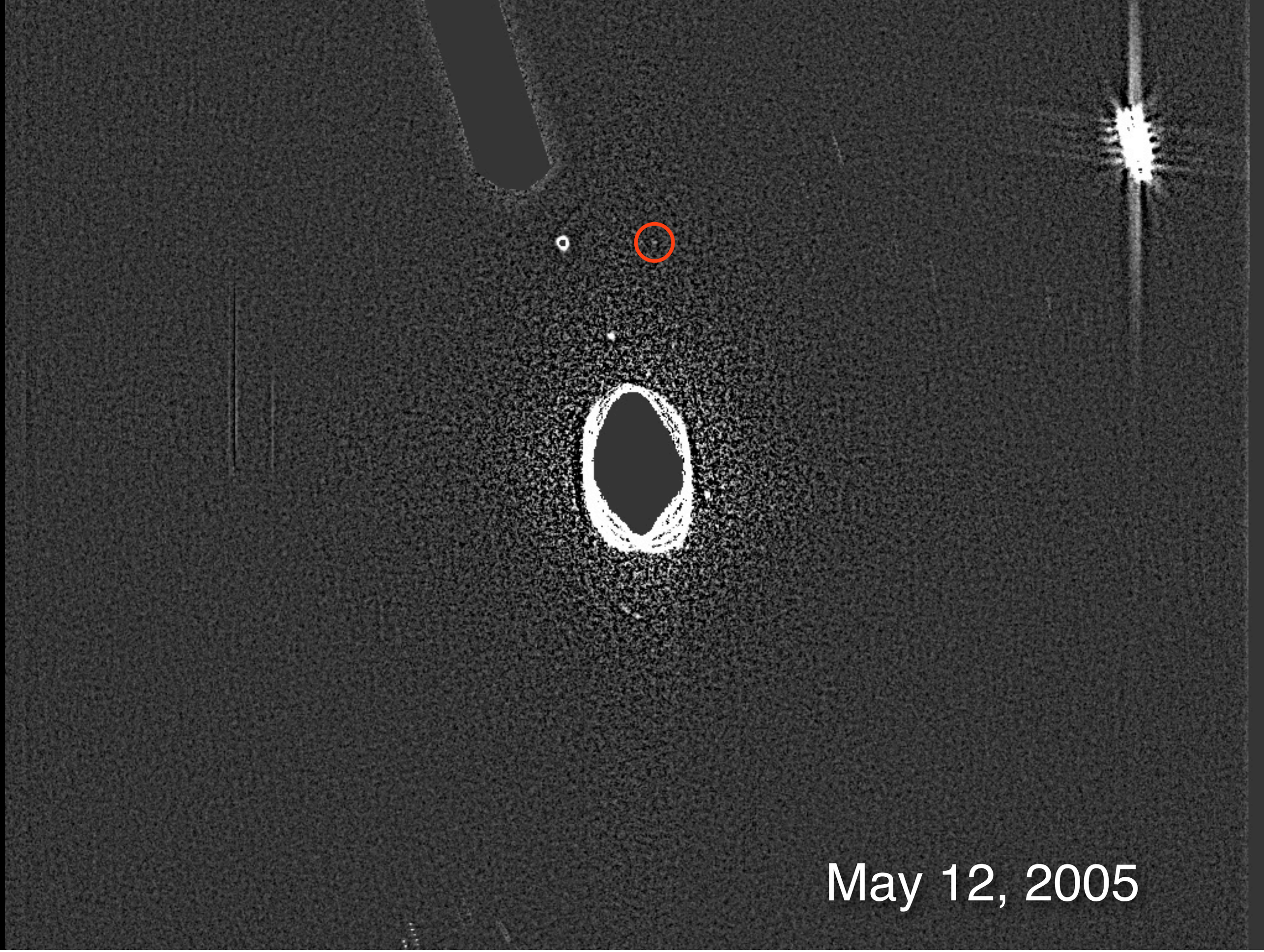

November 6, 2004
HRC + occulting mask


December 8, 2004


December 9, 2004


December 9, 2004


May 6, 2005


May 12, 2005

# S/2004 N 1

- Ten detections spanning 2004–2009.
- Mean motion 378.907 ± 0.01 °/day.
  - Period = 0.95 days.
- Measured orbital radius 105,300 km.
  - Between the orbits of Larissa and Proteus.
  - Based on its mean motion, 105,283 km.
- Magnitude 26.5 ± 0.3.
  - Assuming 10% albedo, radius = 8–10 km.

# Other comments

- Smaller than the detection threshold of the Voyager cameras at Neptune.
- Violates the previously noted monotonic trend in Neptunian moon size with orbital radius.
- No comparable moons have been detected.
  - Limit < 50% as bright.
- No associated dust rings have been detected.

NEW SATELLITE OF NEPTUNE: S/2004 N 1

M. R. Showalter, SETI Institute; I. de Pater, University of California, Berkeley; J. J. Lissauer, NASA Ames Research Center; and R. S. French, SETI Institute, report the discovery of a new satellite of Neptune. The object, provisionally designated S/2004 N 1, was detected in ten separate sets of images taken by the Hubble Space Telescope (HST) spanning 2004-2009. Each set of images comprises multiple long exposures obtained within a single 50-min observing window defined by one orbit of HST. Images within each orbit were co-added, while allowing for the small but predictable pixel shifts associated with circular, equatorial motion around Neptune. Observation times, measured offsets from Neptune, and S/N ratios are as follows:

| Date UT | Offset | S/N |
|---|---|---|
| 2004 Nov. 6.435 | -4".73 E, -0".55 N | 4.9 |
| 2004 Dec. 8.305 | +4".60 E, +1".10 N | 7.7 |
| 2004 Dec. 9.305 | +4".19 E, +1".75 N | 5.8 |
| 2004 Dec. 9.362 | +3".12 E, +2".26 N | 5.1 |
| 2005 Apr. 1.845 | -4".09 E, -1".91 N | 4.1 |
| 2005 May 6.961 | -4".60 E, -1".53 N | 5.1 |
| 2005 May 12.224 | +4".23 E, +2".02 N | 5.9 |
| 2005 May 17.021 | +3".45 E, +2".42 N | 3.6 |
| 2009 Aug. 19.609 | -3".56 E, +0".26 N | 4.4 |
| 2009 Aug. 19.673 | -4".56 E, -0".79 N | 8.2 |

The instruments used were ACS/HRC, except for WFC3/UVIS in 2009. The initial astrometry is consistent with a body traveling on a near-circular, uninclined orbit. The inferred mean motion (n) is 378.907 +/- 0.001 degrees/day (P = 0.95 days). The projected radial distance from the planet's center is 105300 +/- 500 km, placing the satellite between the orbits of Neptune VII (Larissa) and VIII (Proteus). The orbital radius is consistent with a semimajor axis of 105283 km, as derived from n. The satellite's V magnitude is 26.5 +/- 0.3. If the satellite has an albedo of 0.1, comparable to that of the other nearby satellites, then it has a radius of 8-10 km; this makes it much smaller than any of Neptune's previously known satellites, and below the detection threshold of the Voyager cameras.