THE GALACTIC CENTRE IN MID-INFRARED

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COST 3rd WGs Meeting, Bologna

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The GC in Multi-wavelength

HST/NICMOS Survey of the Galactic Centre

Galactic Center Survey
HST NICMOS
SST IRAC

50 light-years
15.3 parsecs   6'35"

Arched Filaments

Arches Cluster

N
E

Sickle

Quintuplet Cluster

Pistol Star
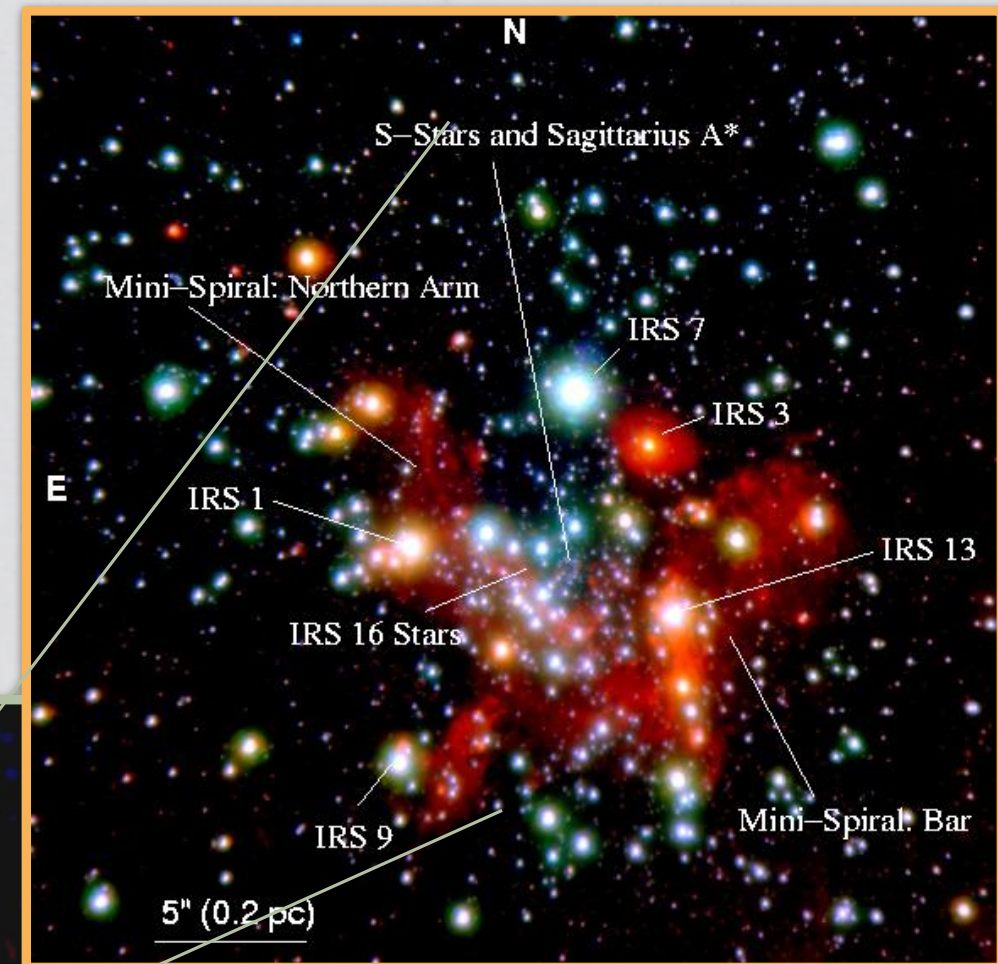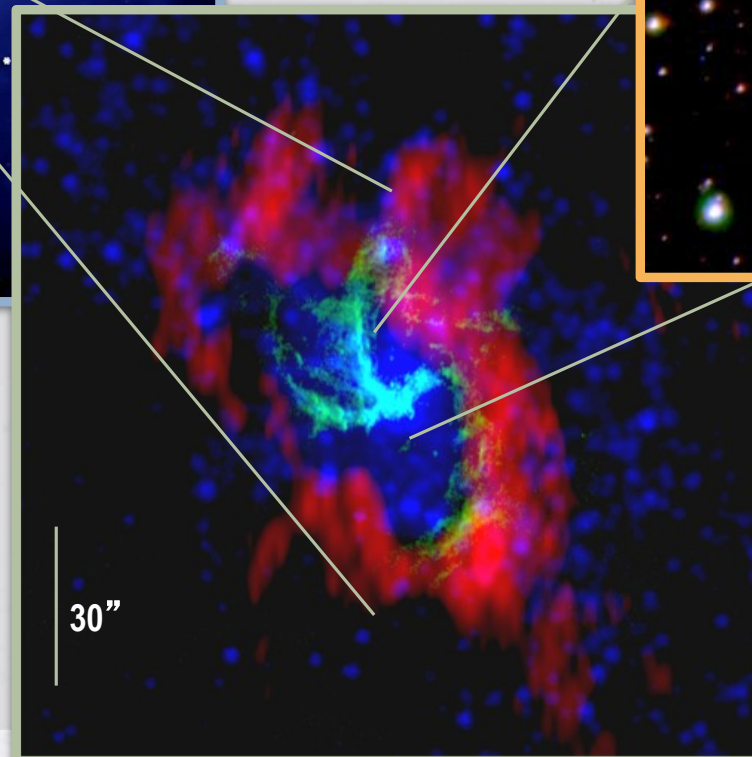
Sgr A

Credit: NASA, ESA, and Z. Levay

Wang+10

The Galactic Centre
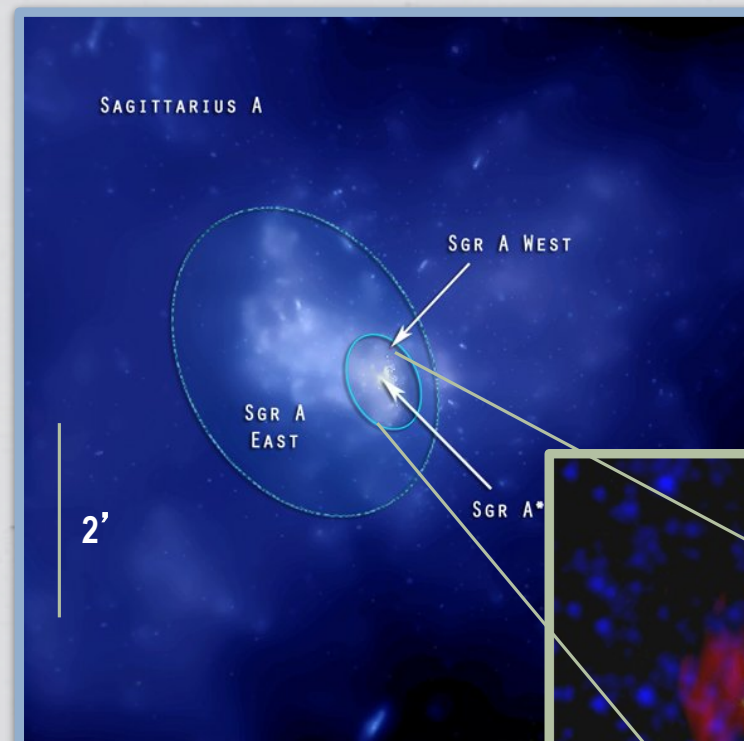
Chandra X-ray Observatory

NRAO/AUI

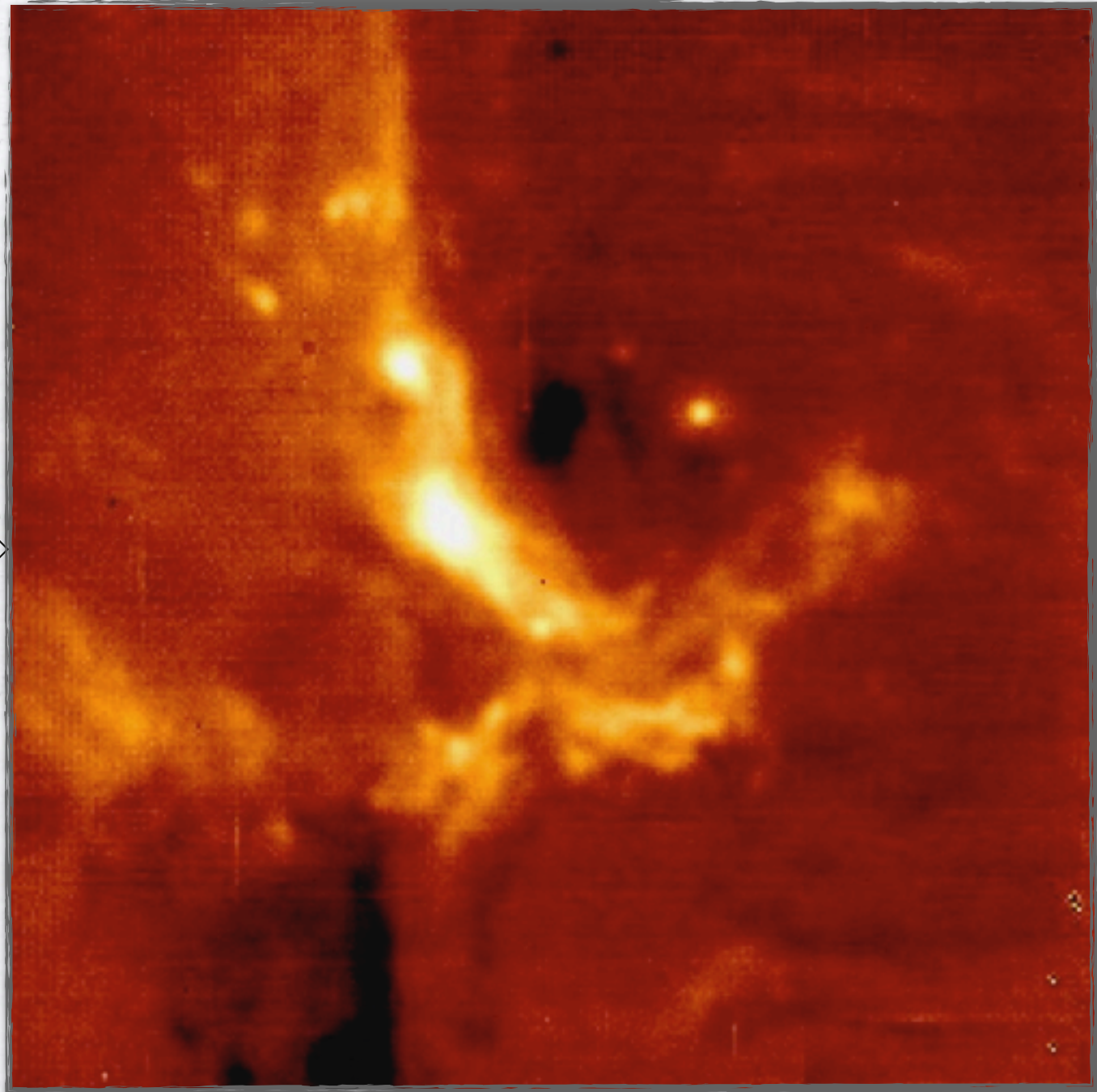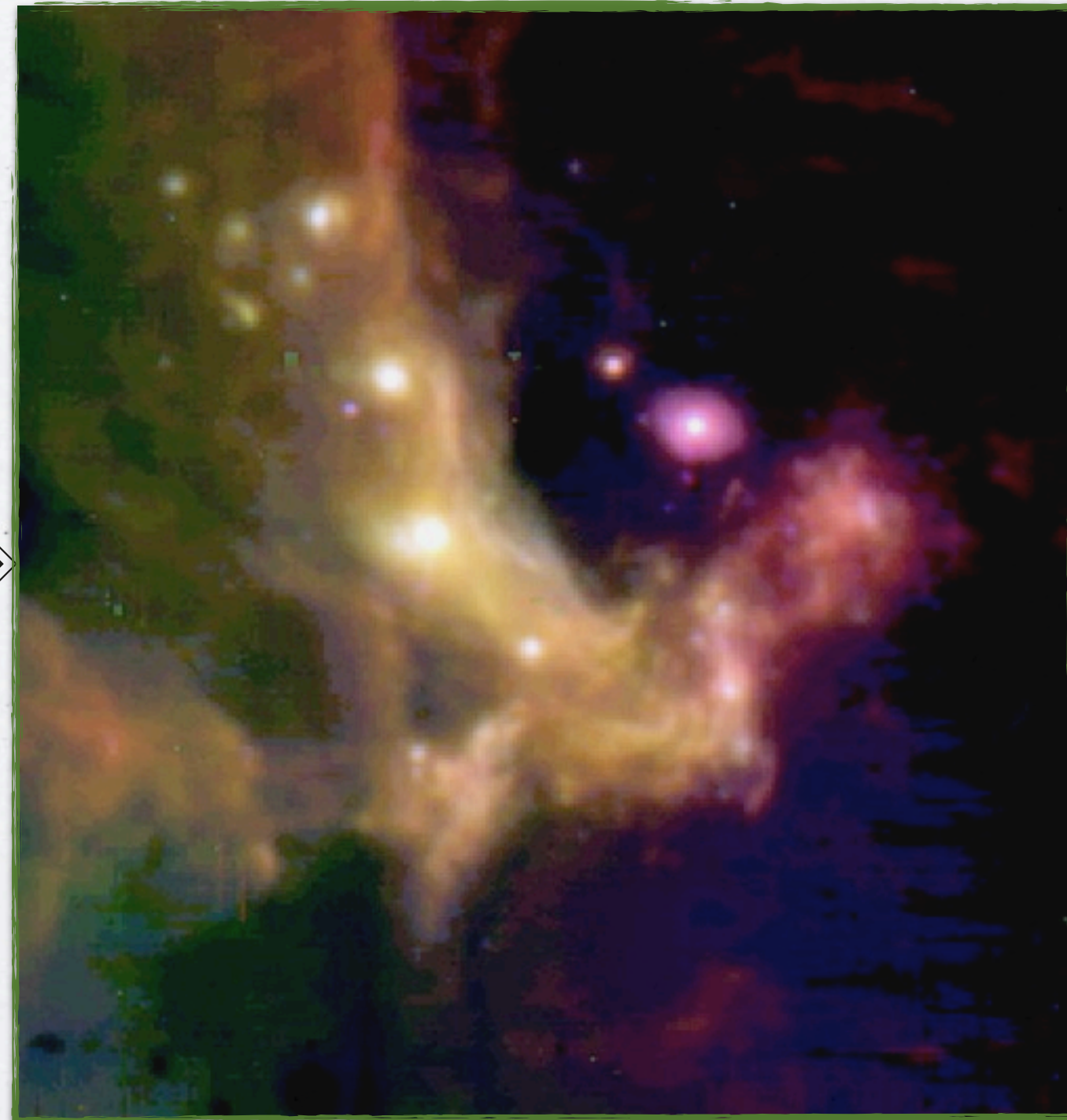VLT/PH1

The GC in Mid-Infrared

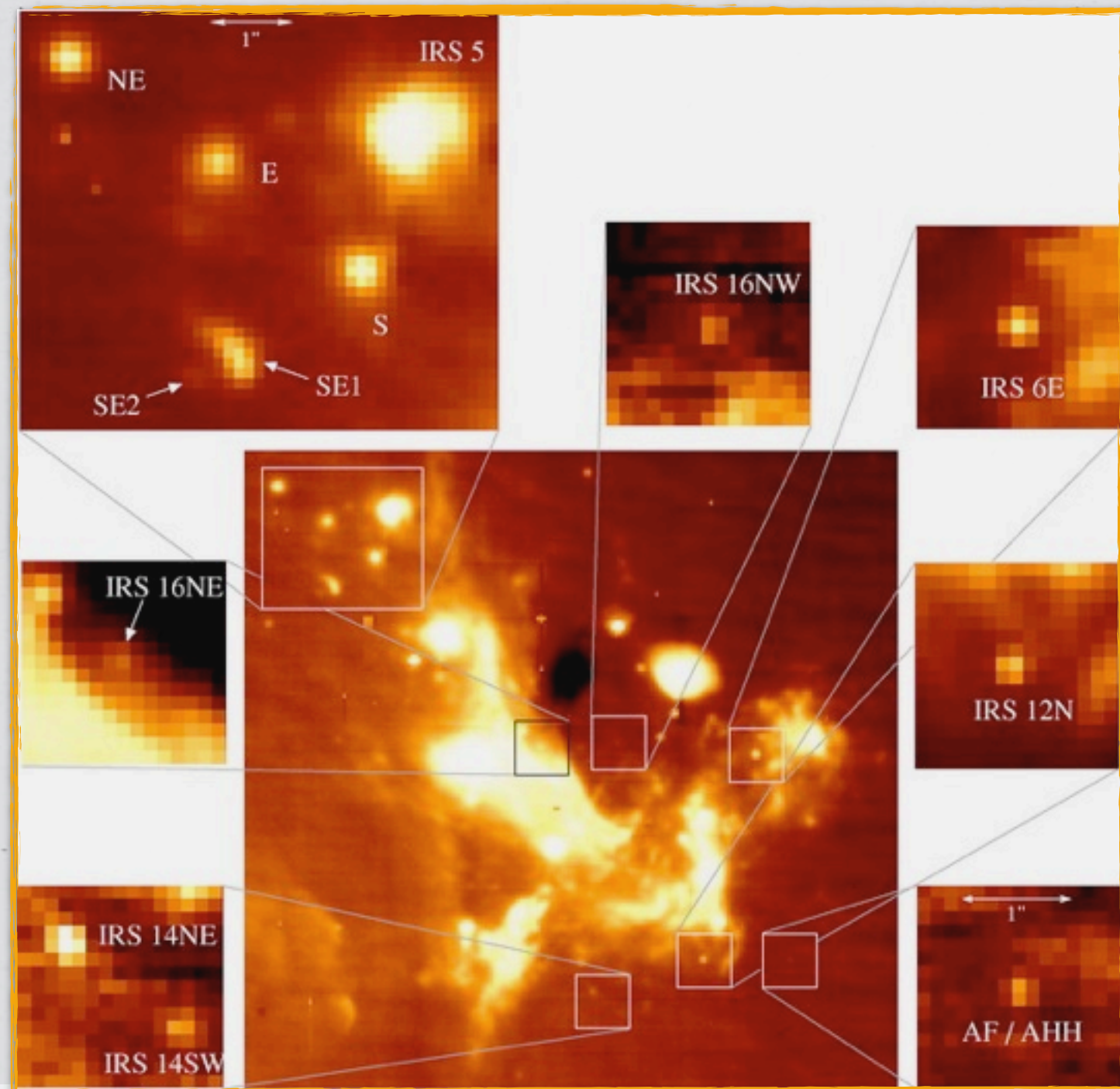VISIR 19.5 μm image of the GC. The field of view is **32" × 32"**. East is to the left, and north is up

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The GC in Mid-Infrared

VISIR N-band three-color composite view of the GC. The blue is 8.6 μm, green is 11.3 μm, and red is 12.8 μm.
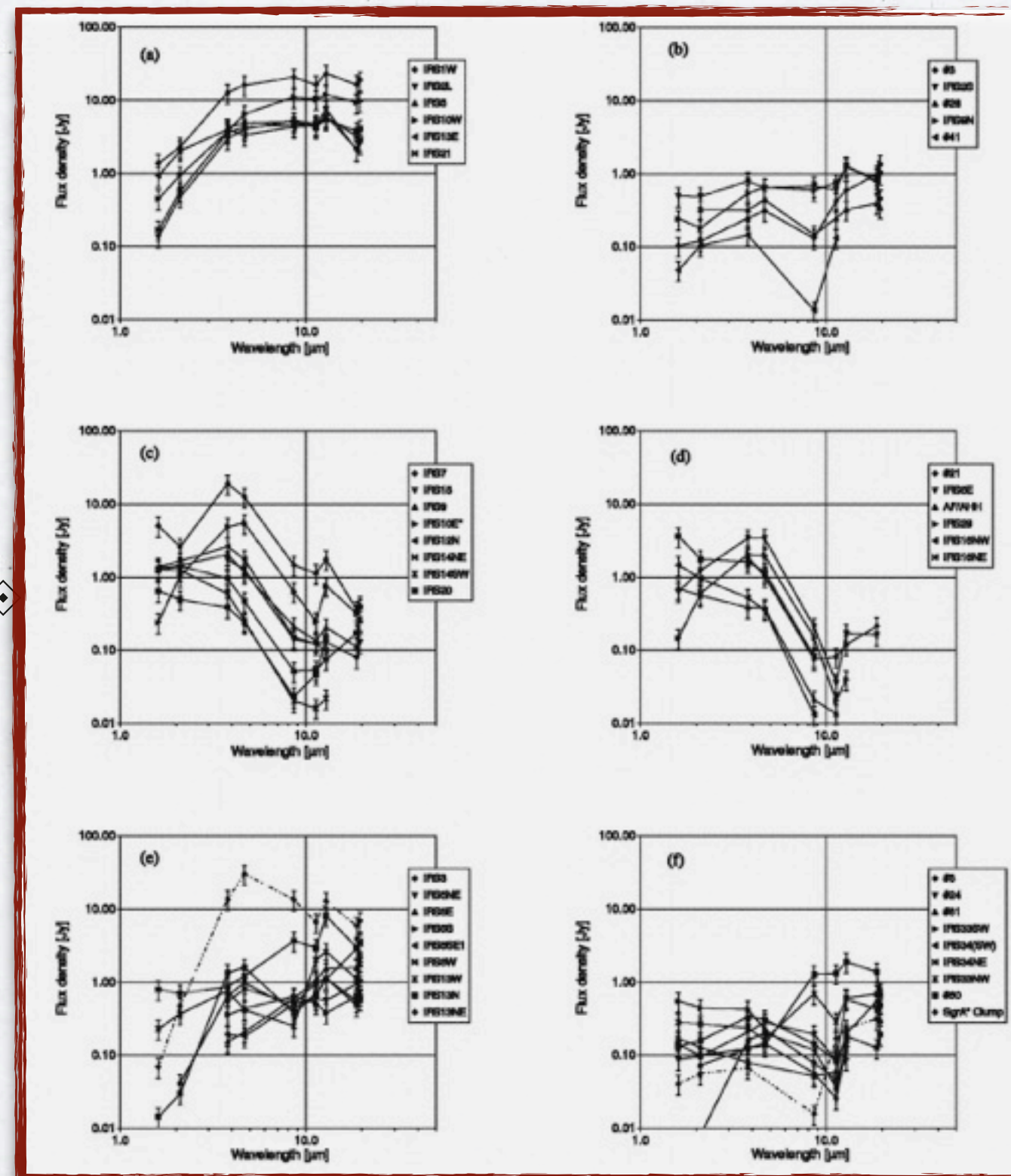
Viehmann+06

The GC in Mid-Infrared

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SEDs of GC Mid-Infrared Sources

(a) typical luminous bow shock sources

(b) lower luminosity bow shock sources

(c) cool stars

(d) hot stars

(e) and (f) the SEDs of unclassified sources

Viehmann+06

CLOSING IN| THE SMBH

The Galactic Centre

*   **SMBH of ~4 x 10^6 Msol at a distance of ~8.3 ± 0.3 kpc**

Eckart & Genzel 1996/1997 (first proper motions)
Eckart et al. 2002 (S2 is bound; first elements)
Schödel et al. 2002, 2003 (first detailed elements)
Ghez et al. 2003 (detailed elements)
Eisenhauer 2005, Gillessen et al. 2009 (improved elements on more stars and distance)

Gillessen+ 2009

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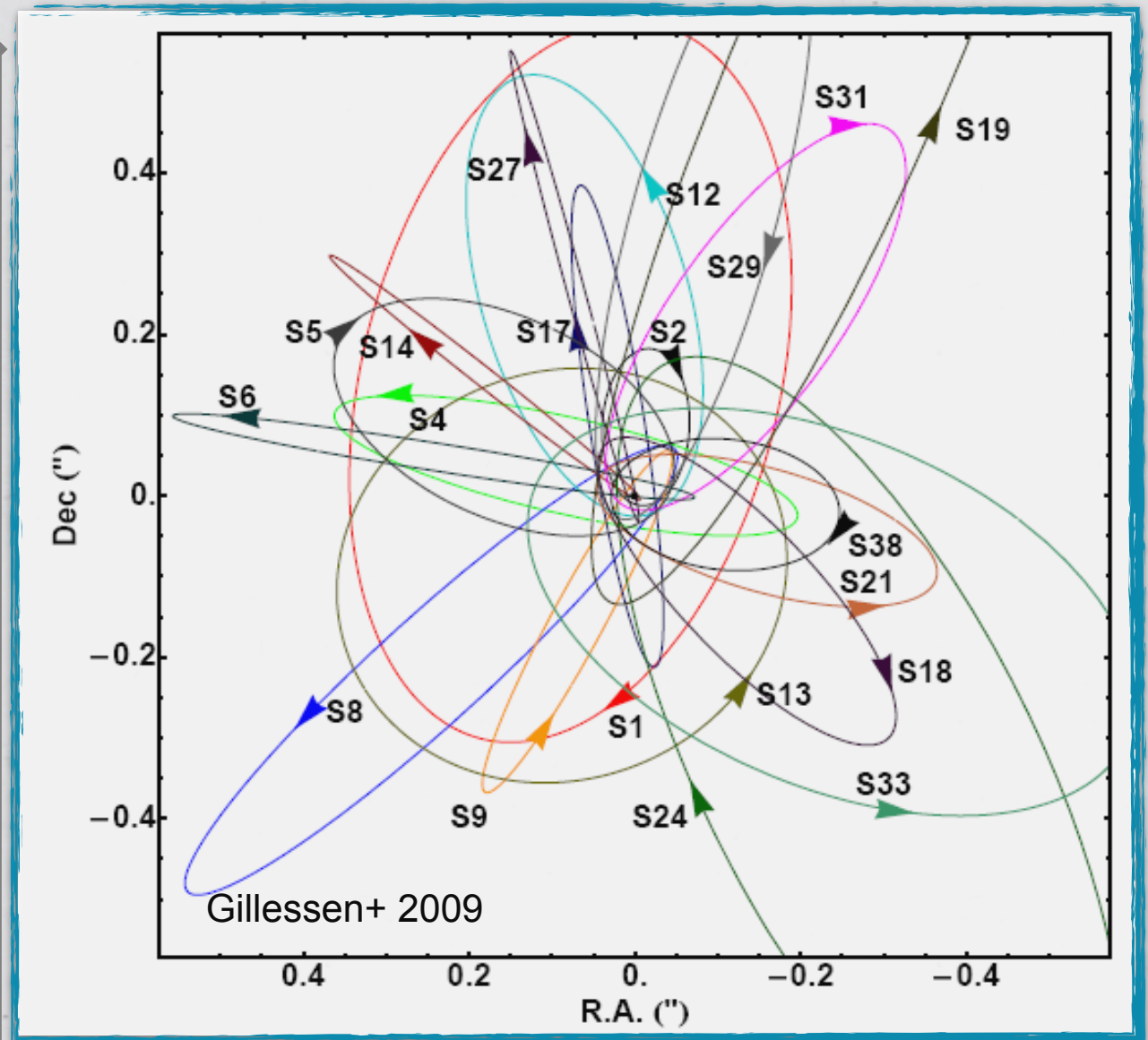
Sagittarius A*

∗ Stellar motions and variable emission associate Sgr A* with a 4 × 10^6 Msol SMBH

∗ Radio, NIR and X-ray observations detect variable and polarized emission

∗ Sgr A* is under luminous (10^-9...^-10 L_Edd) & many orders of magnitudes below other comparable SMBHs AGN

∗ With the exception of the closest galaxies, no extragalactic SMBH with a similar feeble Eddington rate would be observable

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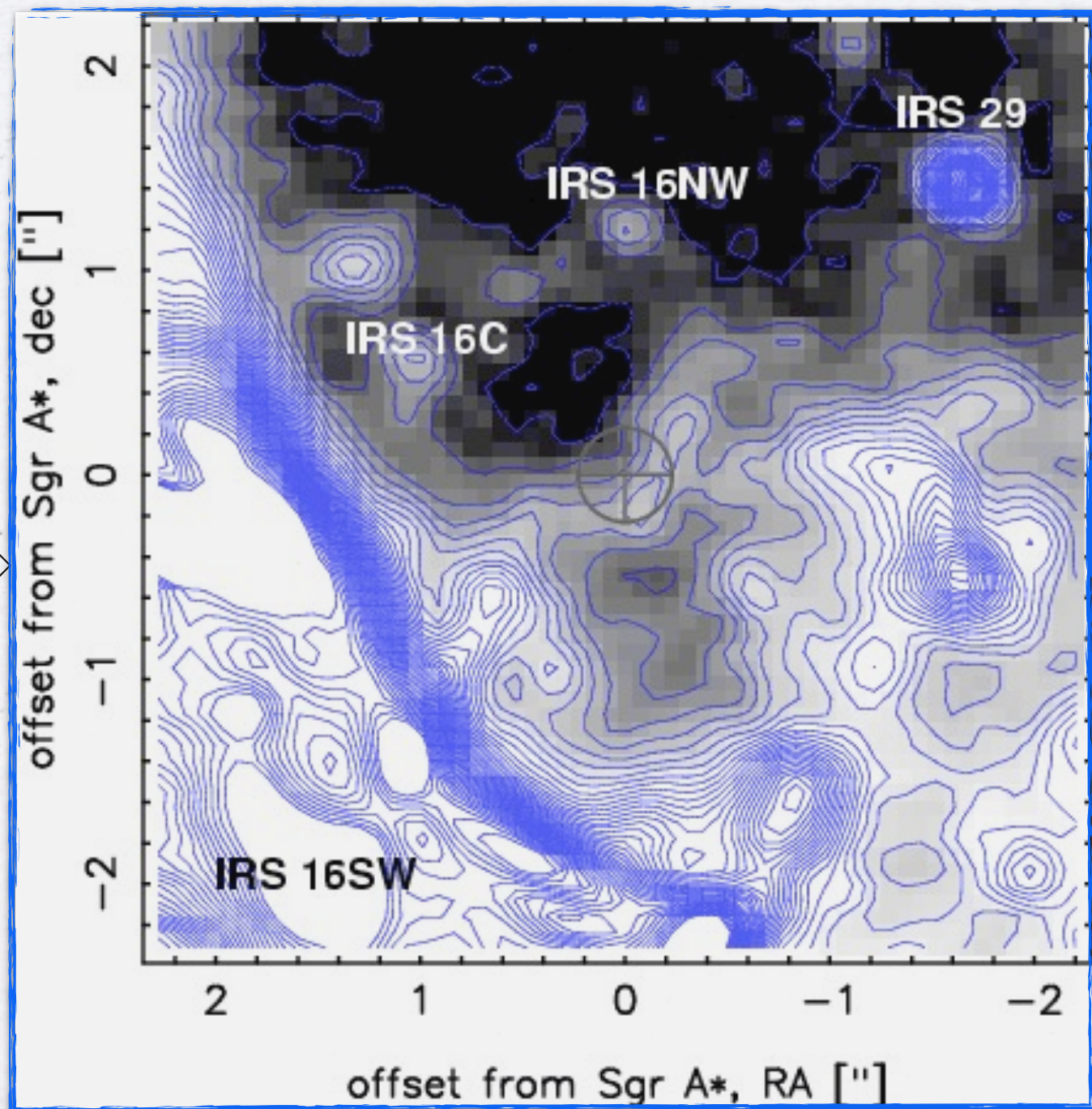
Sgr A * and Surroundings at 8.6 µm

Direct shift- and-add image

Contour lines are plotted in steps of 0.5mJy from 0.5 to 20 mJy per pixel

Schödel+07
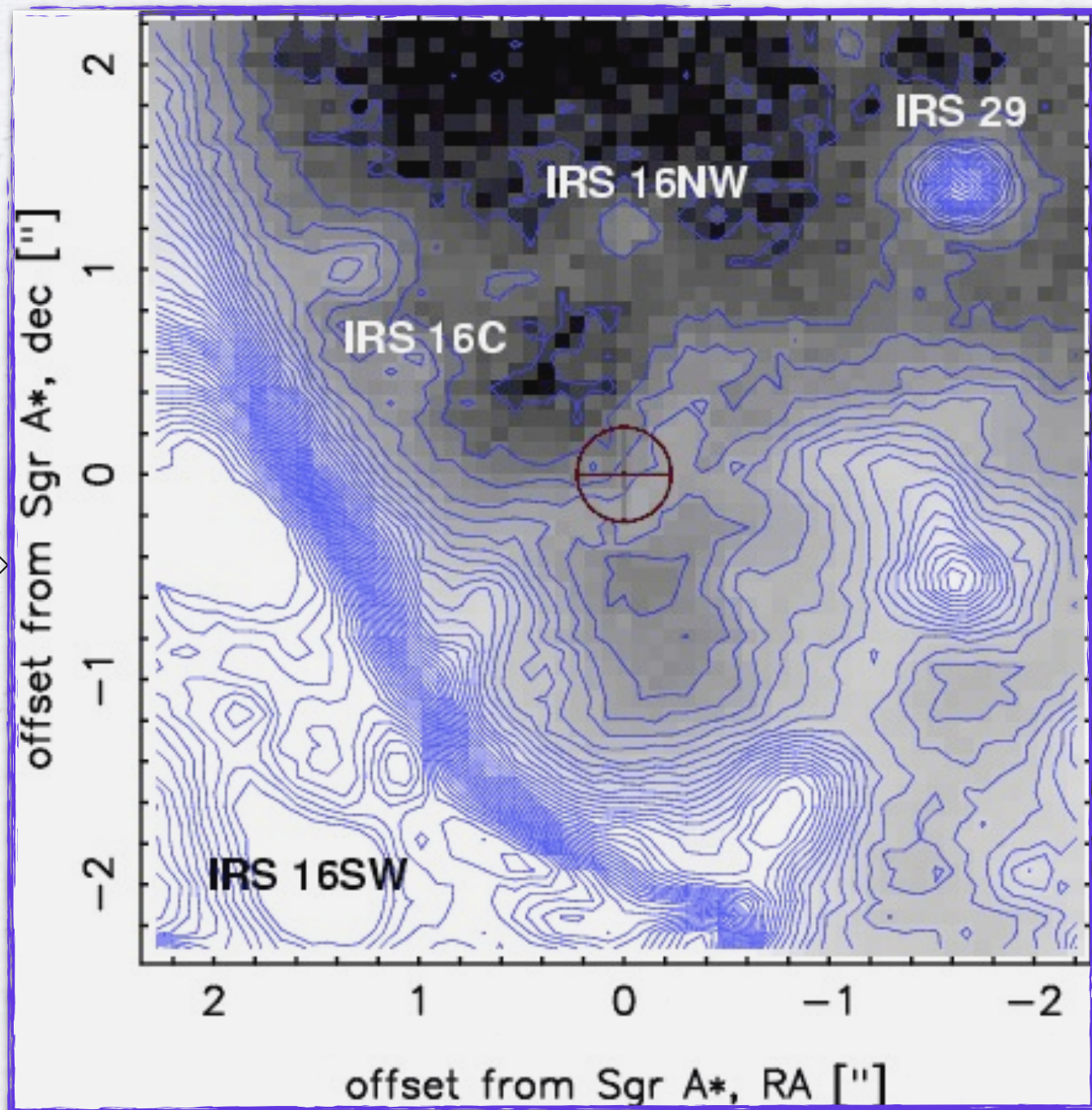
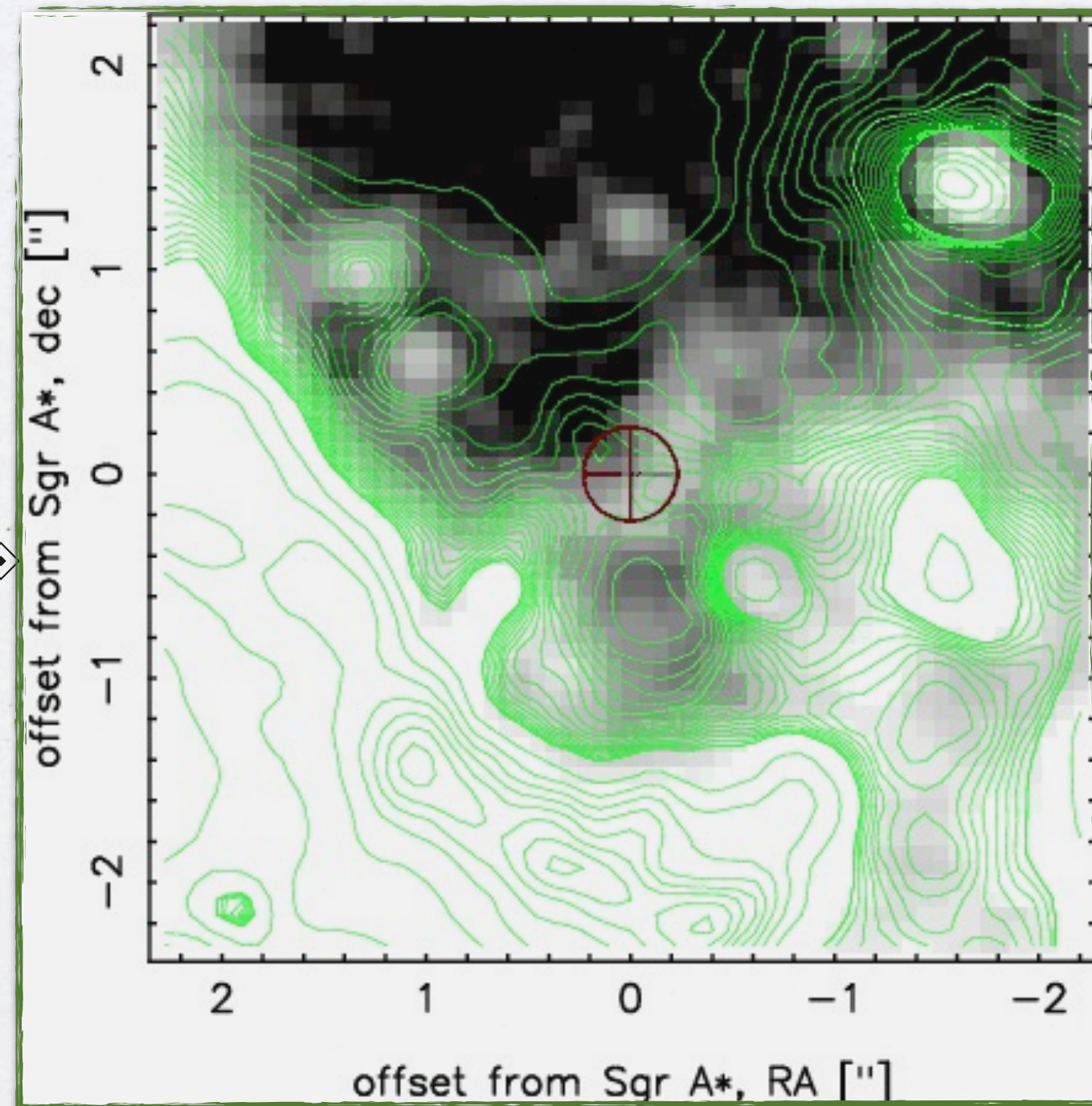# Sgr A * and Surroundings at 8.6 µm

The Lucy-Richardson deconvolved and beam-restored image
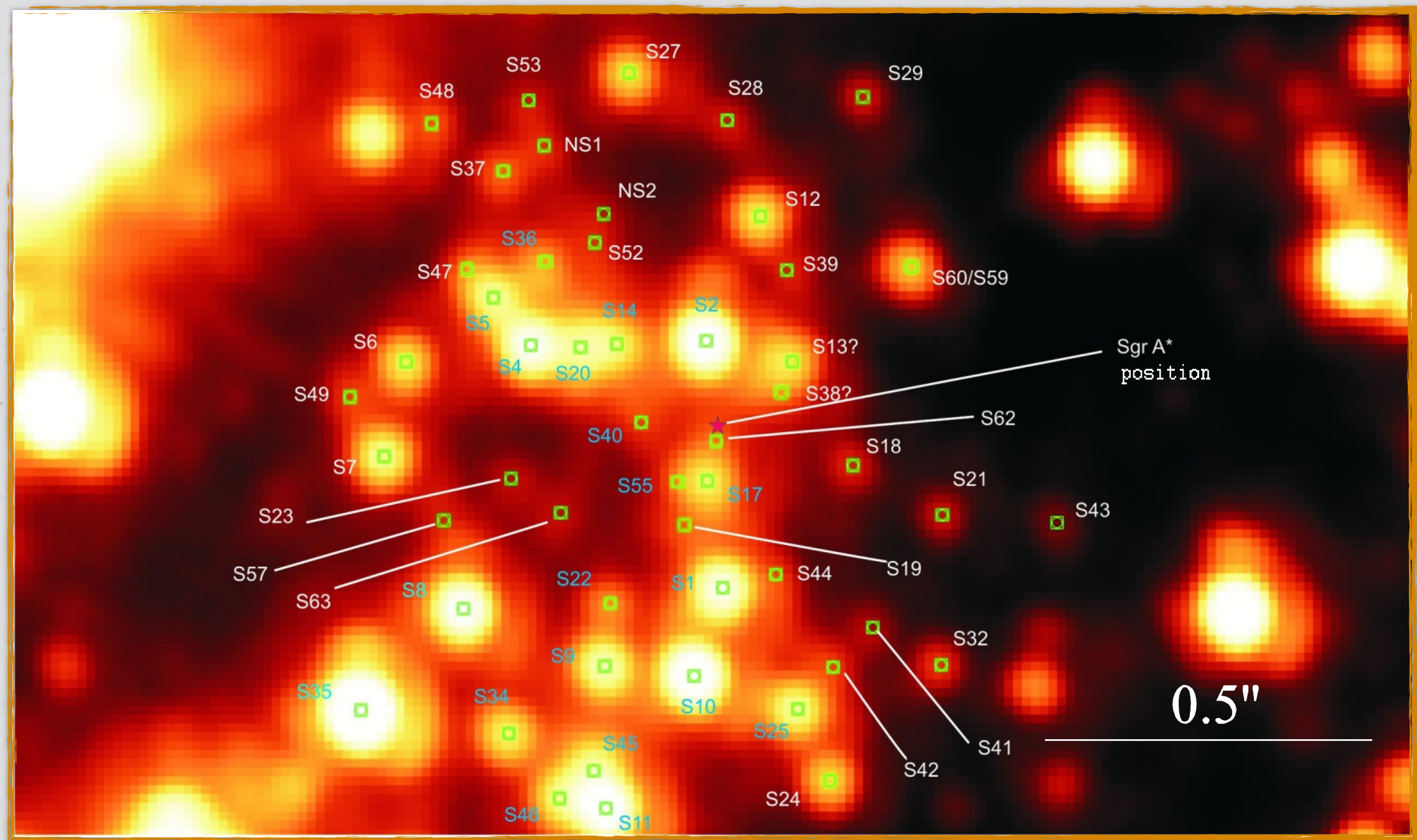

Schödel+07

Sgr A * and Surroundings at 8.6 μm

Diffuse L′-band contours over-plotted onto the 8.6 μm image

Contour levels are drawn between 10 and 200 μJy in steps of 10 μJy and between 0.1 and 2 mJy in steps of 0.1 mJy.
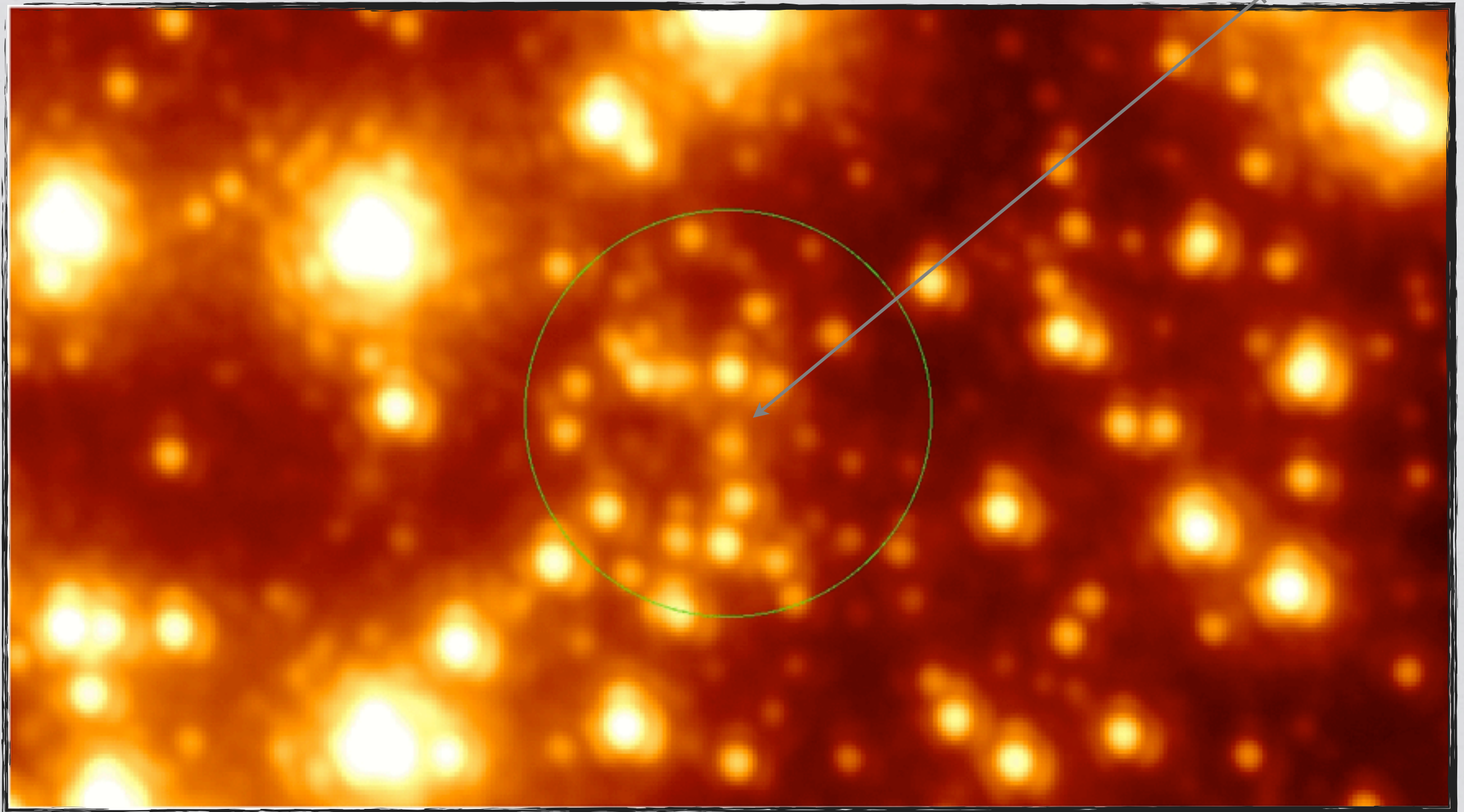

Schödel+07

The Central ~2"

Sabha+10

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Subtracting Stars


Sgr A* position

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Sgr A * Spectral Energy Distribution

* **Radio**: Falcke et al. 1998, An et al. 2005, Marrone et al. 2006

* **NIR (1.65, 2.16 and 3.76 μm)** : Genzel et al. 2003 Dodds-Eden et al. 2009 (3.8 μm)

* The upper limits in the **NIR** band are taken from Melia & Falcke 2001 **(30, 24.5 and 8.6 μm)**, Schödel et al. 2007 **(8.6 μm)** and Hornstein et al. 2007 **(2 μm)**

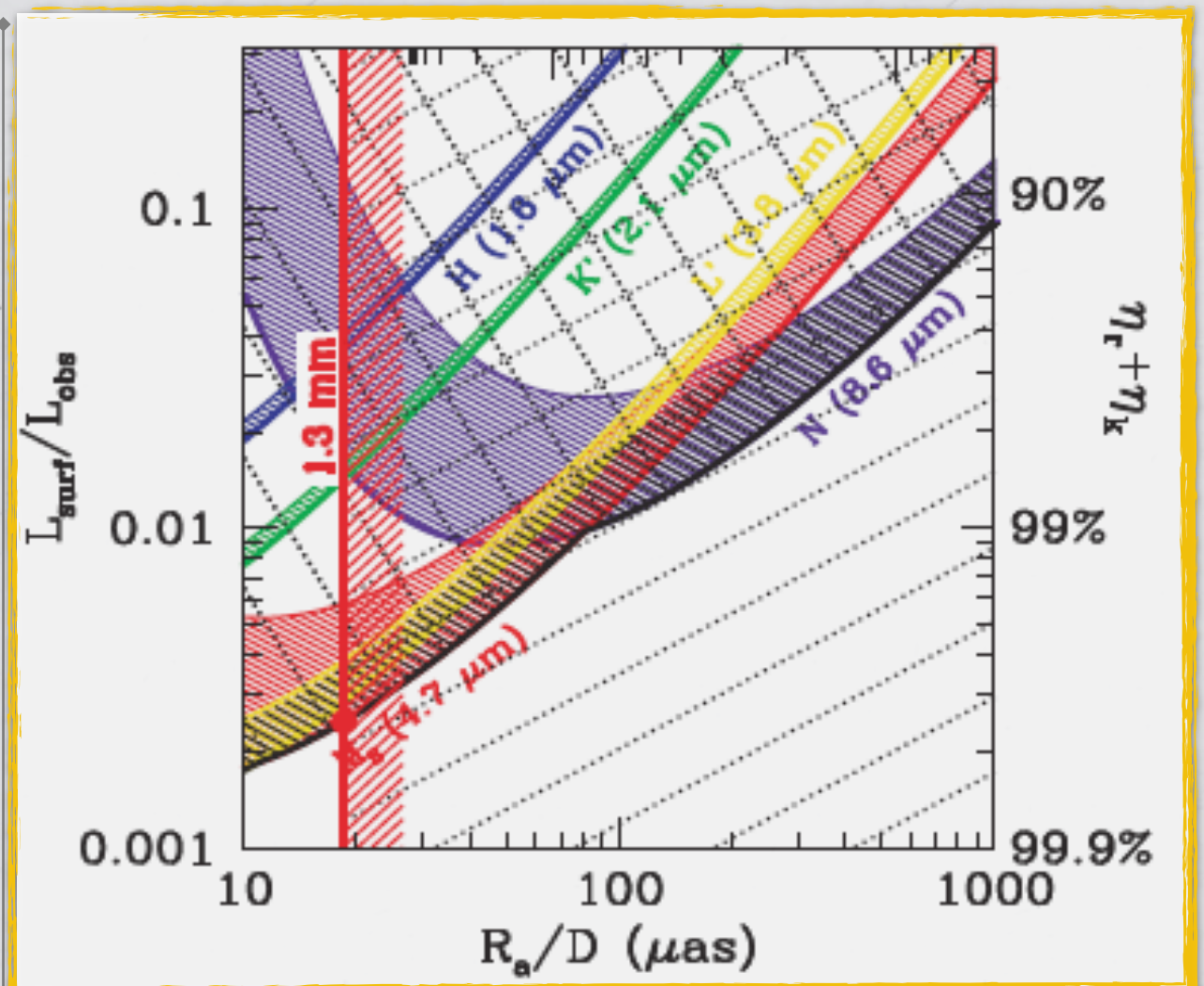* **X-rays (2-8 keV)**: Baganoff et al. 2001, 2003

Mościbrodzka+09
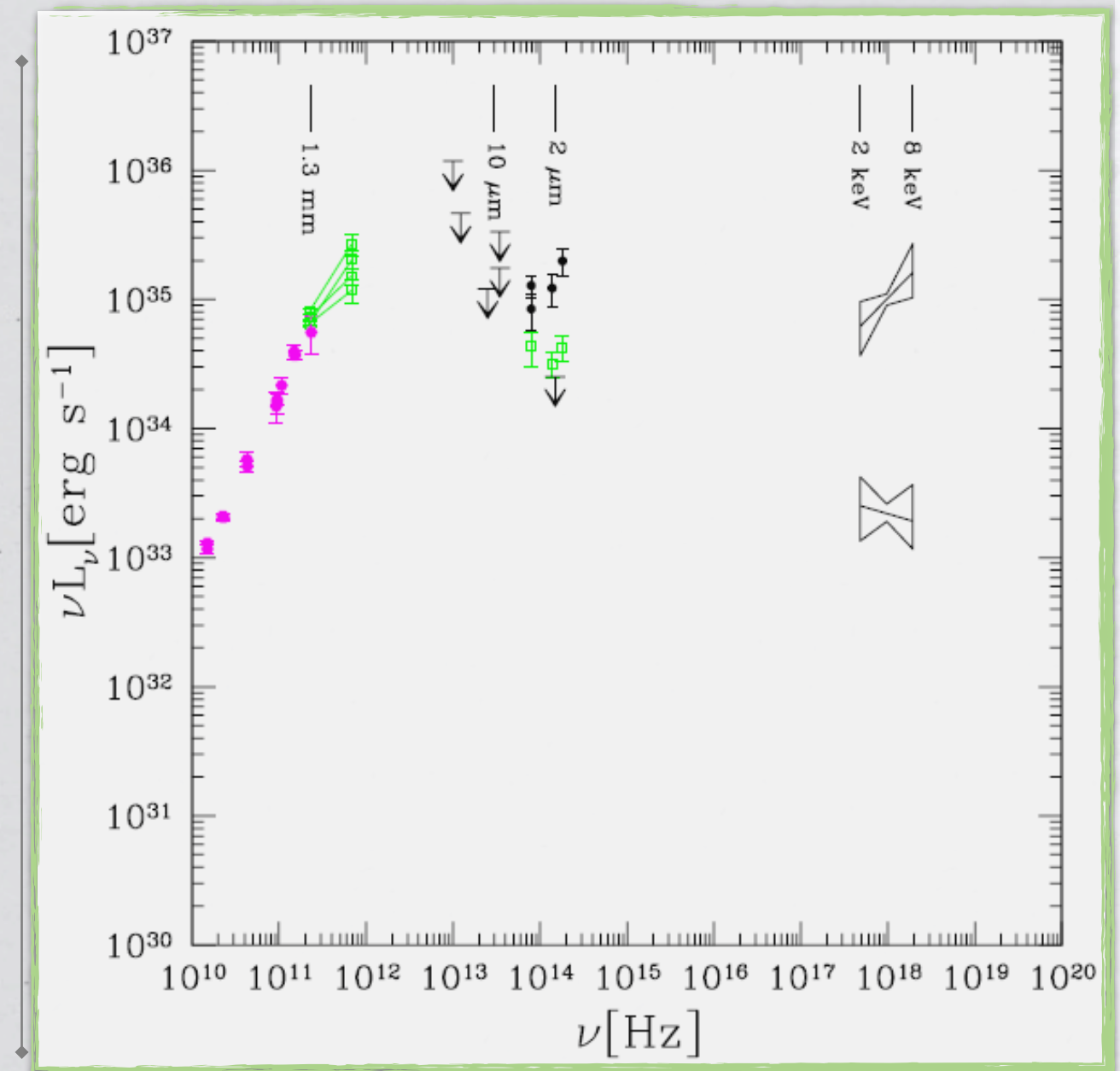
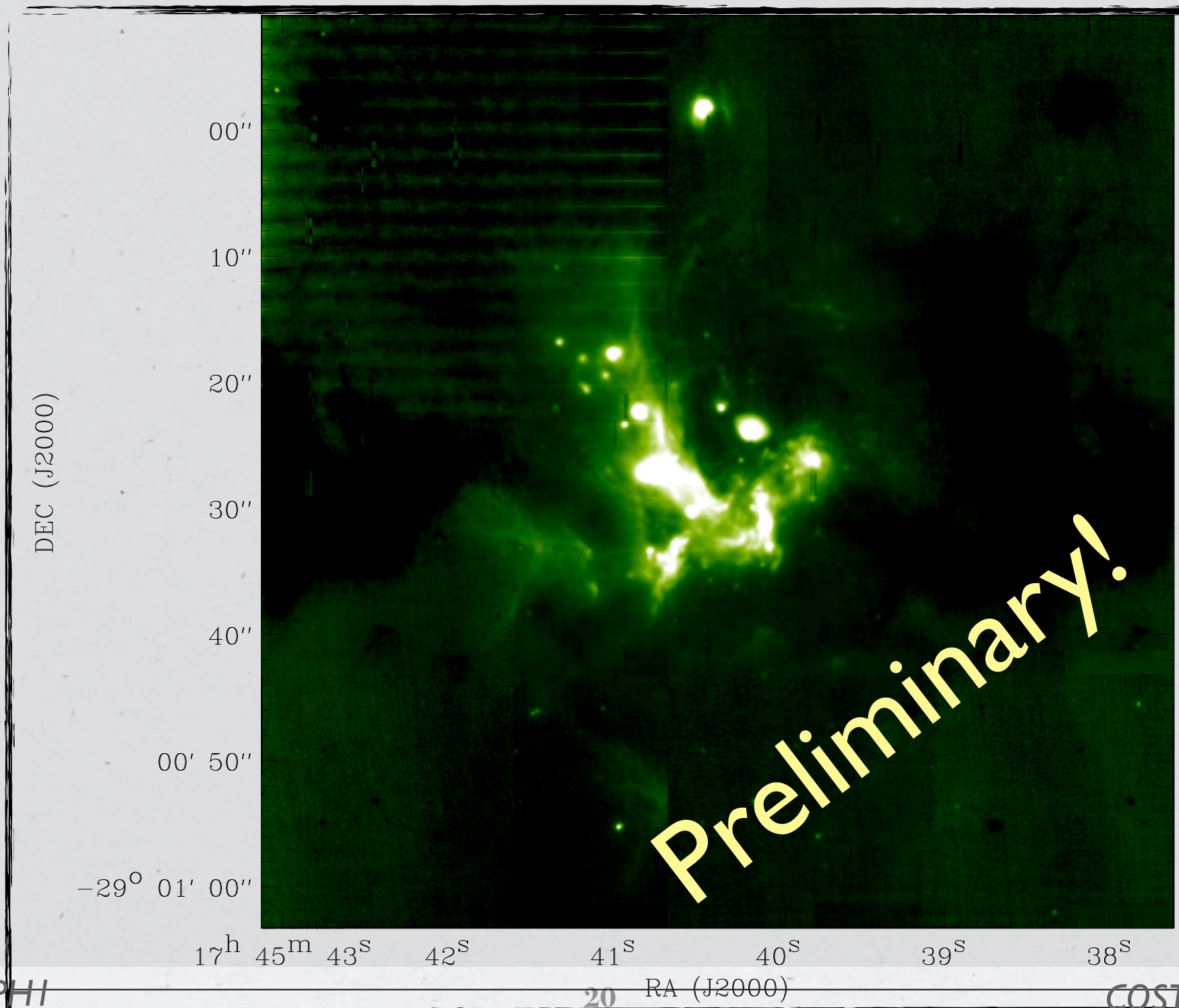# Sgr A * Spectral Energy Distribution
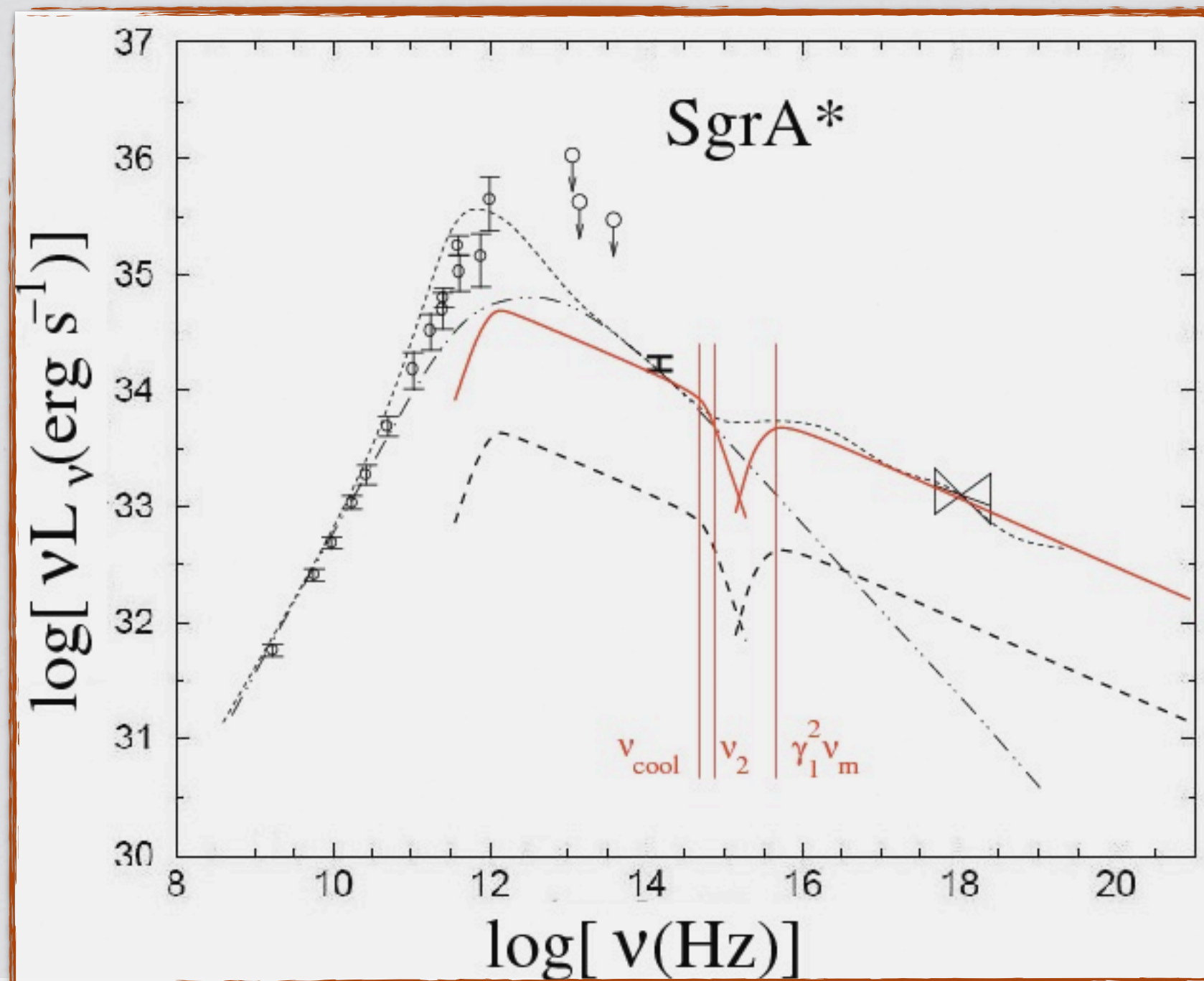
The Nature of Sgr A *

* Constraining the ratio of the surface to the observed luminosity (Lsurf/Lobs)

* Using VLBI size constraints and infrared-mm flux measurements

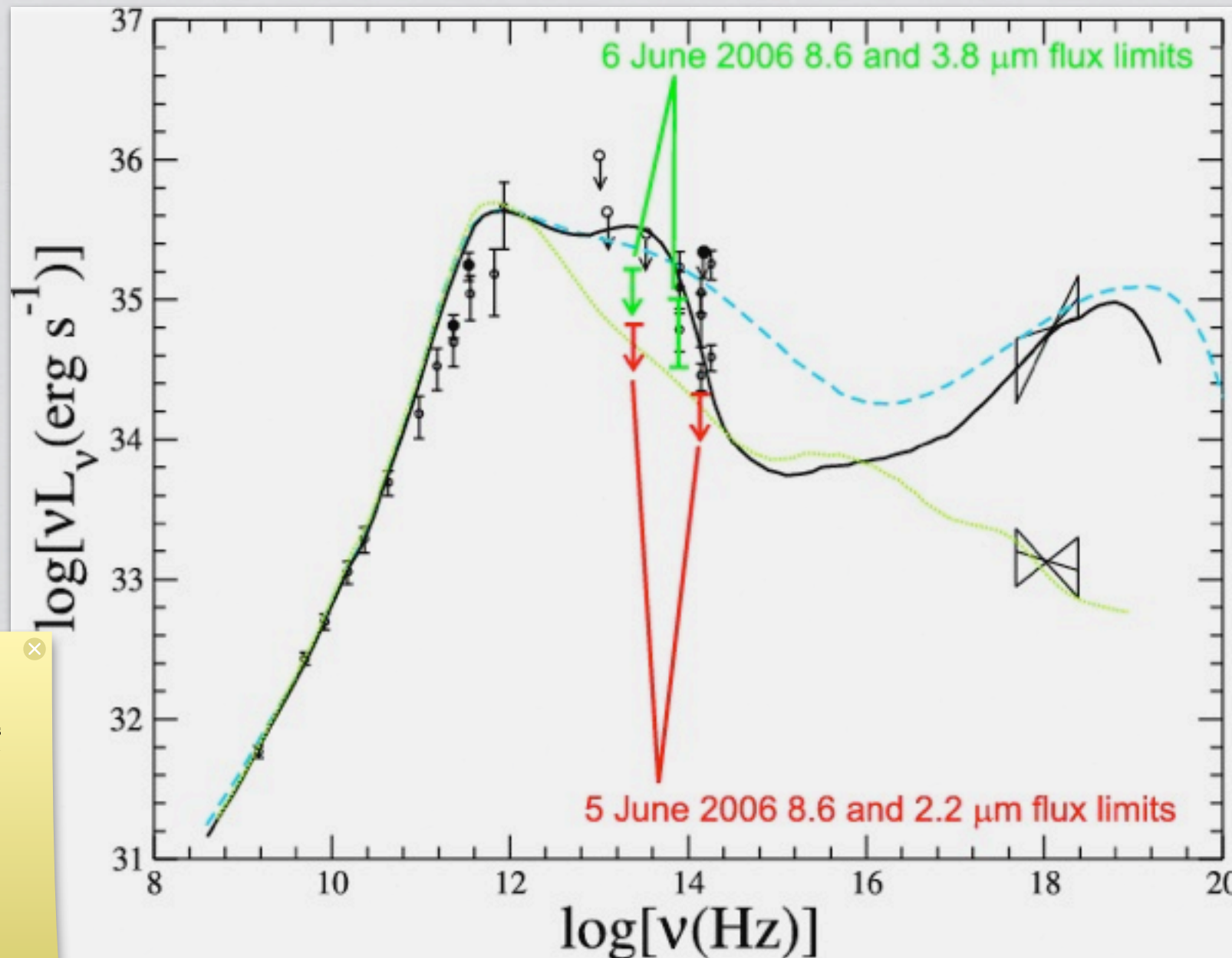* Implying a larger than 99.6% efficiency factor for the energy conversion

Broderick+09

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The GC in Mid-Infrared

Preliminary!

THANK YOU!

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Sgr A * Spectral Energy Distribution

Emission models for Sgr A* (Yuan et al. 2003, 2004). The upper limit on the flux of Sgr A* at 8.6 μm determined in this work is indi- cated together with the simultaneously measured (NACO/VLT) flux at 3.8 μm on June 6 and the upper limit on the 2.2 μm emission on June 5 superposed onto RIAF models of the quiescent (dotted line) and flaring (dashed and solid lines) emission from Sgr A*. All flux measurements were corrected for extinction.

Schödel+07

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The GC in Multi-wavelength
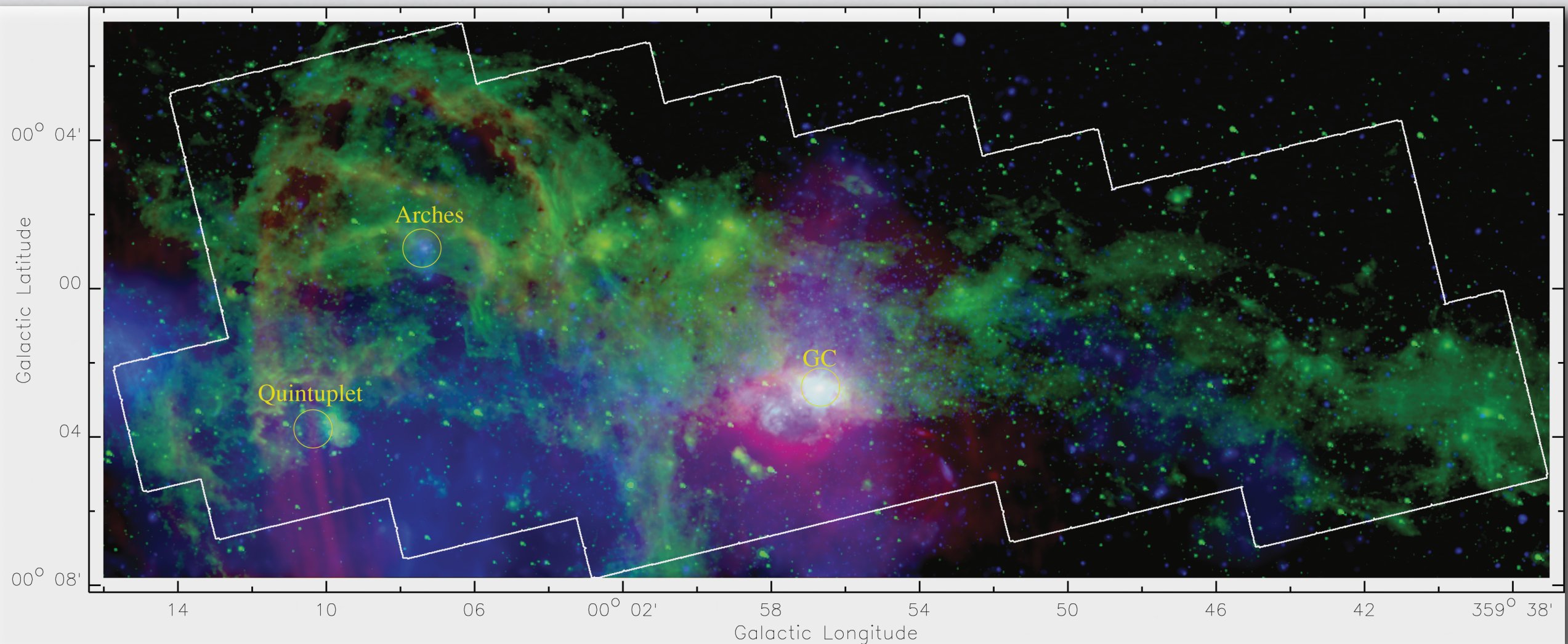
Red: Very Large Array 20-cm continuum (Yusef-Zadeh et al. 1984)
Green: *Spitzer* 8 μm (Stolovy et al. 2006; Arendt et al. 2008)
Blue: *Chandra* ACIS-I 1–9 keV (Wang et al. 2002; Muno et al. 2009)

Wang+10