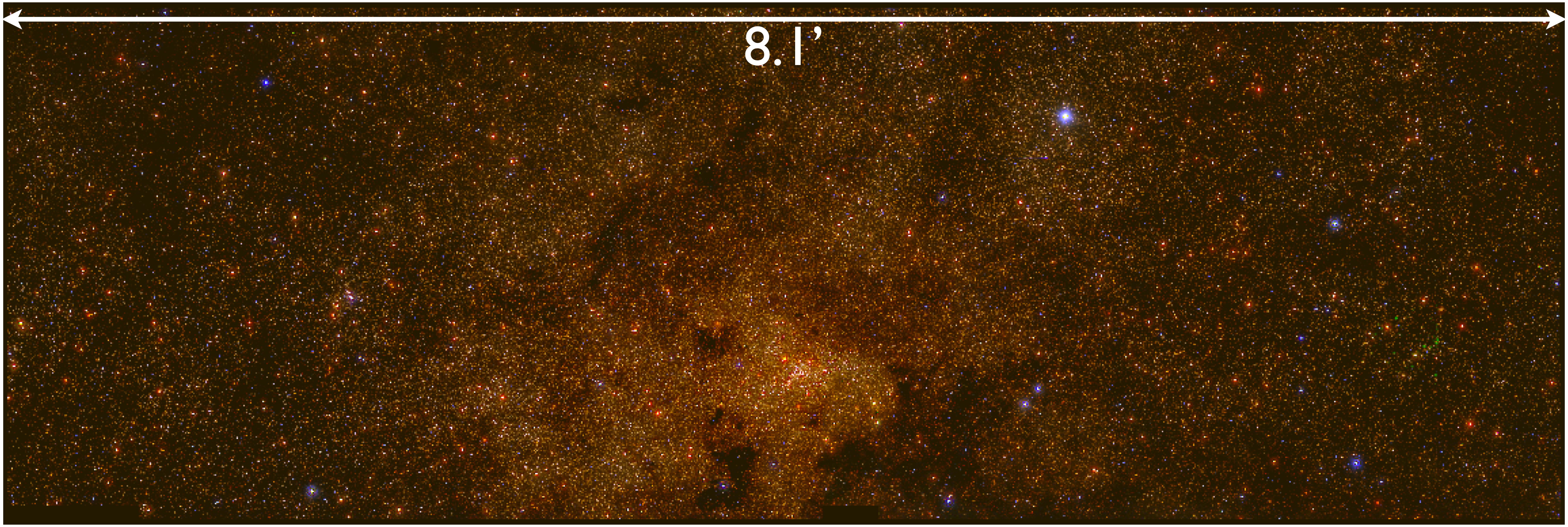
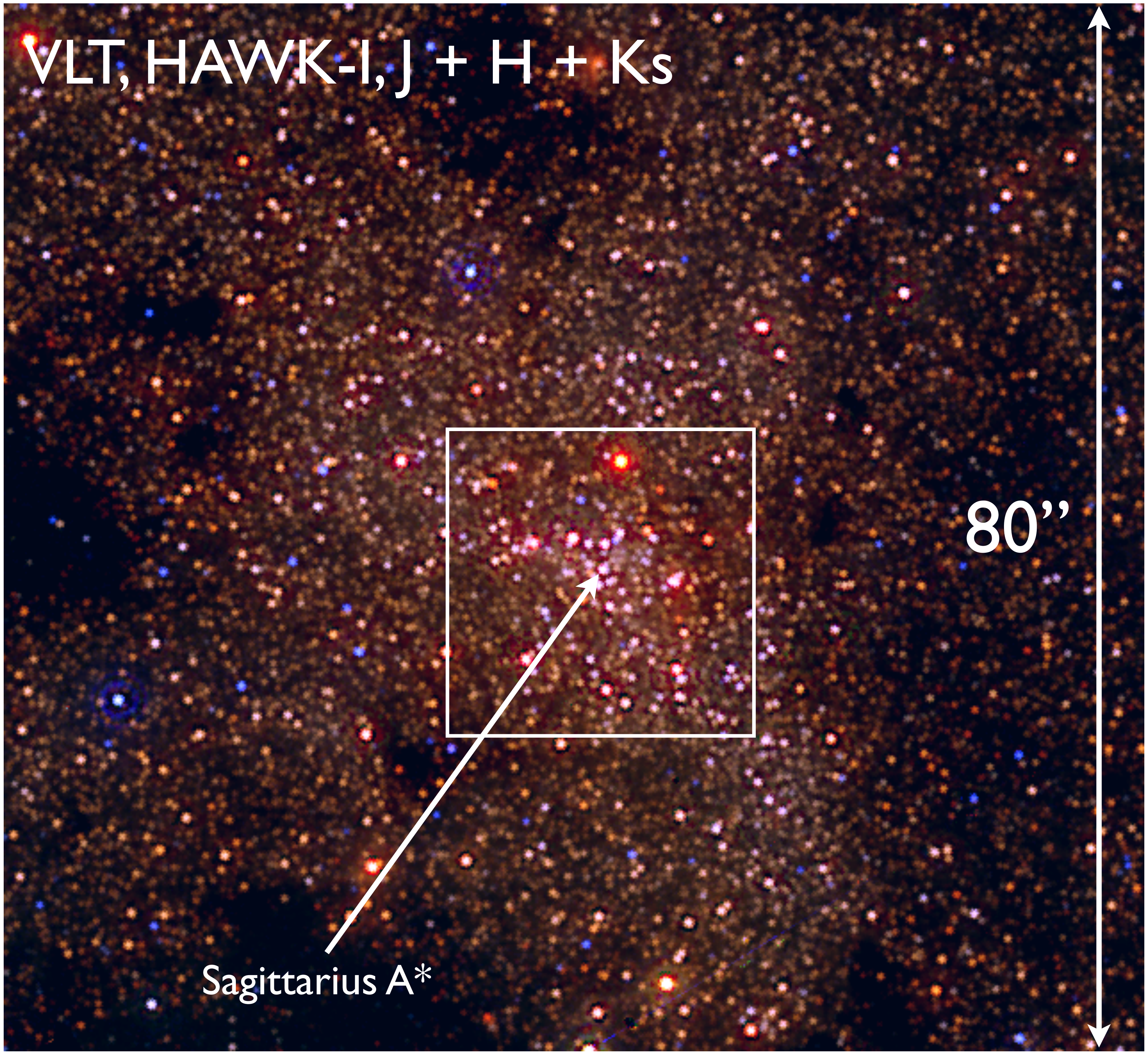
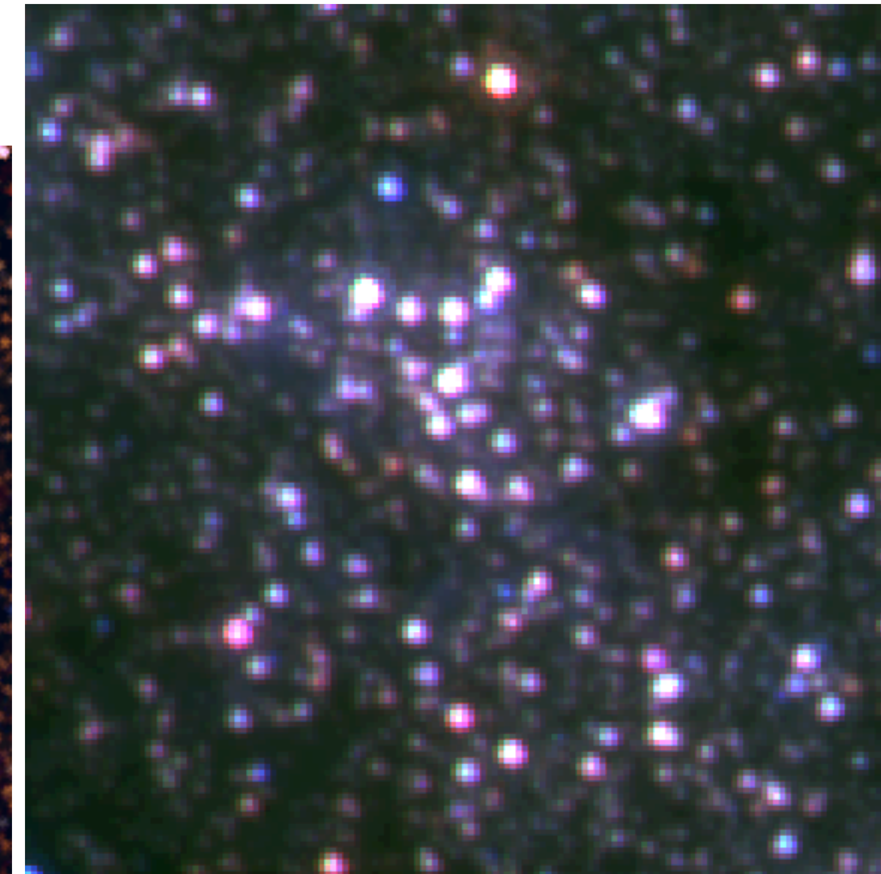
VLT Adaptive Optics Community Days

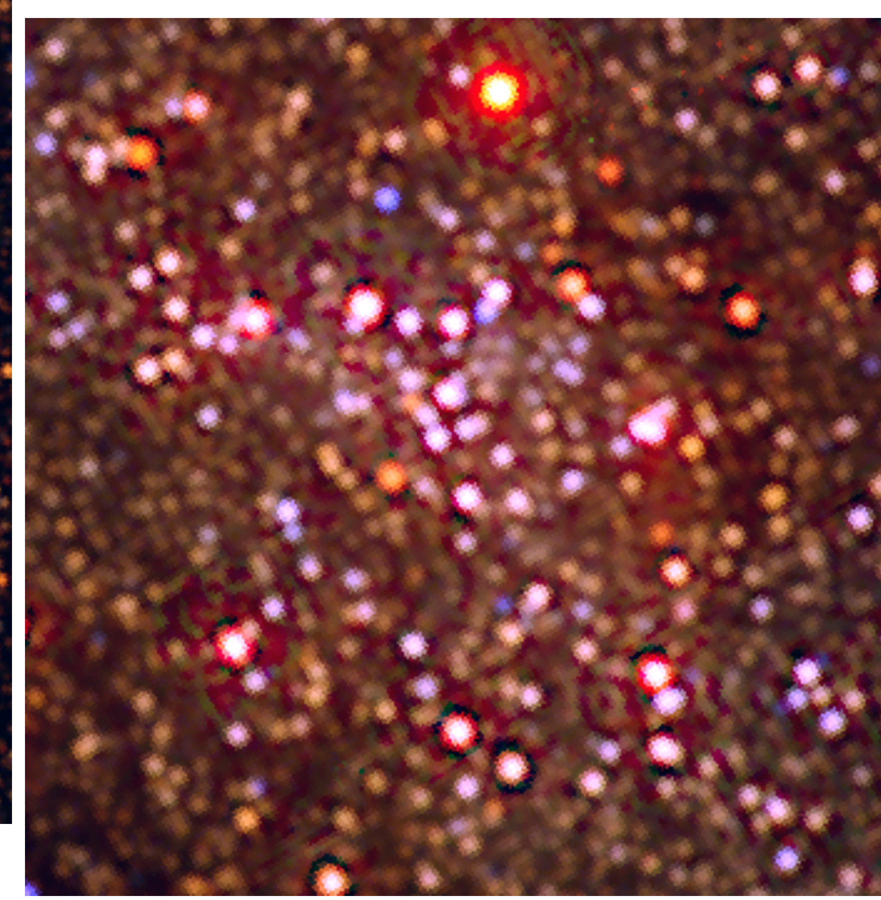


Rainer Schödel (IAA-CSIC)
ESO Headquarters
20 September 2016

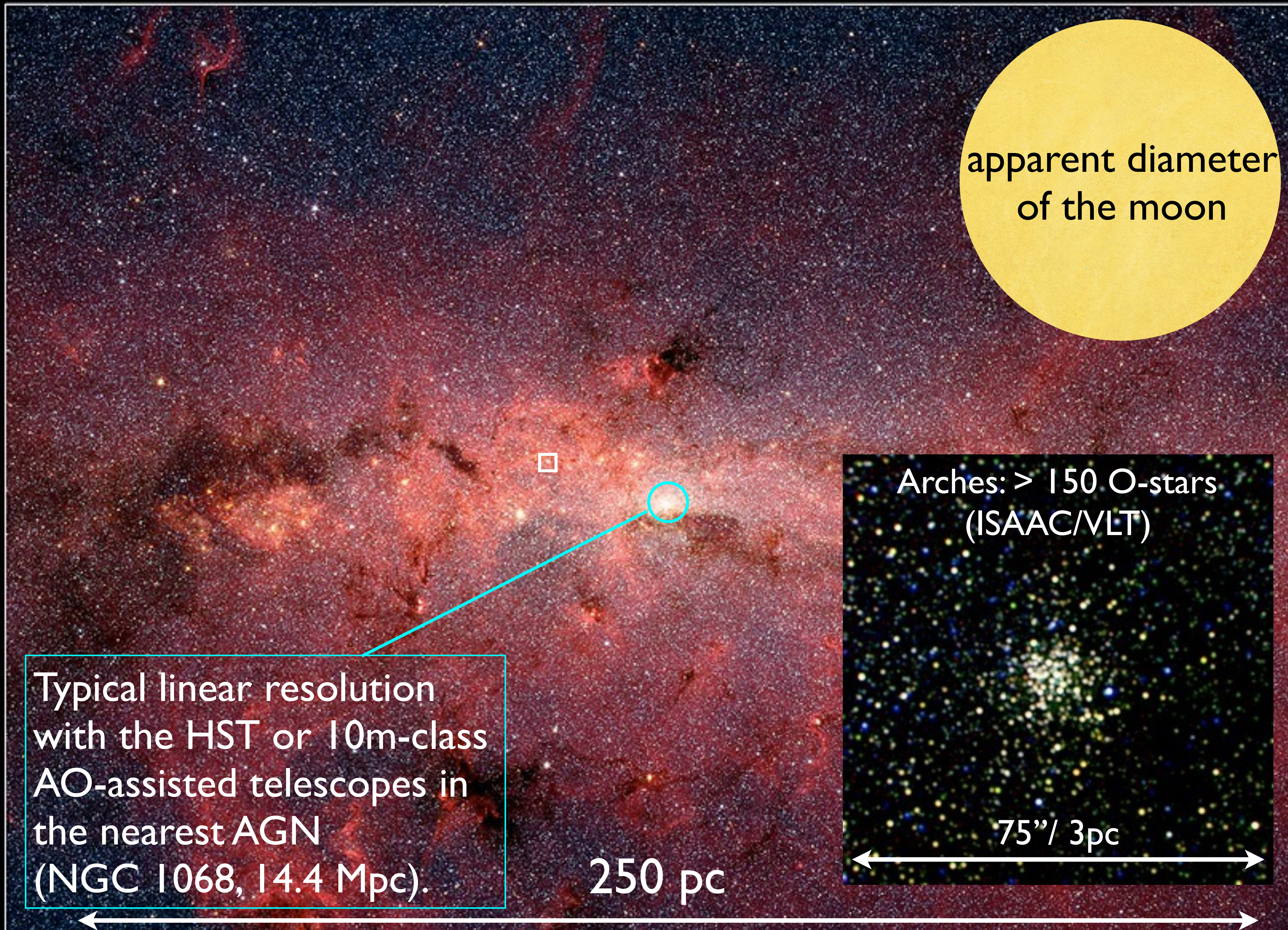
The Galactic Center on large scales with high angular resolution







Low-resolution view of the Galactic Center



The Center of the Milky Way Galaxy — Spitzer Space Telescope • IRAC

NASA / JPL-Caltech / S. Stolovy (Spitzer Science Center/Caltech) — ssc2006-02a

GC in the mid 2020s

Central Black Hole and central parsec well covered

1. Tests of GR (ERIS, GRAVITY, Event Horizon Telescope)
2. E-ELT/MICADO + HARMONI
3. ALMA: accretion flow / outflow on 10 mas scales

General GC environment:

1. GALACTICNUCLEUS survey in JHK at 0.2" FWHM
2. NIR-MIR Survey with JWST (probably)
3. SKA Key Science Project.

GC VLT Science Cases in mid 2020s

1. **Time Domain:** Properties of the stellar population: variable sources (binaries), transients (CVs, XRBs, magnetars, isolated BHs?), counterparts of point-like sources detected in X-rays and radio (SKA), exotic sources, Sgr A*, Lensing/microlensing in the GC field
→ **LSST will not adequately cover the GC; JWST+ELTs not for monitoring**

2. **GC archaeology:** proper motions to infer assembly history (relaxation time long)

3. **The stellar population/ IMF at the GC:** Detection of dissolved clusters; Main Sequence to (sub-)solar masses (proper motions and SED); metallicities

4. **SgrA*/GR:** Stability of astrometric reference frame

5. **Synergy with SKA/ALMA**

Small fields → large fields.
Sensitivity tied to resolution in GC.

GC Science Case: Requirements

1. **Resolution** 50-100mas to overcome confusion. High spatial PSF stability for accurate photometry (~1% across the field possible?)

2. **PSF prediction** for photometric accuracy

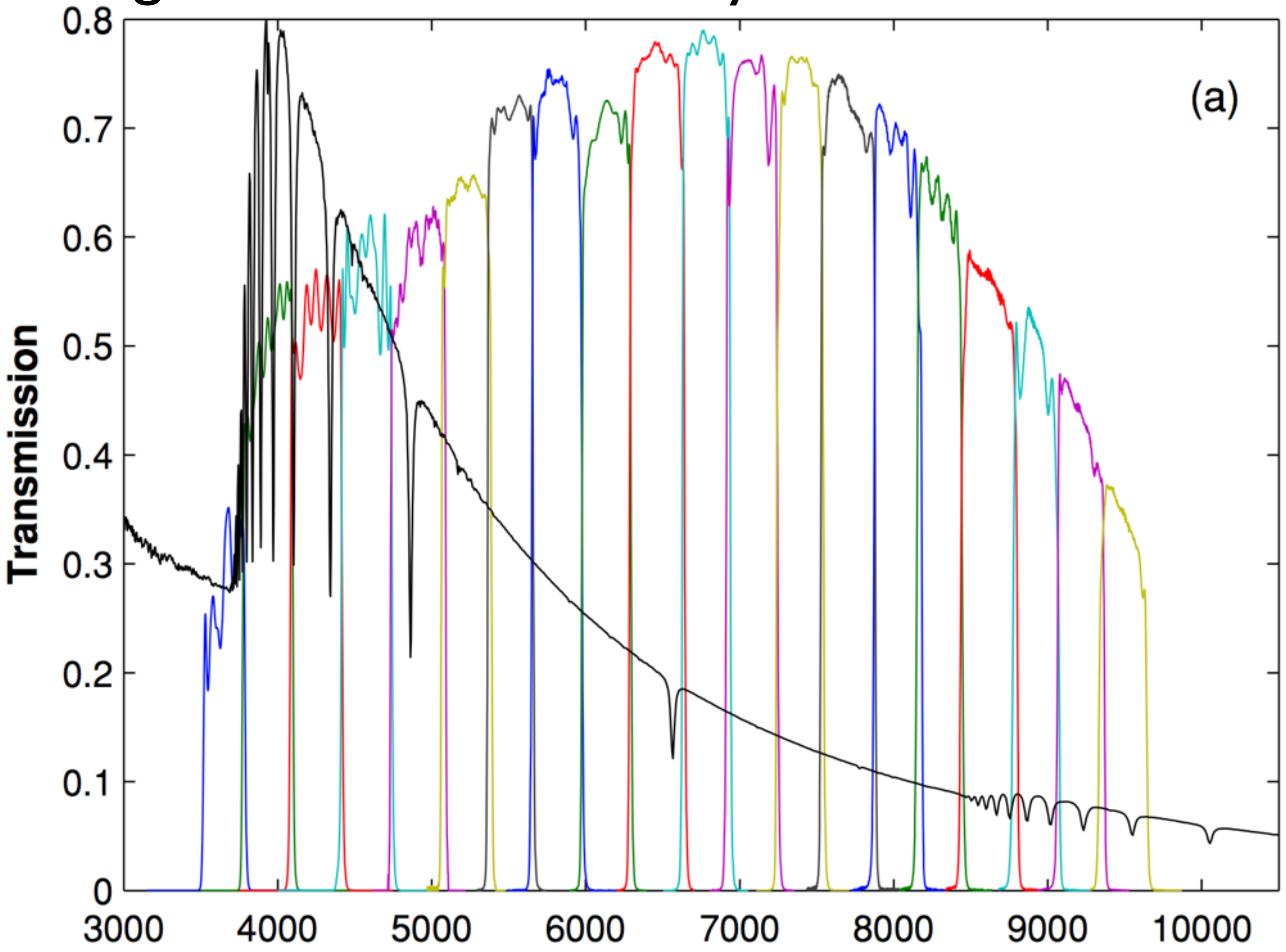
2. **FOV** 2' x 2' minimum, better similar to HAWK-I; large FOV helps astrometry.

3. **Large set of filters** across NIR to derive SEDs, similar to ALHAMBRA, J-PAS surveys. This can compensate the small FOV of IFUs and the impossibility of optical observations

4. **Nice to have:** Long, deep integrations at the diffraction limit in Y-band to overcome degeneracies

Spectroscopy vs. SED vs. FOV…multiple filters?

The FOV in AO IFUs is always too small …
Optimize the trade-off between field and spectral resolution through use of tuned filter systems.



ALHAMBRA Survey

Figure: Aparicio Villegas et al. (2010)

Conclusion: VLT AO in the mid 2020s

Large fields

Lots of time

Lots of wavelengths

Thank you!

Stars in the near-infrared