Multi-band Infrared Mapping of the Galactic Nuclear Region

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Why Galactic Center?

The only nuclear region in which stellar population can be resolved. We can learn about:

- Spatial and kinematic distributions of individual stellar populations.
- Star formation mode and history.
- Initial mass function and mass/light ratio.
- Interplay among stars, the ISM, and the SMBH.

HST/NICMOS P α Emission Survey of the Galactic Center: 1.90 μ m Map

Arches cluster

15

ear)

une, 2008 two wavelength filters

rometry correction (to better than jions (Dong et al. 2010). ' continuum emission.

1.9 µm magnitude distribution



0.6 million stars are detected:

- accounting for > 80% light
- including all stars with M > 8 M_{\odot} and evolved lower mass ones.
- strong red clump indicates a major starburst about 300 Myr ago.

HST/NICMOS 1.87µm Map of the Galactic Center

- The 1.87 μ m filter covers the P α line.
- Subtracting the 1.9µm map from the 1.87µm map adaptively. \rightarrow A net P α line emission map.



Why do we need the HST?

- Only observable from the space
- Excellent imaging stability
- Little background due to the Earth's warm atmosphere

Wang et al. 2009





Ionized gas features resolved into arrays of organized linear filaments → strong local magnetic fields.

(c)

New Population of young massive stars



- ~170 stars show enhanced Pa emission.
- ~2/3 of them are located outside the three known clusters.
- 20 have been followed up spectroscopically, confirming that they are indeed massive stars (Mauerhan et al. 2009; 2010)
 - \rightarrow a new population of massive stars.

Detailed views of individual compact HII regions



Summery

- A new population of very massive stars in relative isolation and with strong winds.
- Fine filamentary structures of ionized diffuse gas indicating profound influence of local strong magnetic field.
- Compact nebulae, tracing various stages of massive star evolution
- Evidence for a major starburst ~ a few 10⁸ yrs ago.

We need a WFC3 IR imaging survey!

- SED fits for individual stars \rightarrow foreground extinction distribution and intrinsic spectral shape.
- Eventually proper motion mapping.



NICMOS image: Red: H, Green: 1.9 Blue: K



Extinction map from SED fits for individual stars

Great Observatory Survey of the GC

