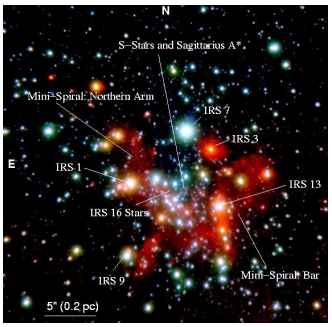
Stellar and galactic physics

The Galactic Center



The central parsec of the Milky Way seen with the near infrared camera and adaptive optics system NACO at the ESO VLT. Two narrow band images (at 2.18 μm and 2.36 μm) were combined with a broad band image at 3.8 μm to obtain a pseudo-color image. The red extended emission is due to gas and dust in the mini-spiral or due to cirumstellar material of individual stars.

Theory

by M. SCHULTHEIS

I) Introduction to the central parts of the Milk Way

The nucleus of the Milky Way is the most extreme environment in our Galaxy. It is hosting a massive star cluster of 30 million solar masses coexisting with a supermassive black hole of 4 million solar masses. This central star cluster is a typical representative of a very common class of objects called nuclear star clusters (NSCs), the densest stellar systems in the universe we know of. Given their position at the center of the potential well of a galaxy and their coexistence with black holes, nuclear star clusters potentially play a key role in the formation and certainly in the growth of the central supermassive black hole in a galaxy. The Milky Way nuclear cluster is a unique laboratory to study the co-existence of nuclear stars clusters and supermassive black holes.

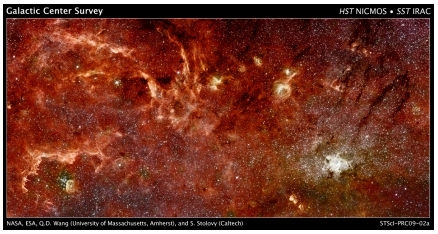
II) Star fomation in the Galactic Center region

The Galactic nucleus is an exceptional region for testing massive star formation and evolution models. It contains 10% of the present star formation activity in the Galaxy, yet fills only a tiny fraction of a percent of the volume in the Galactic disk. The initial conditions for star formation in the GC are unique in the Galaxy. The molecular clouds in the region are extraordinary dense, under high thermal pressure, and are subject to a strong gravitational tidal field. In this section we will determine the star formation rate in the inner region using the population of massive young stellar objects.

Applications

by M. SCHULTHEIS

The student will work on multi-wavelength data -from near-IR spectra which has been recently obtained by the VLT (ESO/Chili), as well as complementary photometric data from the near to the the mid-IR and to the radio counterparts.



Multi-wavelength composite image of the Galactic Center region including the massive star forming regions

After getting familiar with the different data sets, the student will cross-match the different data sets in these highly dense regions. He will learn the difficult task in obtaining full spectral energy distributions and confront them with the most recent models of massive YSOs. The final aim is to calculate the present star formation rate and to trace it in the nuclear star cluster as well as in its surrounding environment (nuclear disk, inner bulge). This work is done within our international Galactic Center framework with partners from Heidelberg, Lund, Trieste, Bonn, and Los Angeles where the student will access to the newest observations obtained by large ground-based telescopes.

See also

- An overview of the Galactic Center
- The nuclear star cluster
- Star formation in the Galactic Center

Contact

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