Eagle-eyed View from Flying Telescope Reveals How the Swan Nebula Hatched

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Talk 361.03

Paper: Lim, De Buizer, & Radomski (2020, ApJ, accepted)

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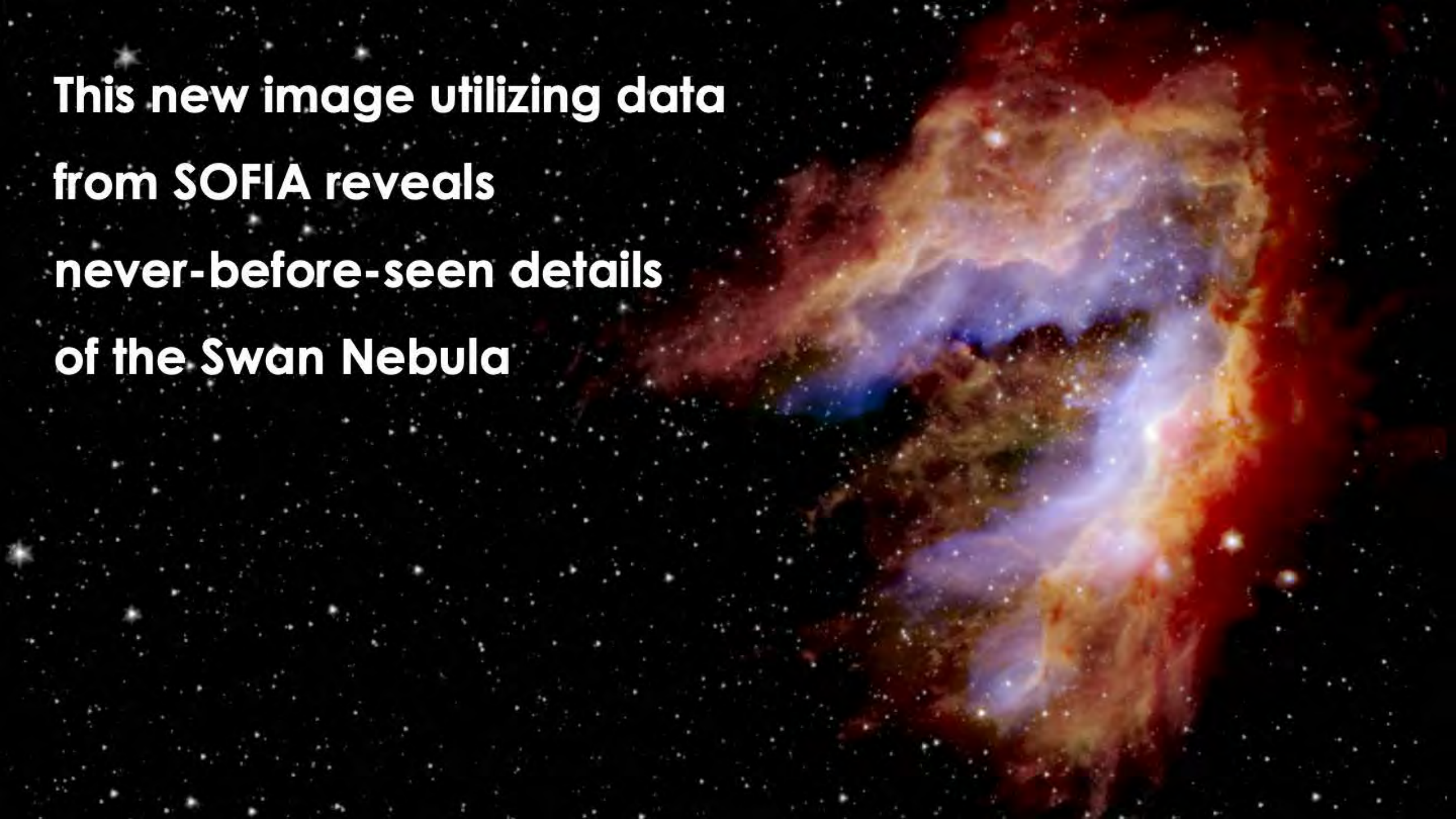

This new image utilizing data
from SOFIA reveals
never-before-seen details
of the Swan Nebula

Main results:

A hidden population of very young, massive stars was uncovered

The nebula was not all formed at the same time

"Massive" stars are 8x the mass of our Sun or larger

Only 1% of all stars are bigger than 8 M_{sun}

Credit: ESO/M. Kornmesser

Massive stars are rare but their influence is large

They release so much energy that they can change the evolution of entire galaxies

Their rarity makes it hard to learn about them

They form in dense clouds, and cannot easily be seen and studied

Observations in the infrared are needed

Credit: ESO/M. Kornmesser

The Stratospheric Observatory For Infrared Astronomy (SOFIA) was used for making these observations

The Swan Nebula (M17) is located more than 5,000 light years away in the constellation Sagittarius

Optical Image: Orion Telescopes/Joe B.

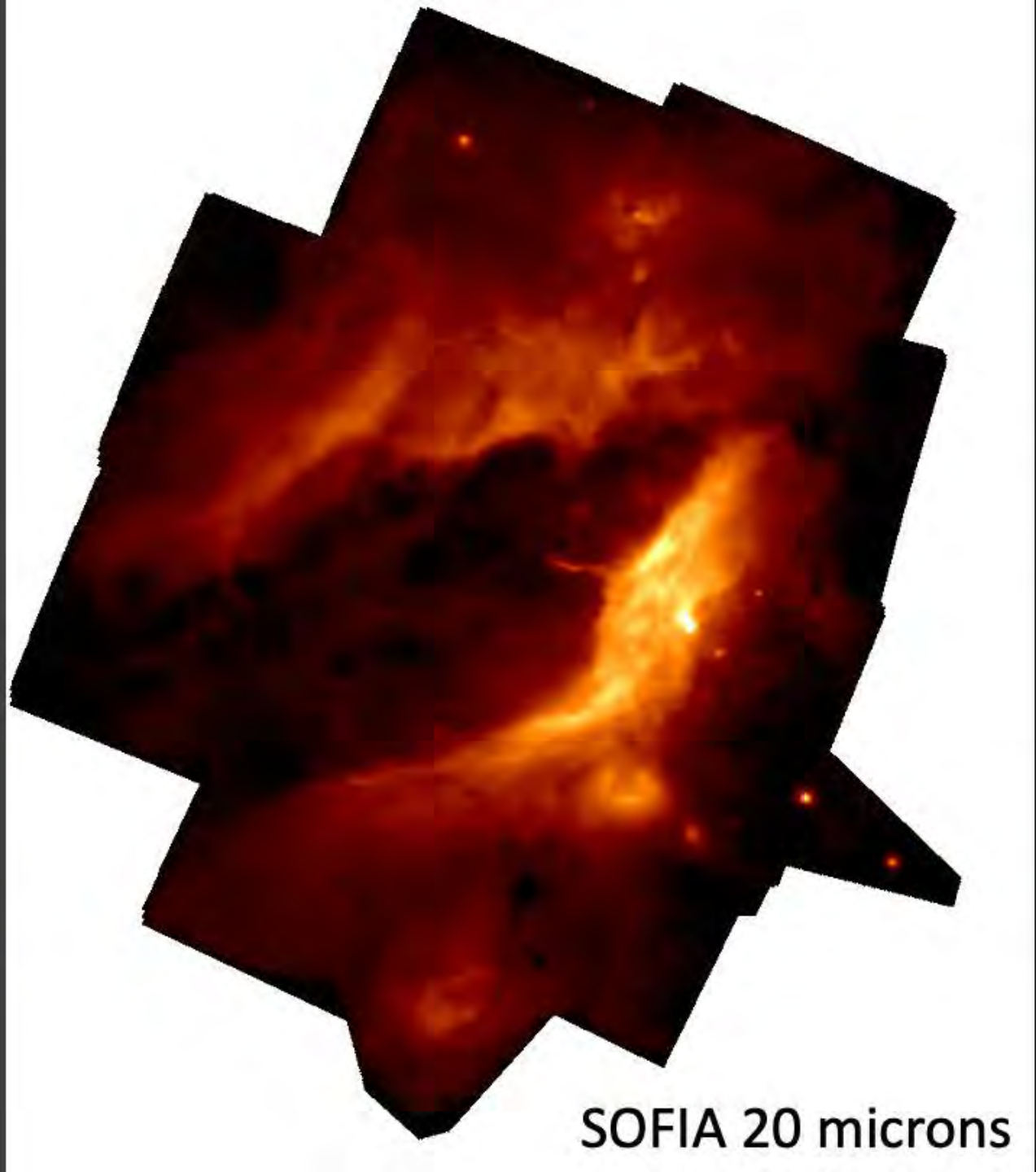
The Swan Nebula contains a giant star-forming region where massive stars are being born

Dark optical areas are the dense cloud areas where stars are forming

Optical Image: Orion Telescopes/Joe B.

These are the most detailed images ever obtained of the entire Swan Nebula at these infrared wavelengths

The SOFIA 20 micron image provides great resolution without being over-exposed



SOFIA 20 microns

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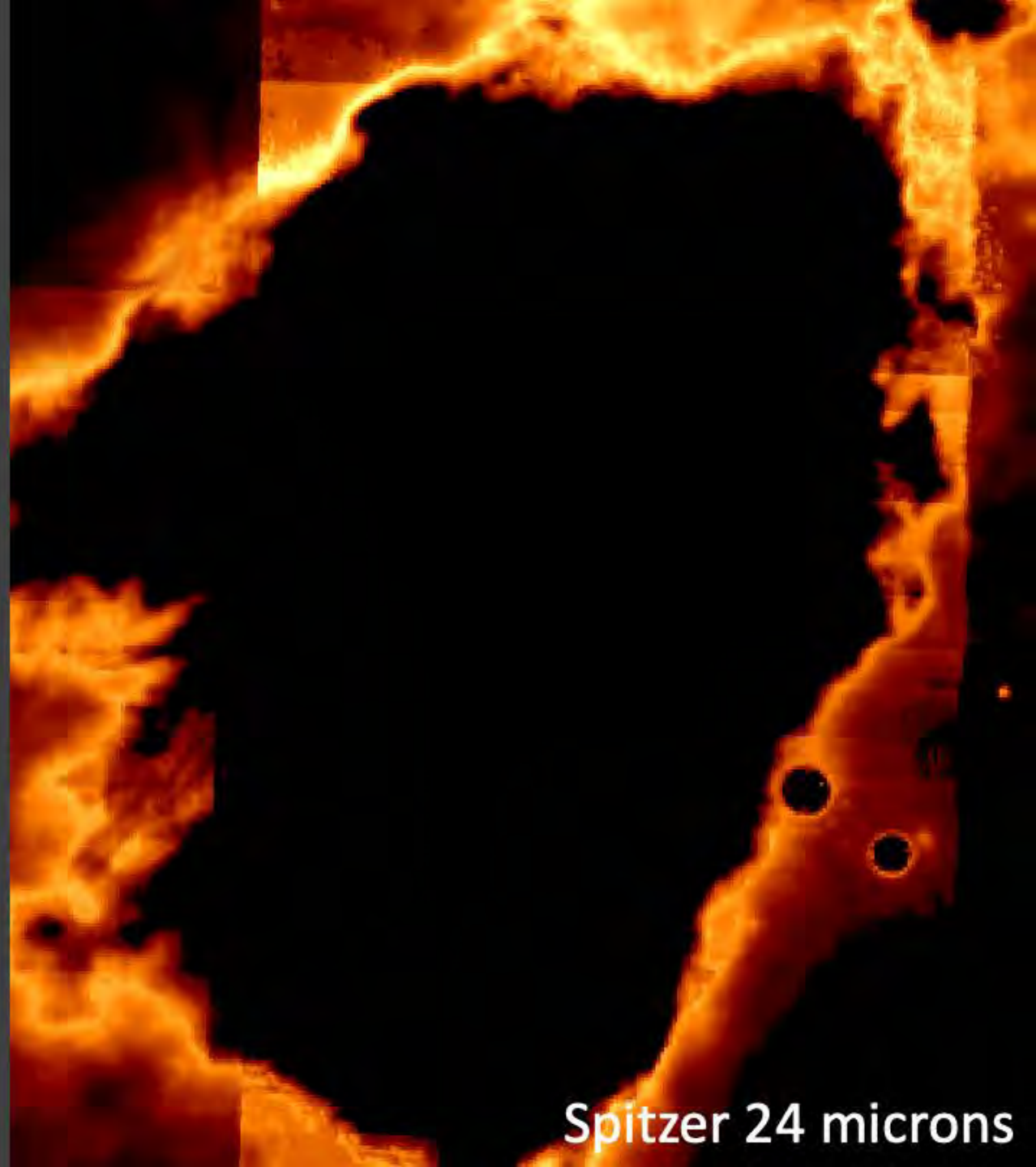
Spitzer images comparable resolution, but images were over-exposed



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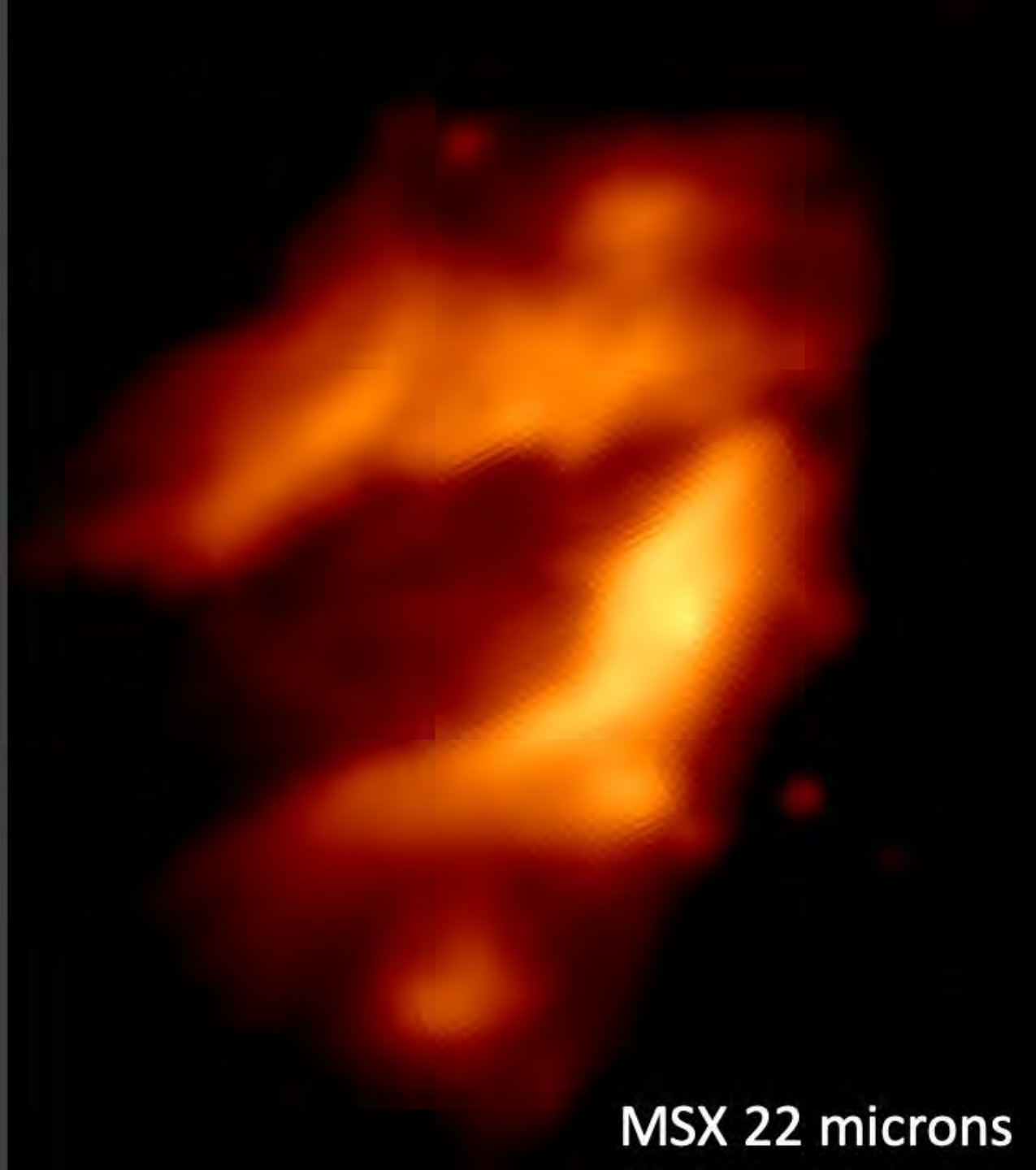
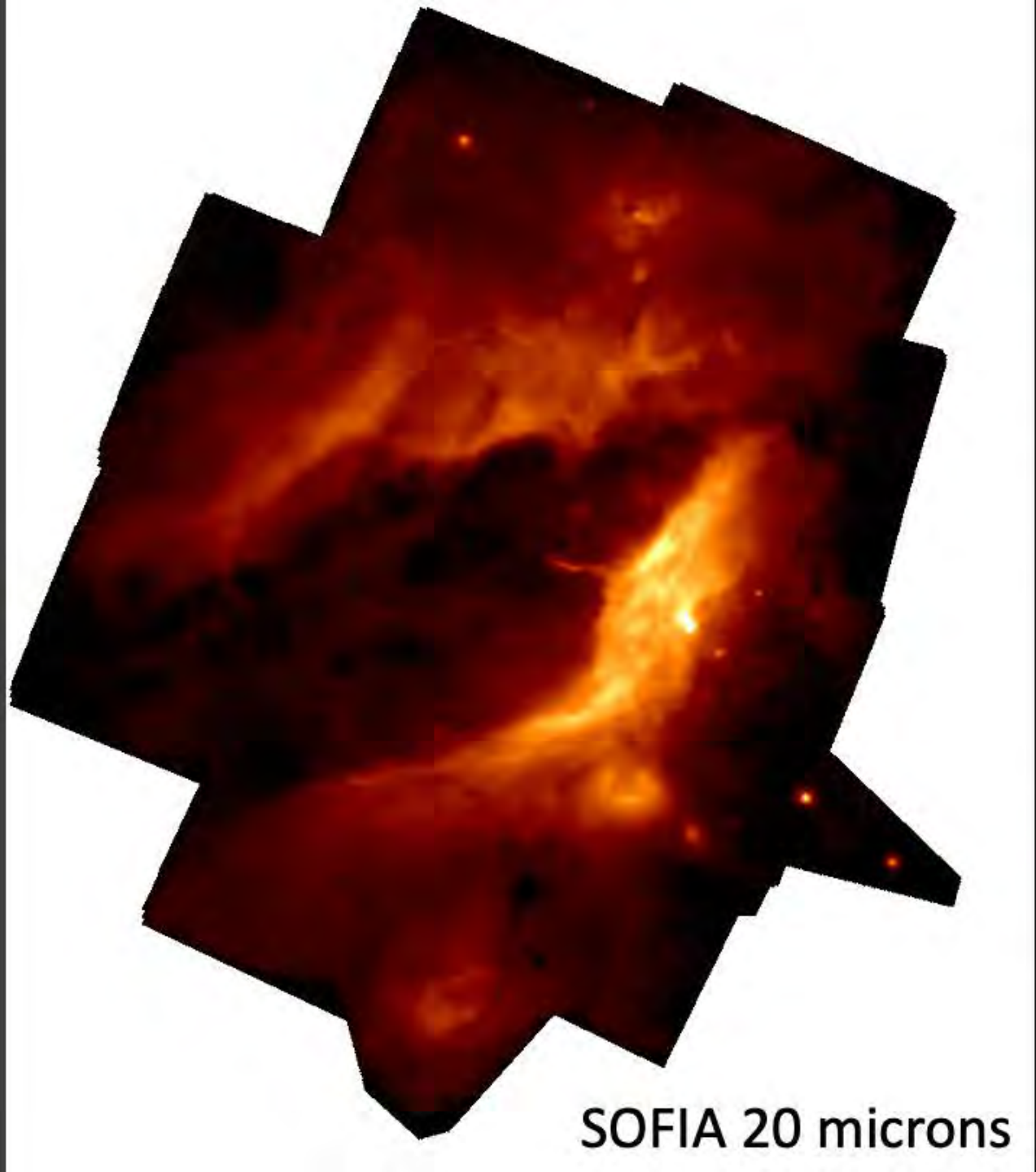
Before the SOFIA images, the MSX images were the best resolution images



These are the most detailed images ever obtained of the entire Swan Nebula at these infrared wavelengths

The 20 micron SOFIA image is the best resolution ever



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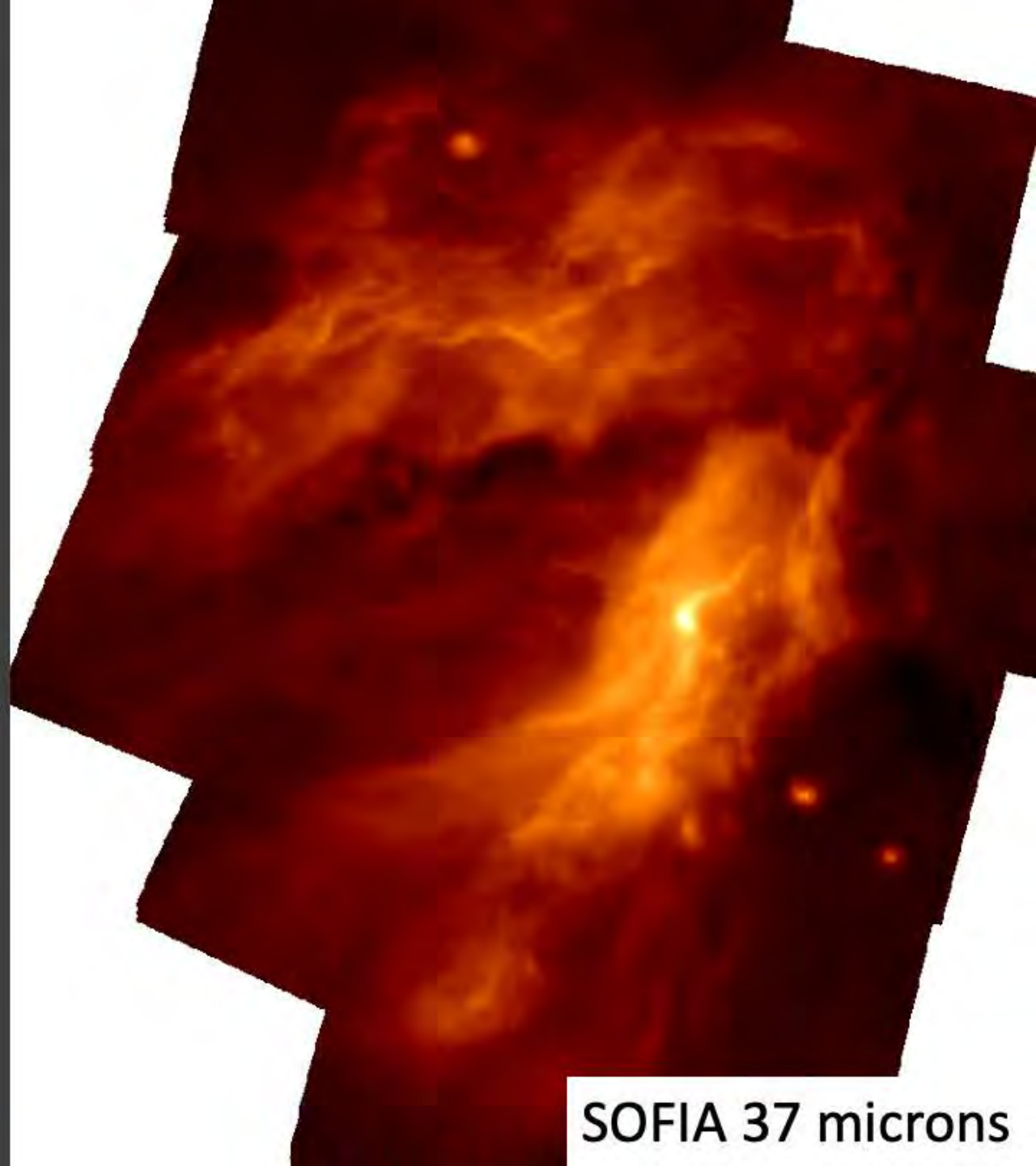
No comparable image to the 37 micron SOFIA image exists

These images provide great resolution so that we could detect a previously unseen massive young stars



SOFIA 37 microns

This composite image contains SOFIA data, along with Herschel data, and Spitzer near-optical data

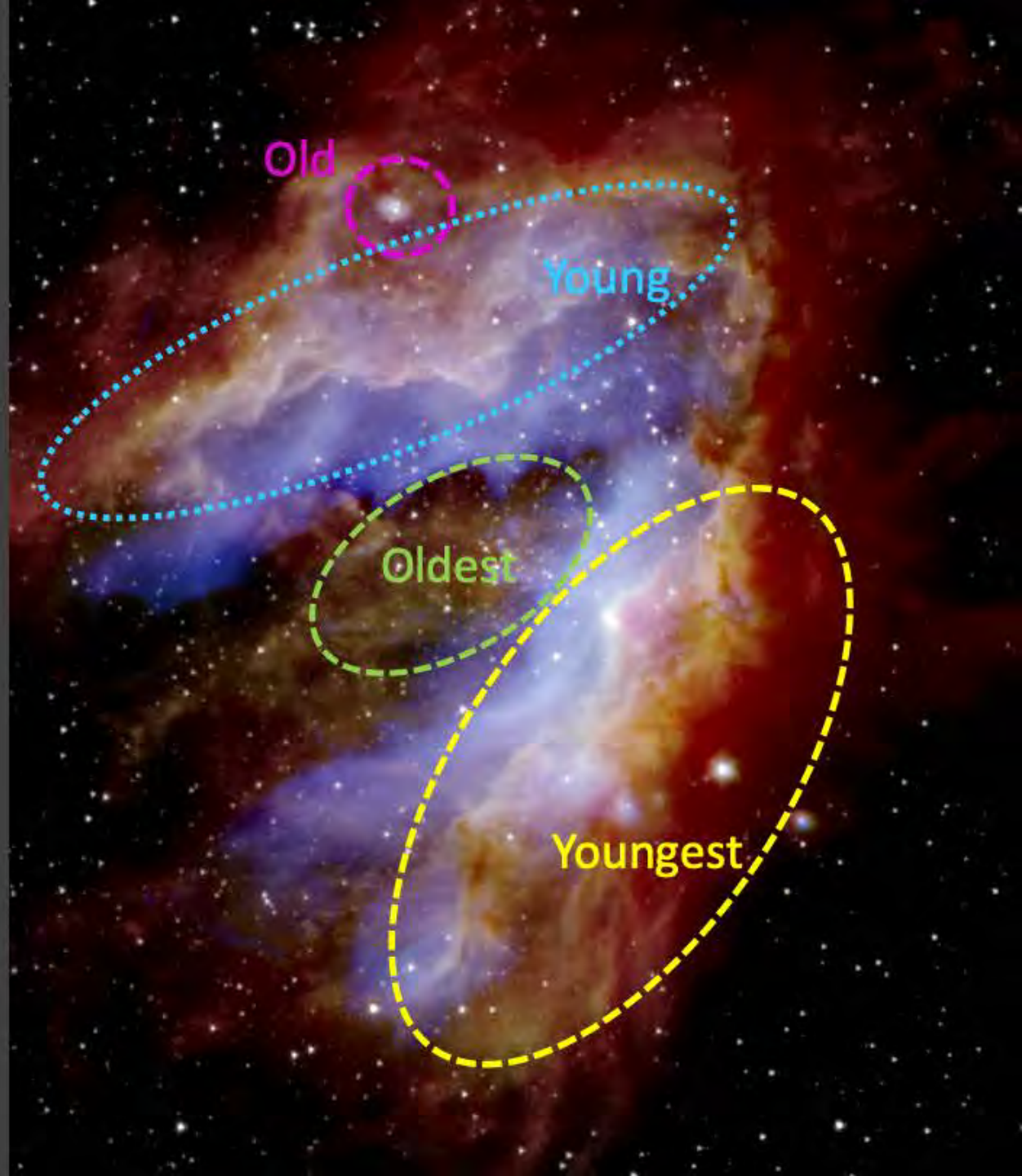
Blue = SOFIA 20 micrometer

Green = SOFIA 37 micrometer

Red = Herschel 70 micrometer

White stars = Spitzer 3 micrometer

We determined that the nebula has undergone multiple eras of formation that are responsible for its present appearance



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M17 Swan Nebula
from SOFIA-FORCAST
with additional data from Herschel, Spitzer