

Observations of Nearby Galaxies with a warm Spitzer

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Nearby galaxies emphasize the strengths of IRAC (field-of-view & surface brightness sensitivity)

The science questions that should be addressed are:

Stellar morphology of disk galaxies

Where are the edges of stellar disks?

What is the mass distribution in the disks?

Star formation surveys using the $4.5\mu\text{m}$ to $3.6\mu\text{m}$ flux ratio

AGN searches by looking for hot dust

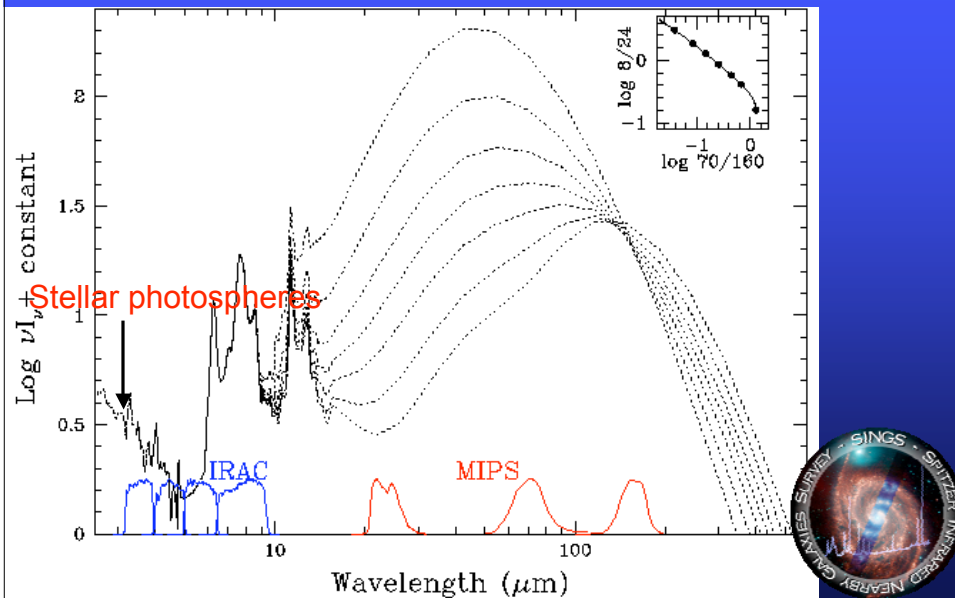
A census of evolved stellar populations in the Local Group.

Variability monitoring in the Local Group

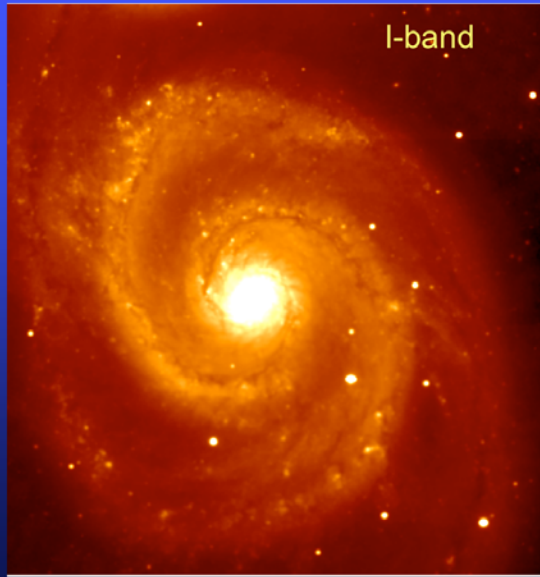
The infrared SED of stellar populations

Stellar Morphology of Nearby Galaxies using IRAC 3.6 μm images.

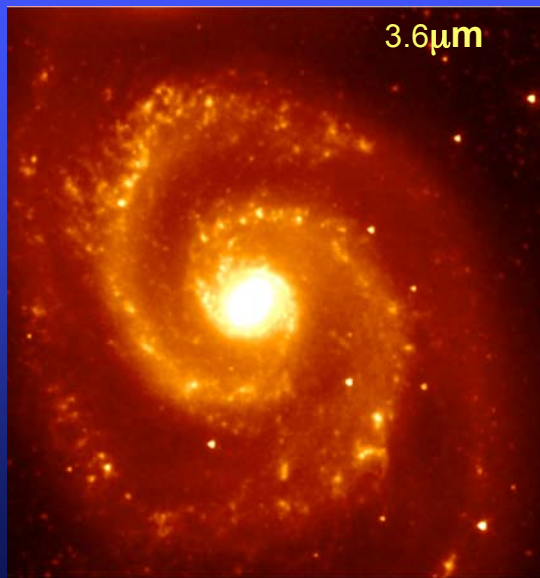
IRAC and MIPS well sample the SEDs of spiral galaxies.



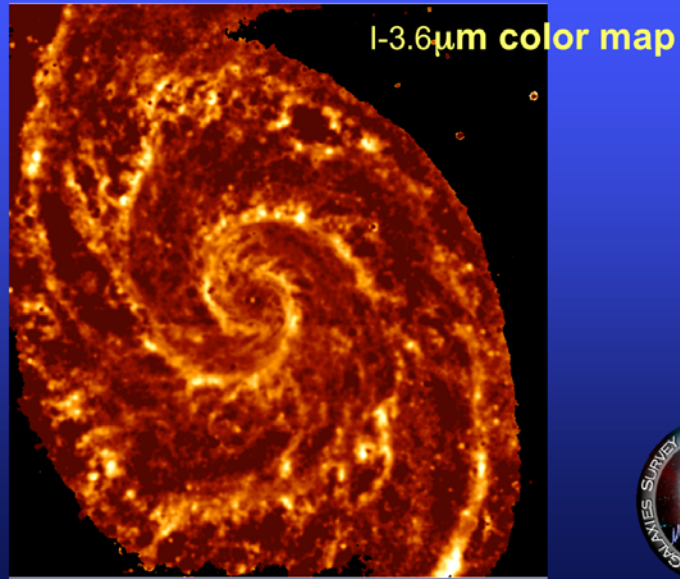
In M51 the Channel 1 ($3.6\ \mu\text{m}$) emission looks like dust free stellar emission.



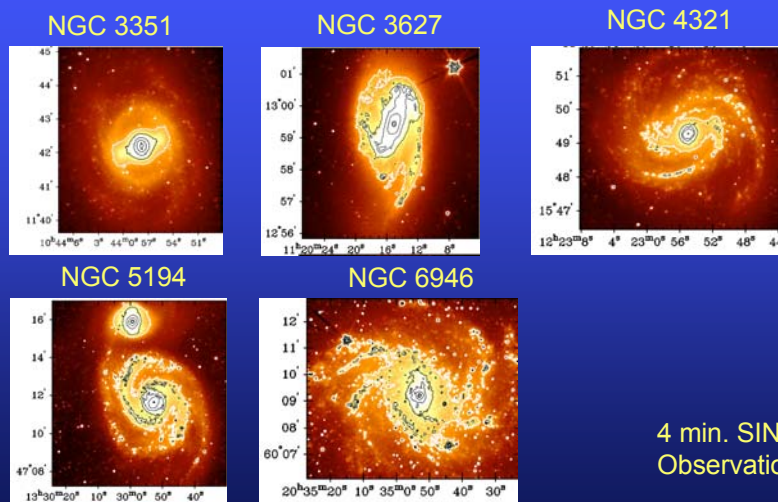
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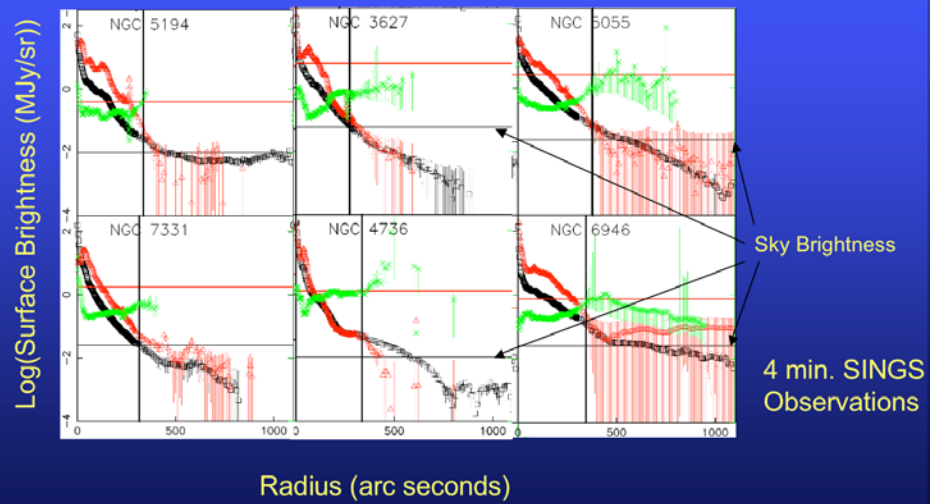
In M51 the dust extinction shows a similar morphology to the 8 μm emission.



3.6 μm and 4.5 μm images reveal the structural components of galaxies.

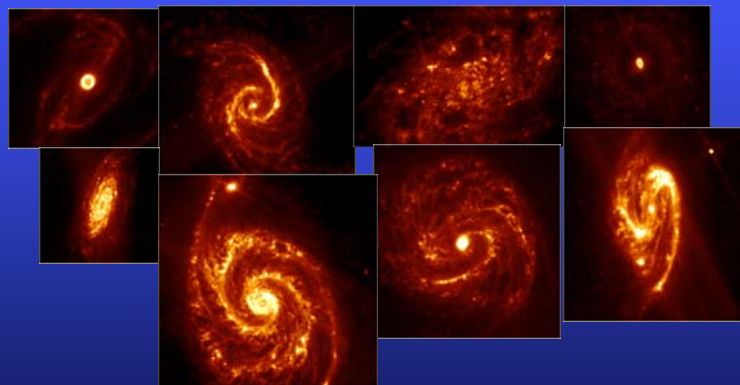


The excellent surface brightness sensitivity of IRAC allows accurate surface brightness profiles to large radii.



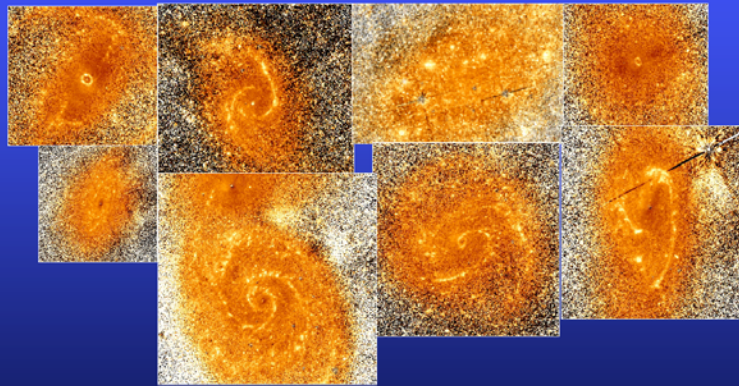
Regan et al. 2006

The images of the ratio of 4.5 μ m to 3.6 μ m have a similar morphology to 8mm PAH emission.



8 μ m PAH Emission

The images of the ratio of $4.5\mu\text{m}$ to $3.6\mu\text{m}$ have a similar morphology to $8\mu\text{m}$ PAH emission.



Ratio of $4.5\mu\text{m}$ to $3.6\mu\text{m}$ Emission

Hot dust in AGN can be identified using IRAC $3.6\mu\text{m}$ and $4.5\mu\text{m}$ images.

The inner edge of an AGN torus contains very hot dust that affects the ratio of $4.5\mu\text{m}$ to $3.6\mu\text{m}$ emission.

Combined with ground-based NIR images an SED can be created that will identify AGN

Stellar variability has been correlated with dust production.

Combine existing Local Group MIPs images of stars with dust excesses with long-term IRAC monitoring.

We could create a database of MIR fluxes of stellar populations.

Need fluxes as a function of metallicity and age.
Would allow better population synthesis models.

So, what could we do?

A large survey (~1500) galaxies to create a catalog of the morphology of stars and star formation in the nearby universe

hundreds of hours – a few thousand hours

A deep survey for the edges of disk (tens of galaxies)

~100 hours

A survey to search for AGN at $z < 1$

~hundreds of hours

A survey of variability in Local Group

variable amount of time

A survey of star forming clusters in the nearby Universe

hundreds of hours

