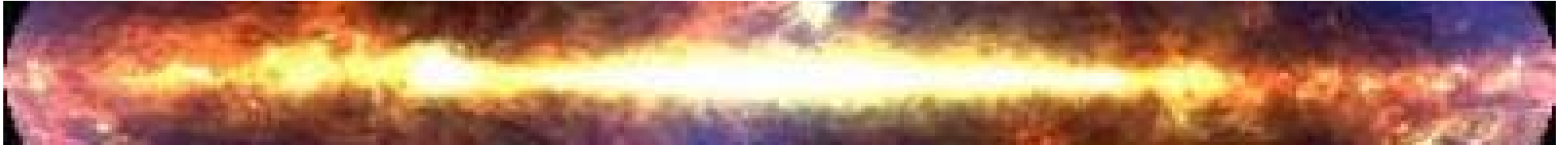


# Hi-GAL

## The Herschel infrared Galactic Plane Survey



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Hi-GAL team

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et al.

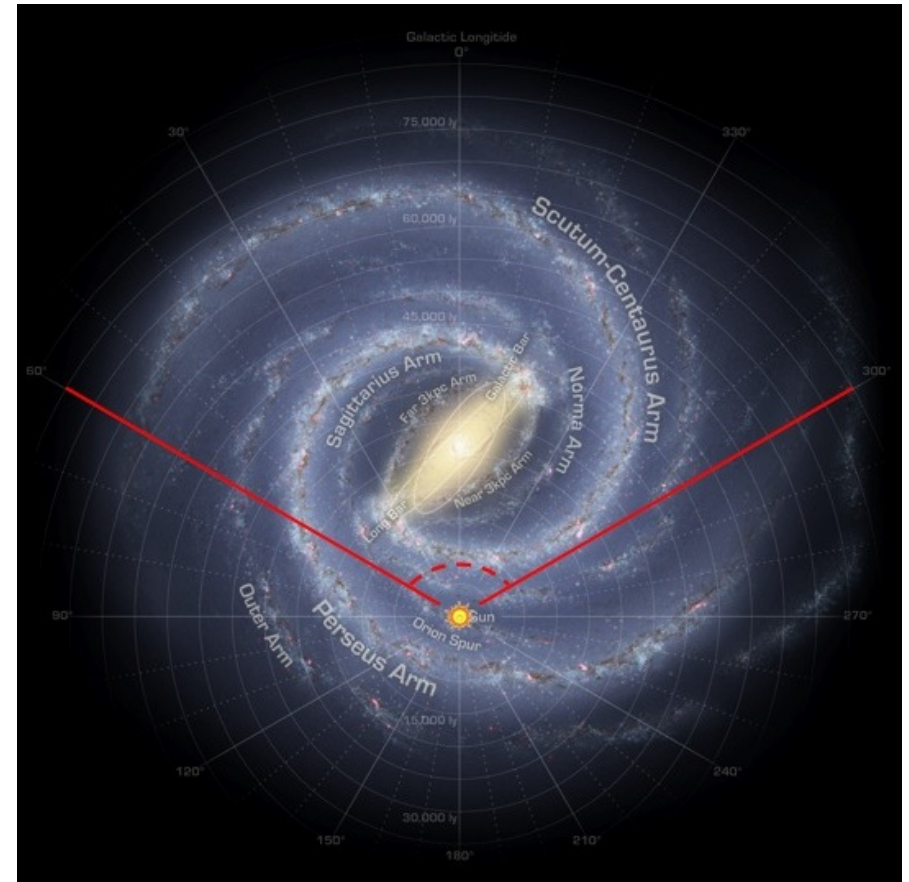
## Toward a Predictive Global Model of Galactic Star Formation

- The High-Mass Star Formation Timeline
- Measure the star formation rate and history Galaxy-wide
- Cold dust in the Galactic Plane and the Formation of Molecular Clouds
- Understanding star formation laws and the nature of thresholds as a function of ISM properties across a full range of galactocentric radii metallicity and environmental conditions
- Determining the relative importance of global *vs* local, spontaneous *vs* triggering, agents that give rise to star formation.
- Build bottom-up recipes and prescriptions useful for Xgal science

# Hi-Gal

A Herschel Key-Project for the Far-IR mapping of the inner Galactic Plane

- $-60^\circ < l < 60^\circ$  -  $|b| < 1^\circ$ , i.e. about the GLIMPSE and MIPS GAL areas
- 5 bands 70-500  $\mu\text{m}$  imaging using PACS and SPIRE in Parallel Mode with crossed-rasters
- 6"-35" resolution across the wavelength range



Galaxy-wide Census, Luminosity, Mass and SED of dust structures at all scales from massive YSOs to Spiral Arms

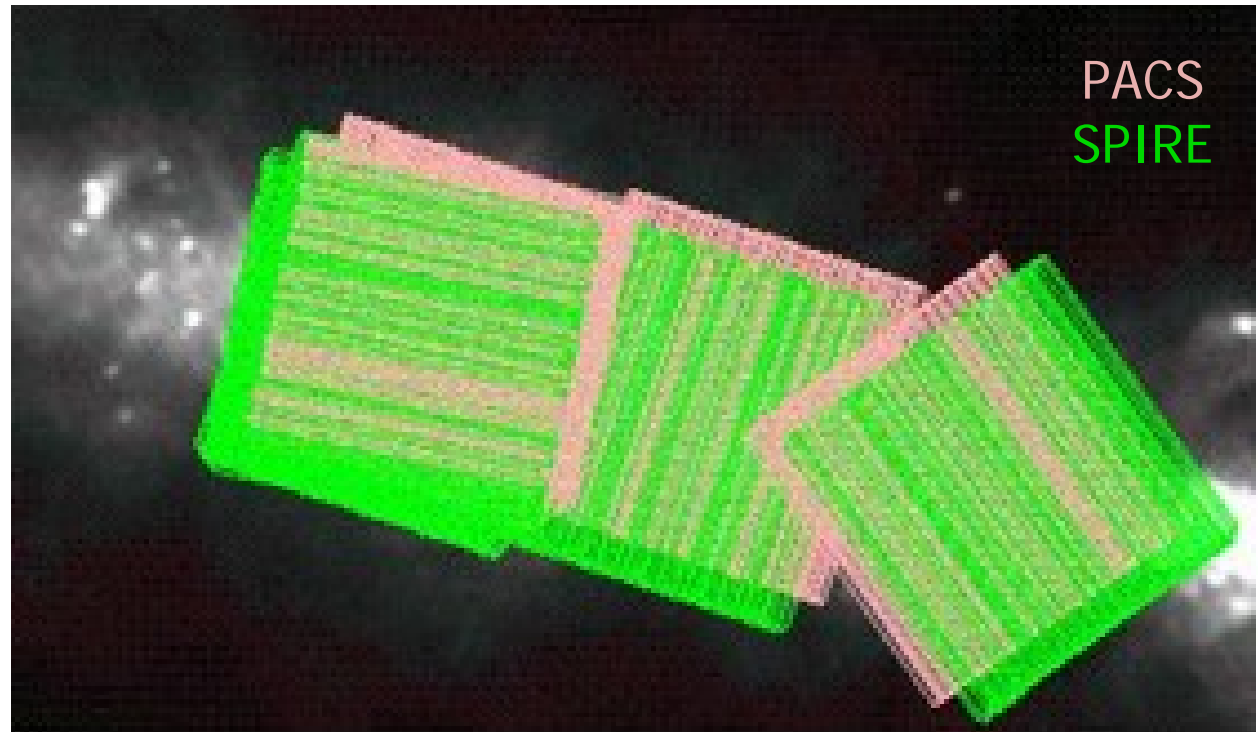
# The Hi-GAL SDP Program

Two  $2^\circ \times 2^\circ$  tiles centered at  $l=30^\circ$  and  $l=59^\circ$  in fast scan ( $60''/\text{s}$ ) pMode (70,170,250,350 and  $500\mu\text{m}$ )

- Significant science return
- Different regimes of contrast ratios and background conditions
  - test for saturation conditions
  - check noise and confusion
- Good for PR material
- Fully representative for Hi-GAL
  - Measure data processing load

# Hi-GAL Observing Strategy

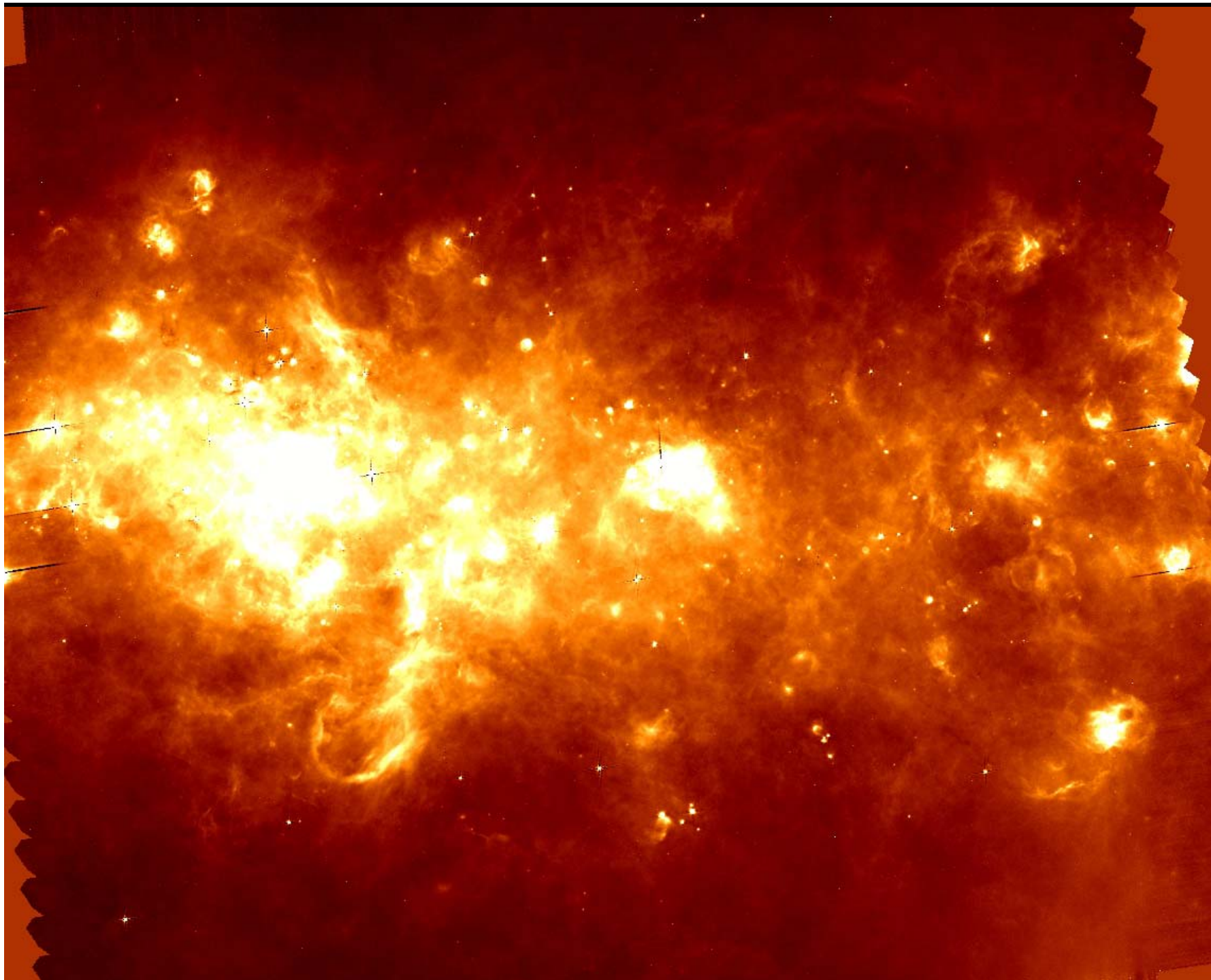
The Galactic Plane  
 $|l| < 60^\circ$  -  $|b| < 1^\circ$   
will be covered  
with a series of  
square tiles



- Each tile is observed with two oversized mutually orthogonal square rasters
  - optimal track for the instrumental drifts and minimization of  $1/f$  noise
- Oversizing ensures that ...
  - PACS and SPIRE overlap area is indeed  $2^\circ \times 2^\circ$
  - we are not sensitive to time of observation in delivering a continuous  $2^\circ$ -wide strip
  - sufficient overlap between adjacent tiles

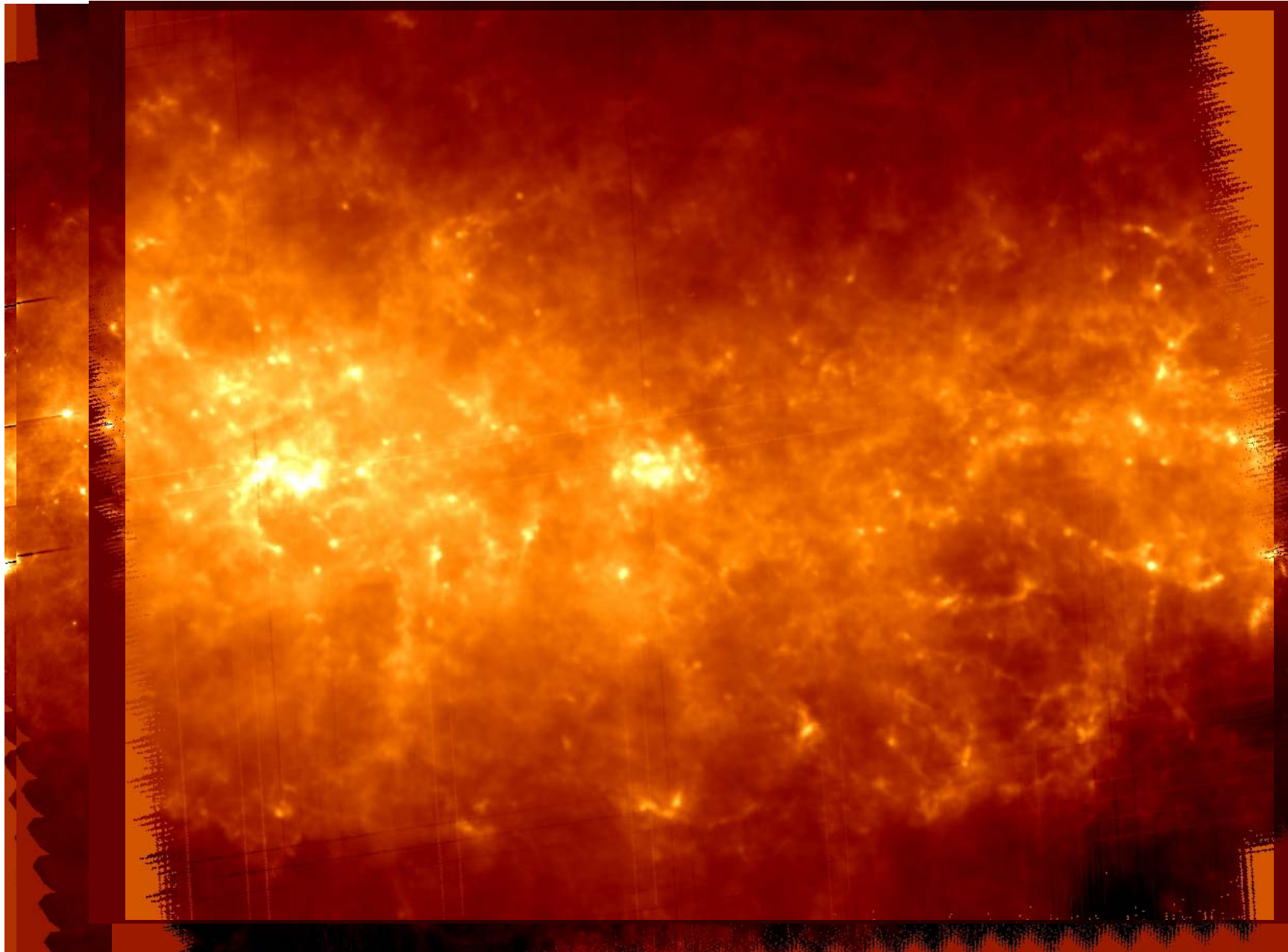
# Hi-GAL Data Reduction

- Pointing refinement using multiple passages on point-sources from the PACS 70 $\mu$ m and applied to all bands
- HIPE reprocessing
  - No standard deglitching (PACS only)
  - No high-pass filtering whatsoever (PACS only)
  - Common-Mode (correlated slow drifts) removal
- Deglitching done in map-making stage
- Optimized maps with ROMAGAL using bolometer-specific noise filters for all bands





# Field $l=30^\circ$



PACS 70

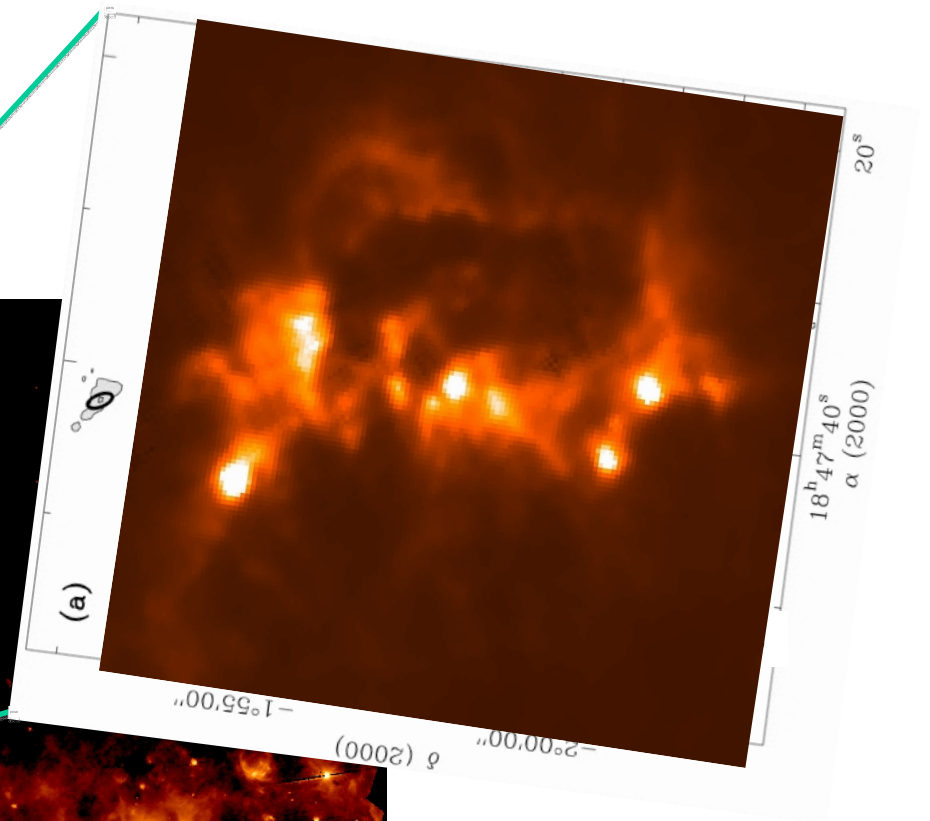
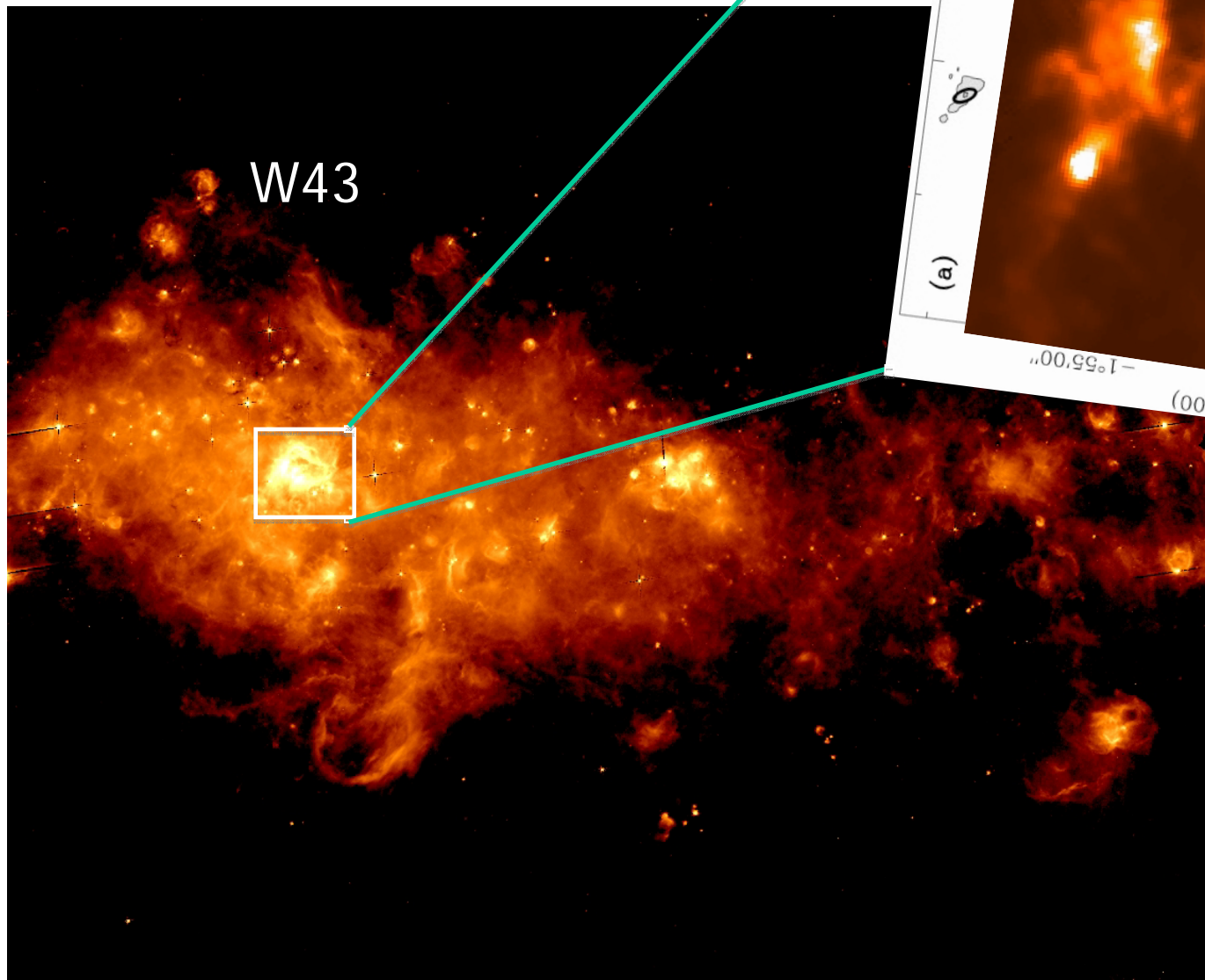
PACS 170

SPIRE 250

SPIRE 350

SPIRE 500

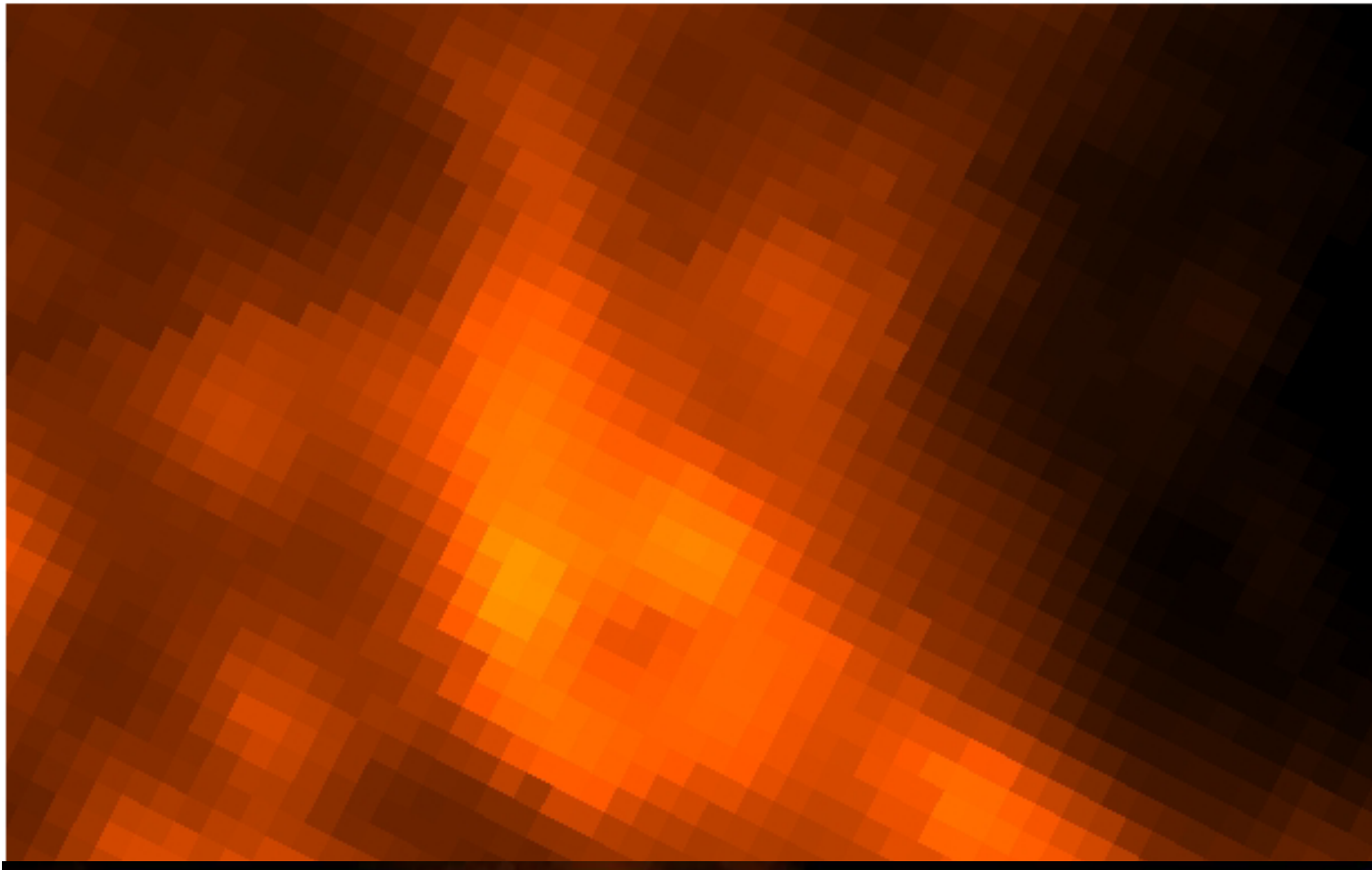
# Star Formation



- Detailed  $10^3$ - $\lambda$  SED modeling
- YSO evolutionary classification from pre-stellar to ZAMS
- SF Timeline + SFR + SFH



# IRDCs: Shadows...and Lights



MIPS 24

PACS 70

PACS 170

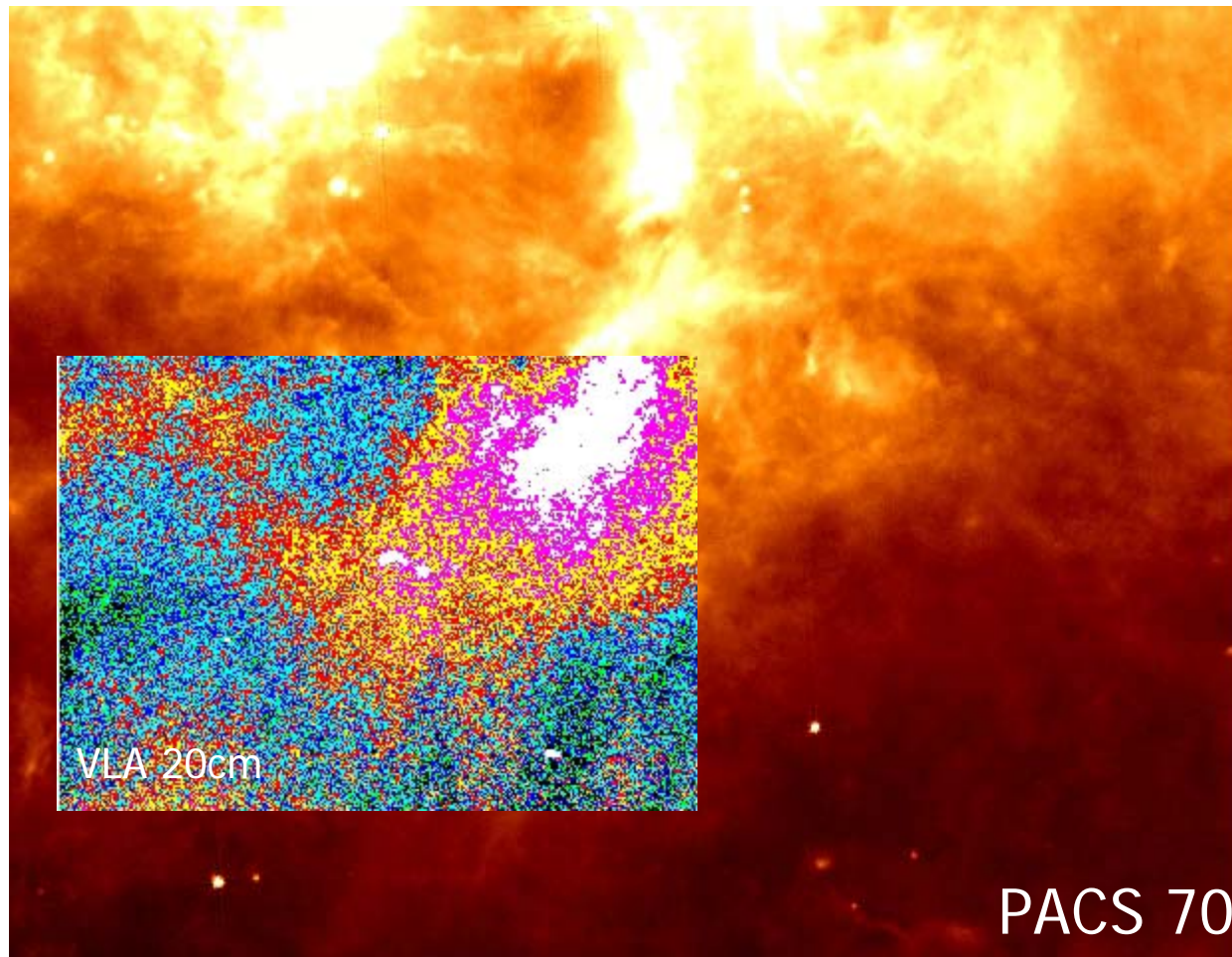
SPIRE 250

SPIRE 350

SPIRE 500

- The earliest stages of massive SF
- The lifetime of pre-stellar phase
- Dust properties at extreme  $A_V$

# HII Regions

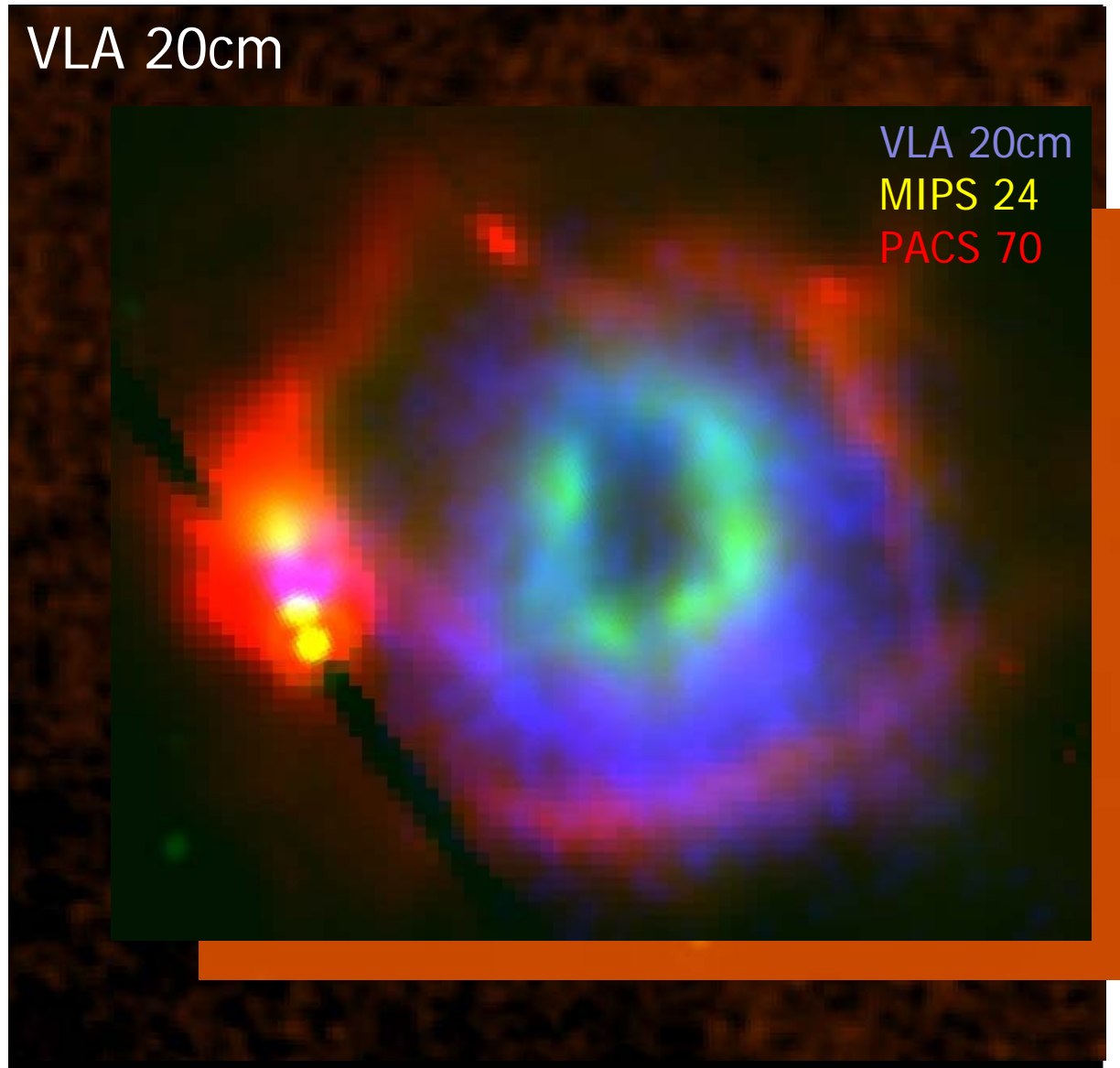


- Dust properties in HII regions
- Dust properties at shock fronts
- ISM compression and triggered SF

# Bubbles

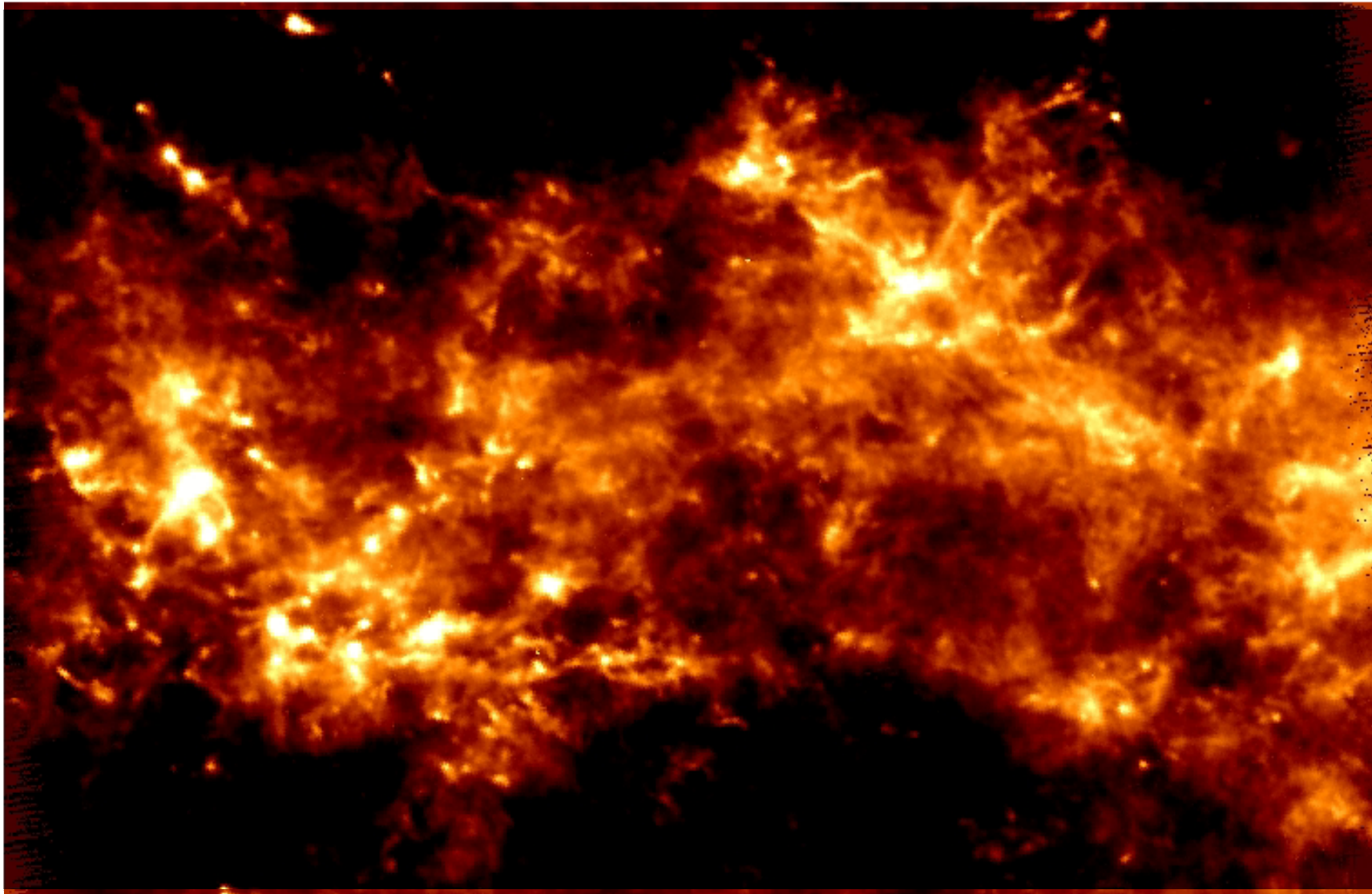
N49 – a small HII region  
from an OV star  
(Churchwell et al. 2006)

- Heated dust from HII compression
- Triggered star formation





# Field $l=59^\circ$



PACS 70

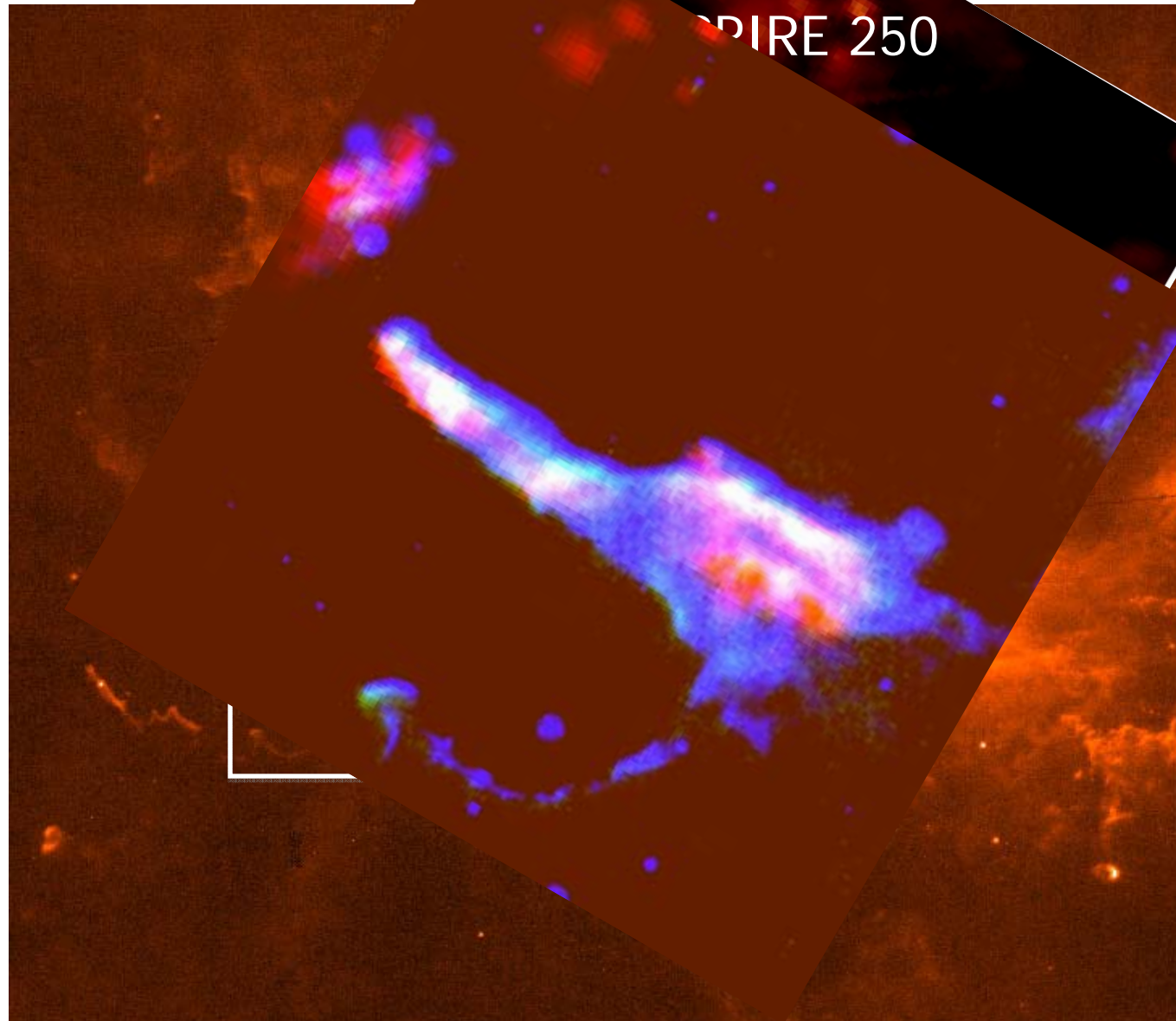
PACS 170

SPIRE 250

SPIRE 350

SPIRE 500

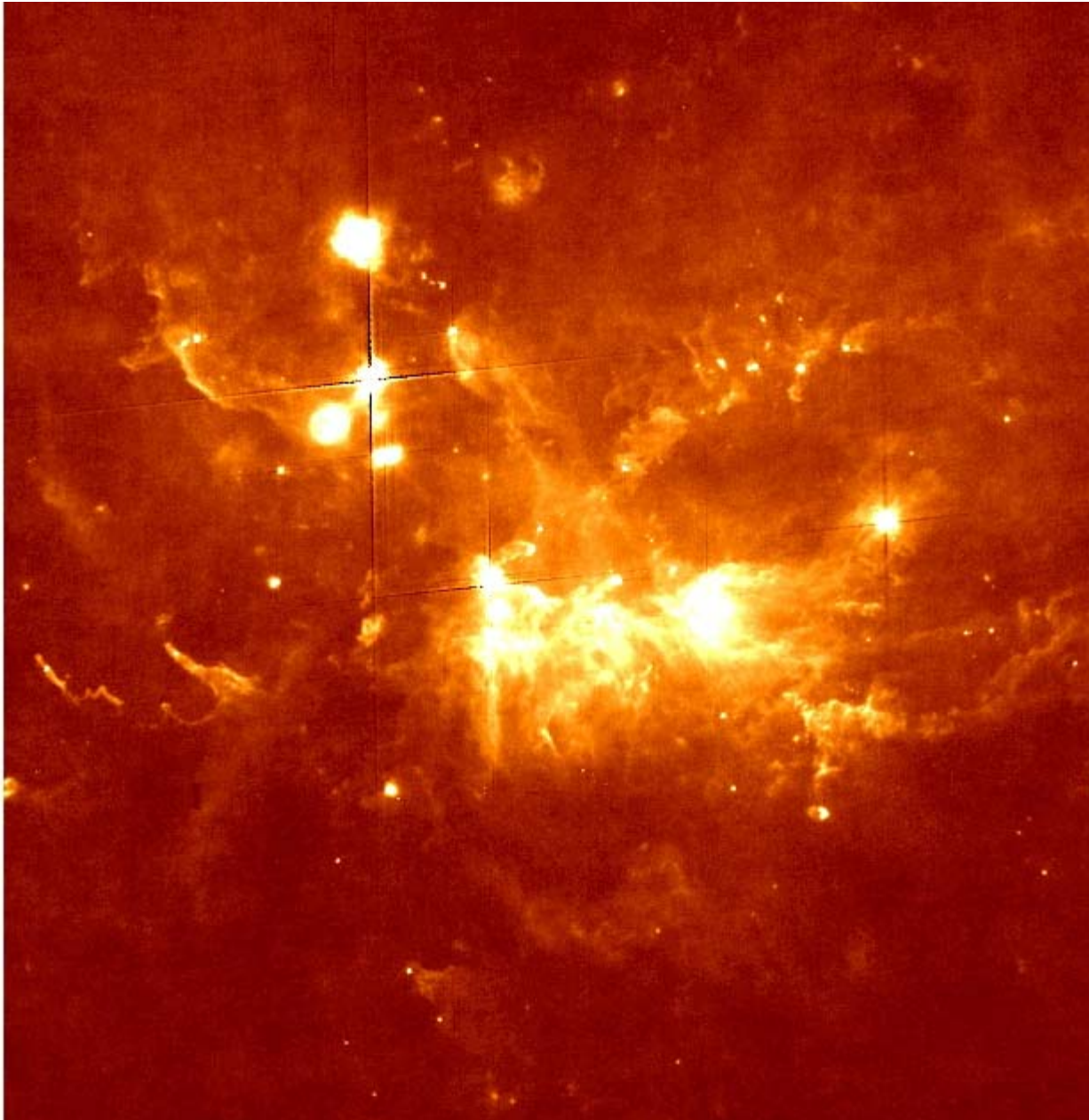
# Pillars and PDRs



- Dust-ISRF interaction
- Star Formation in high radiation fields
- ISM compression and triggered SF



# Pain Areas



entire AOTs (e.g.  
were not found in  
yesterday)  
one.

require work  
n  
exhaustive  
of the time

# Short-term plans

- About 20 papers have been identified by the Hi-GAL Science Working Group Coordinators as a first output from SDP data
  - They address important aspects of the Hi-GAL science goals
  - They are feasible in the spring 2010 timescale
  - A subset can be identified for the A&A Special Issue
- A burst of follow-up programs is likely to flood TACs of major observatories by march or earlier (including the Herschel HOTAC in due time) when a good chunk of the survey will have been executed

# Conclusions

- The SDP program proves that the quality of the data and the data processing approach will allow us to effectively attack the science goals (...and maybe fulfill them)
- Hi-GAL is fully confirming its promise to become one of the longer-lasting legacies of the HERSCHEL satellite, with extraordinary potential for serendipitous science.
- The Milky Way “suburbs” still remain “terra incognita”, and the unprecedented opportunity (quite uncertain beyond the Herschel horizon) for a detailed study of our cold outer Galaxy is at hand....

**Hi-GAL2**

*Image by Nicola Giordano*

