Photo Credit: Levente Buzas, University of Victoria

From Clumps to Cores to Protostars: The GBS First Look at Southern Orion A

Steve Mairs - JCMT User's Meeting - 南京 (Nanjing) 2017
with: Dr. Doug Johnstone, Dr. Helen Kirk, and the JCMT GBS Team

Overview

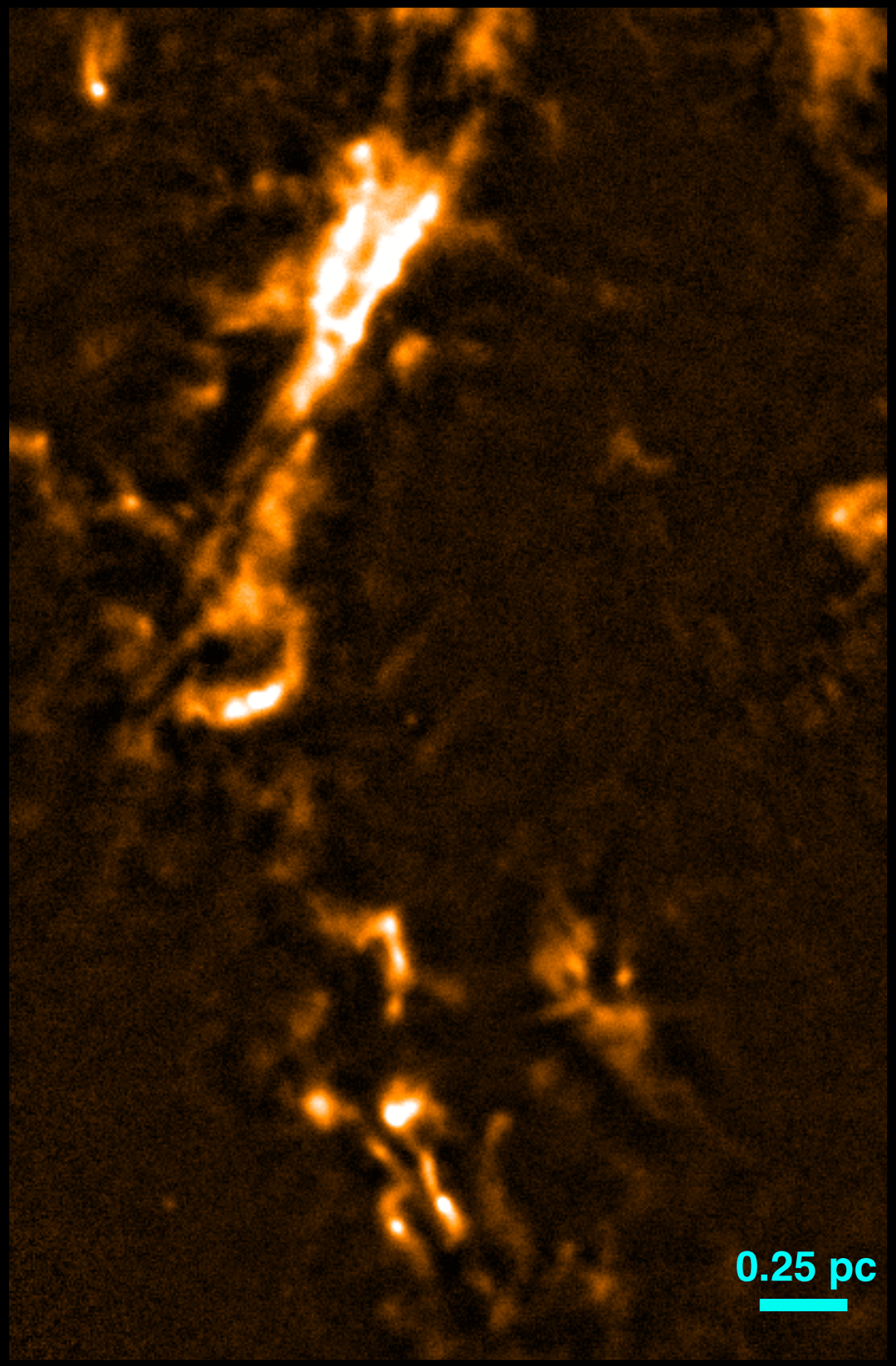
1. **Connecting Large and Small-scale** Structures with the JCMT

2. The JCMT Gould Belt Survey (**SCUBA-2**)

3. Characterising **Significant Structure**

4. Connecting dust emission with **Young Stellar Objects** in Southern Orion A

5. **Summary**



Mairs et al. 2016. MNRAS 461:4022

The JCMT Gould Belt Survey

Star forming regions are complex and dynamic. A full understanding will require investigating the connection between **many different size scales.**

SCUBA-2 provides the **imperative, intermediate observing regime** between the large-scale cloud and the small-scale protostellar physics

The **JCMT Gould Belt Survey** is a consortium dedicated to studying **~20 nearby (<500 pc) star forming regions** at submillimetre wavelengths

JCMT Gould Belt Legacy Survey

Orion, Perseus, Taurus, Ophiuchus, IC5146, Lupus, Cepheus, Auriga, Serpens…

Identifying Structure

SCUBA-2 Observes at 850 μm and 450 μm simultaneously

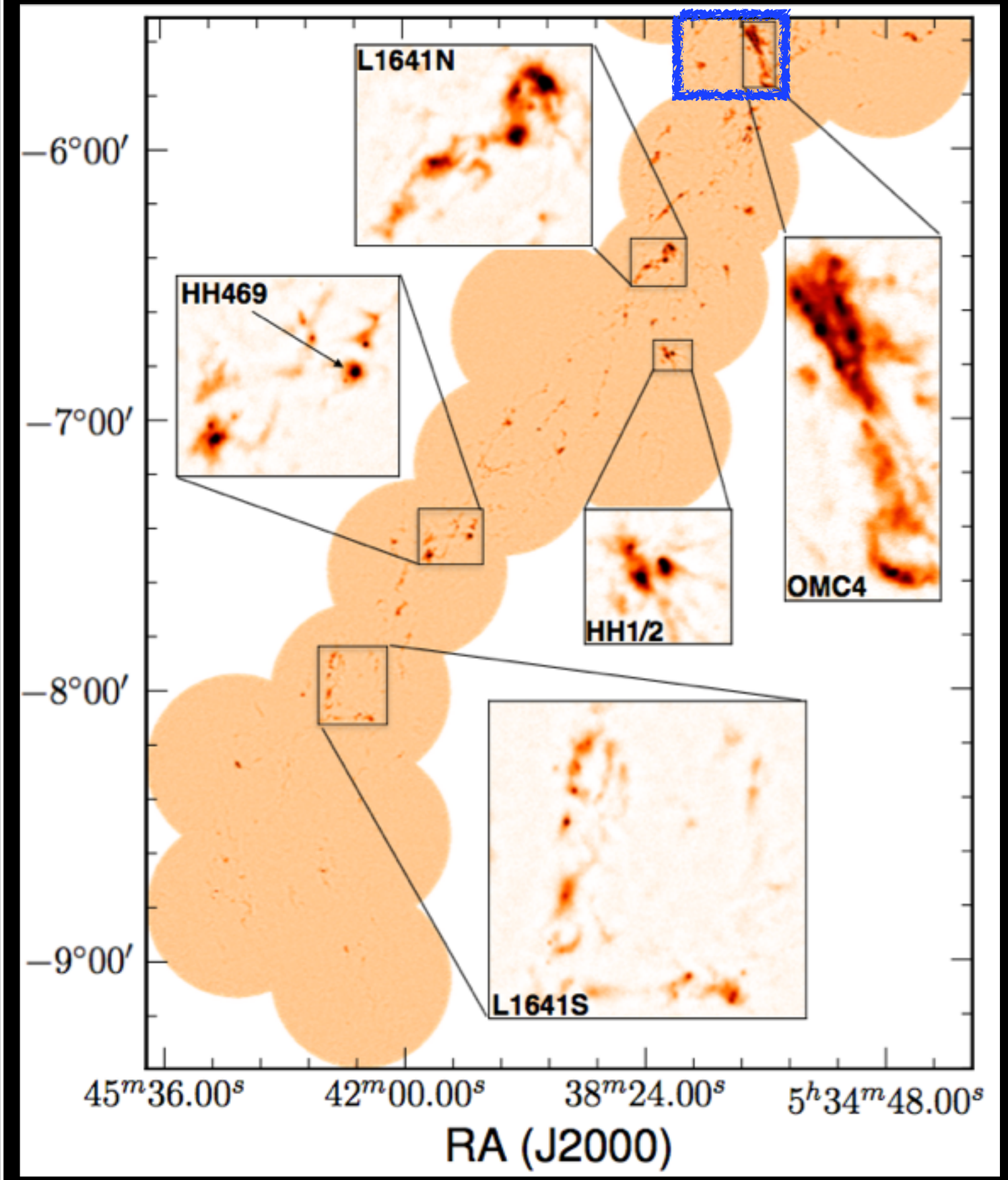
Two Step Source Extraction:

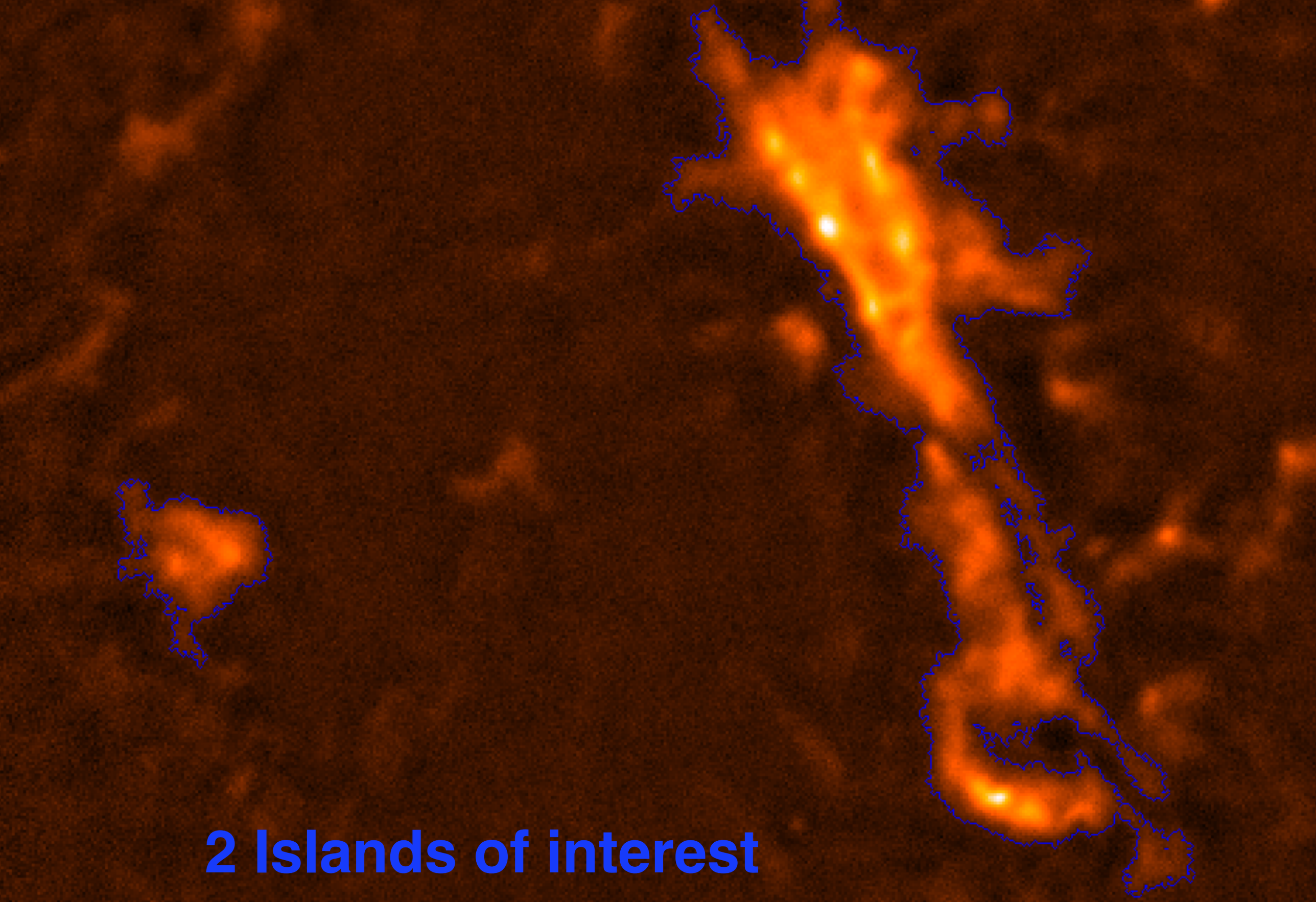
Islands: 3σ contours larger than one beam (~15”)

Fragments: Identified using *FellWalker* (Berry 2015 A&C 10:22)

Fragments are often smaller than islands. They highlight substructures within larger sources

Southern Orion A (850 μm; SCUBA-2)




2 Islands of interest
0.2 pc

2 Islands of interest

Fragment Finding Algorithm

0.2 pc

An Example of an interesting follow-up candidate

Protostar
Class 0/I

Disk

Protostar
Candidate

M ~ 4M_J

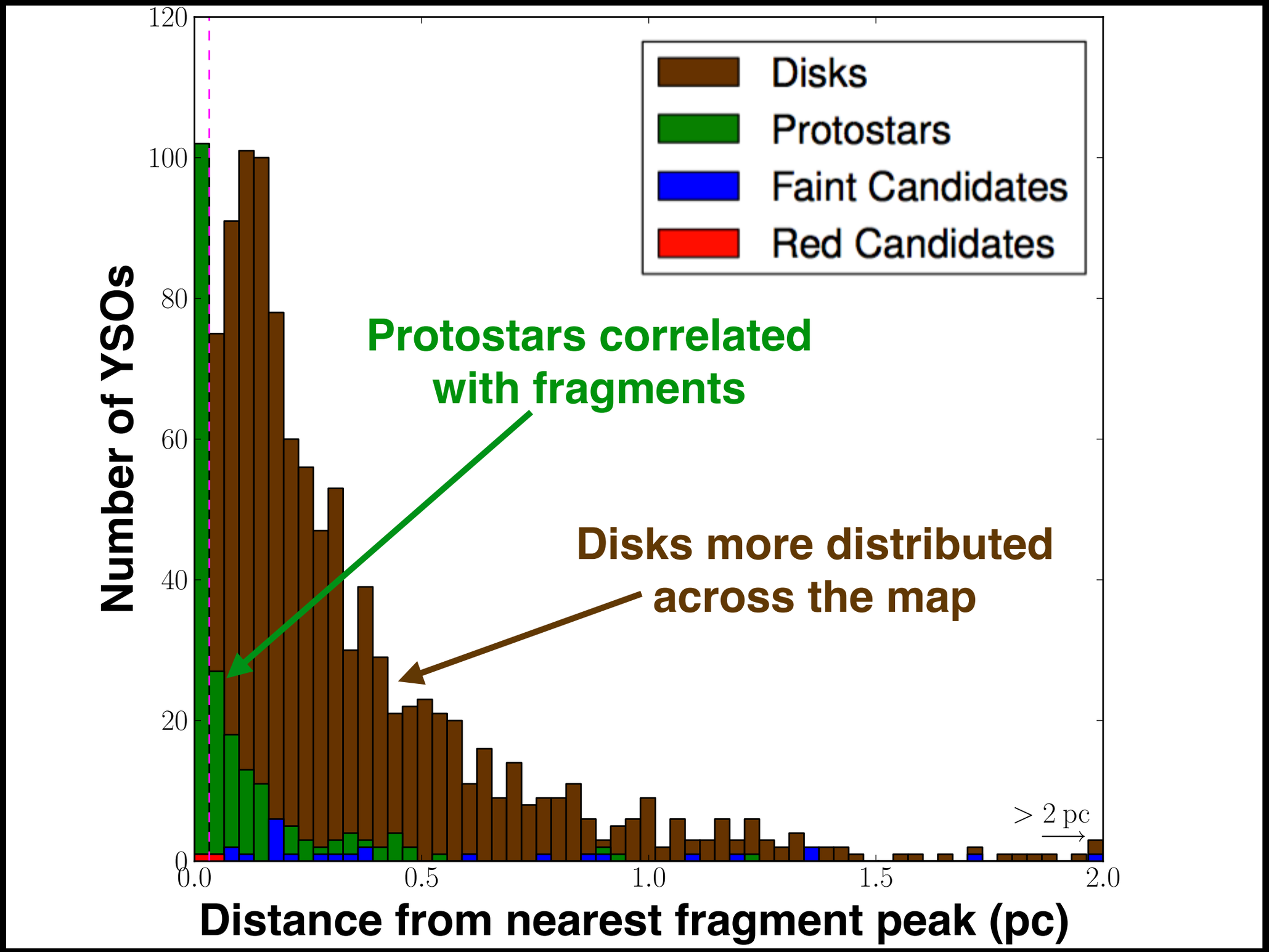
M~ 3M_J

Radius = 0.1 pc
Mass = 16.5 M⊙

YSO Catalogue From:
Megeath et al 2012
Stutz et al 2013

Starless 1

YSO Distribution in Southern Orion A

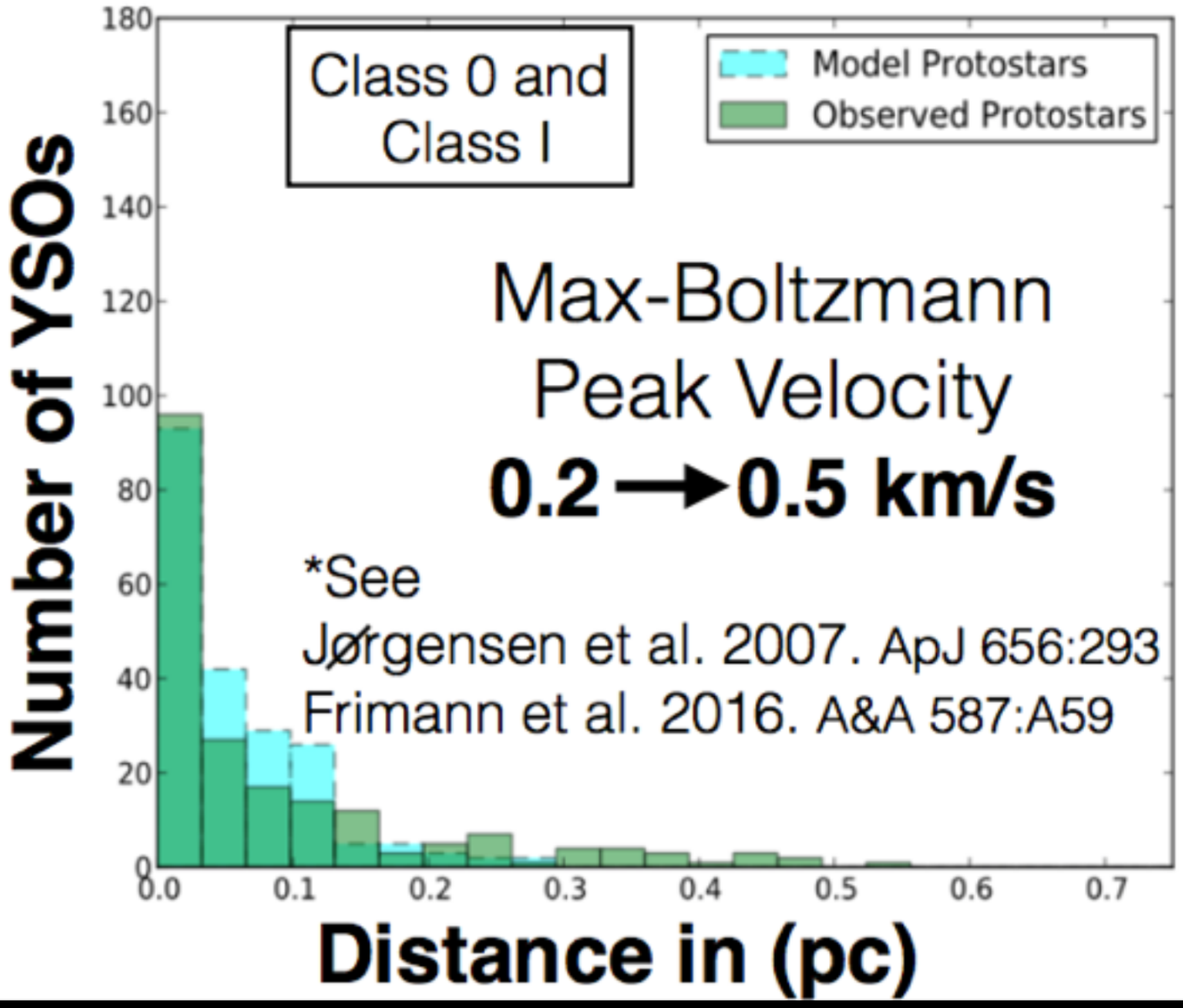


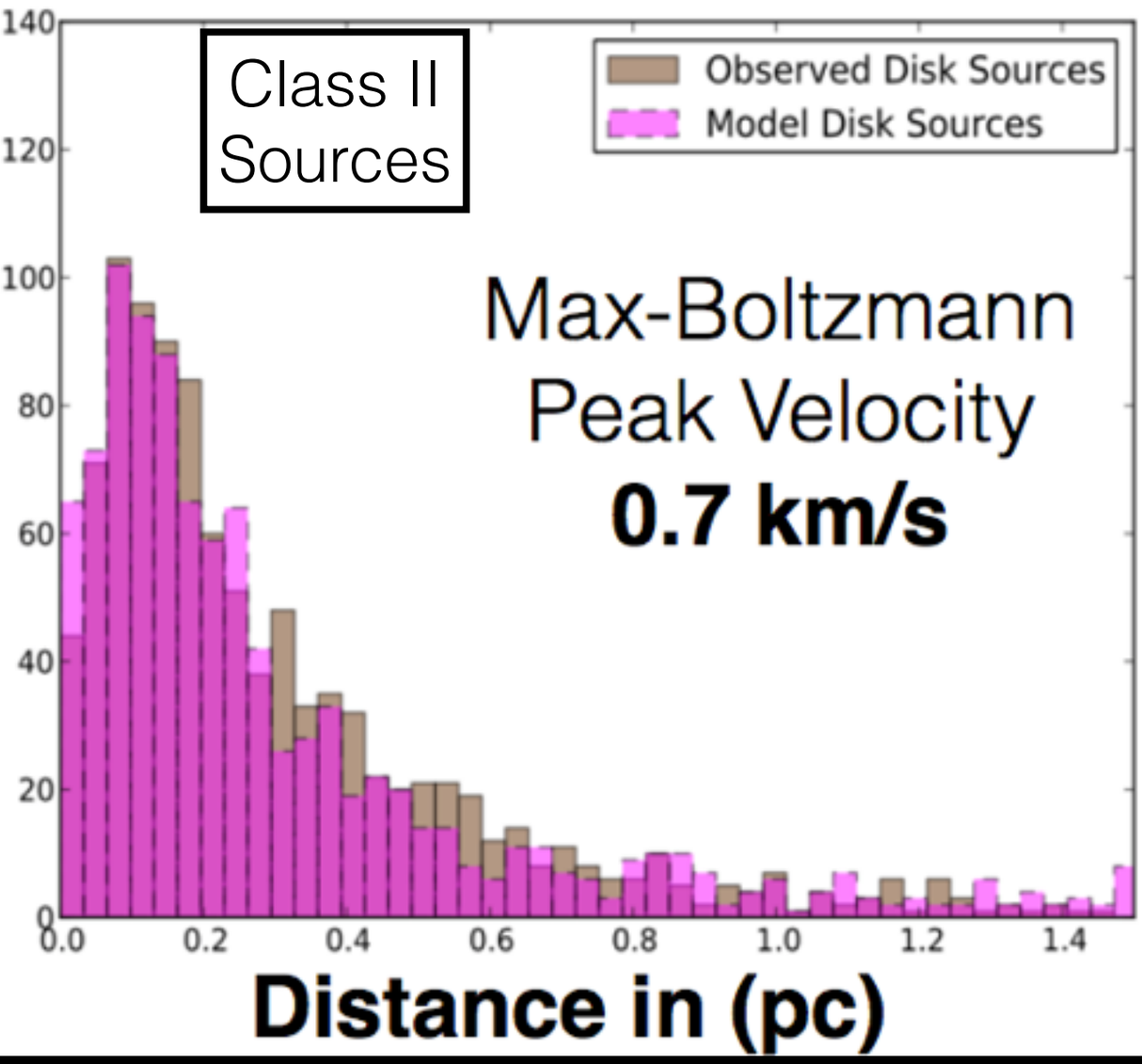
Are we able to recreate this distribution with simple assumptions?

A Toy Model for the YSO Distribution

YSOs "**Launched**" in random directions from **Jeans Unstable fragments**

The launch **velocities** are drawn from a **Maxwell-Boltzmann distribution**

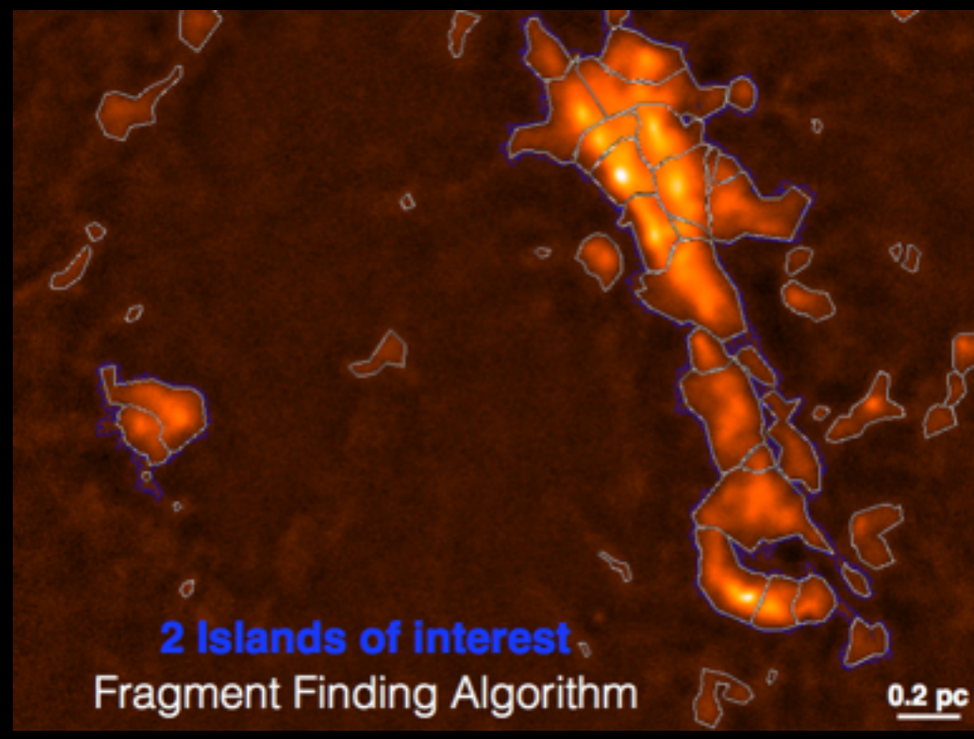




There appears to be an **evolution in velocity dispersion** from YSO Class 0 to Class II

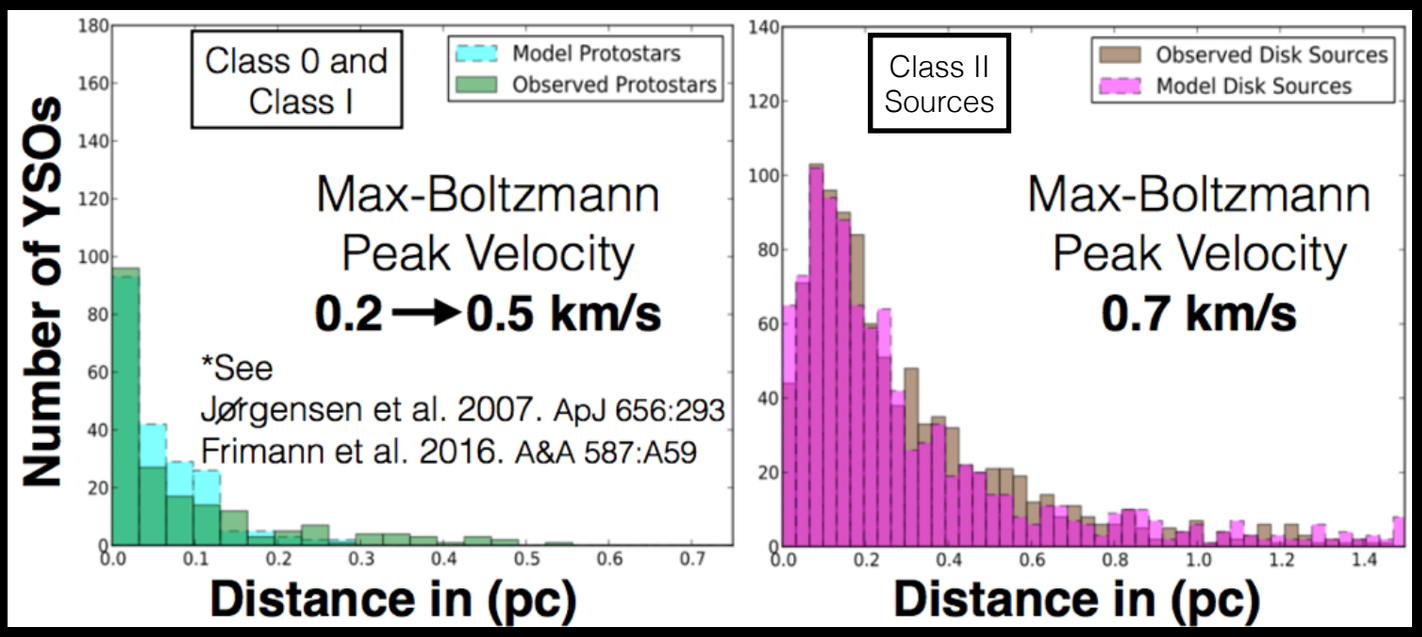
Summary

1. We have completed a **First-Look Analysis** of Southern Orion A using SCUBA-2.
See: **Mairs et al. 2016. MNRAS 461:4022**



2. We have **identified significant structures**, performed an **analysis on fragmentation**, and **highlighted interesting cases** (Super-Jeans)

3. We investigated the dust emission's **relationship with Young Stellar Objects** and created a **simple model to recreate the YSO distribution**



4. There is an apparent **evolution in velocity dispersion** from YSO Class 0 to Class II, though follow-up work is necessary

5. This analysis is being **extended to other GBS regions** by undergraduate **James Lane**