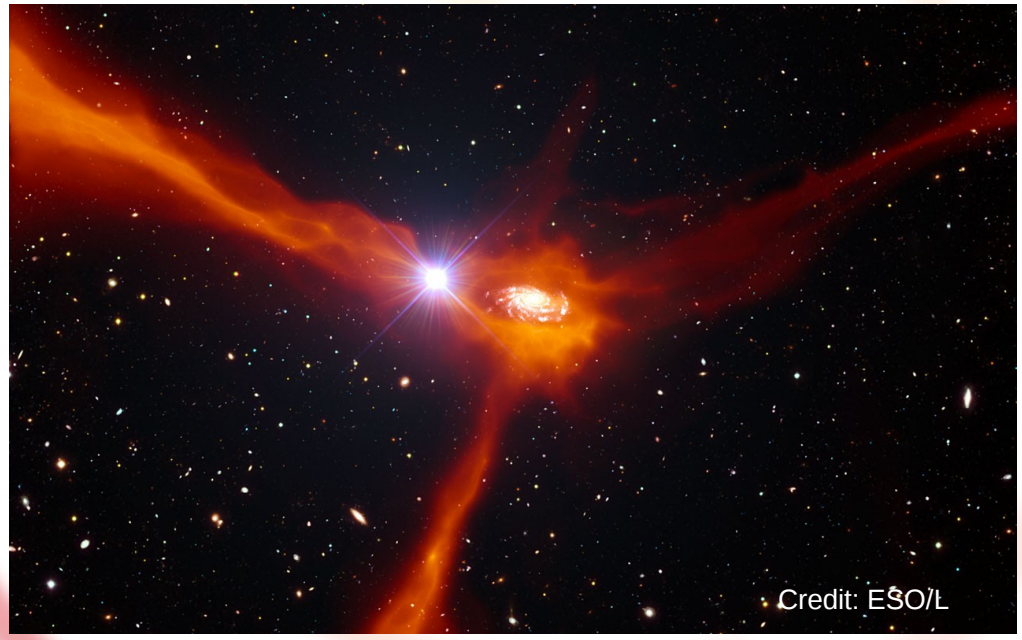
Gas Accretion and Star Formation in Galaxies with WALLABY



Bi-Qing For

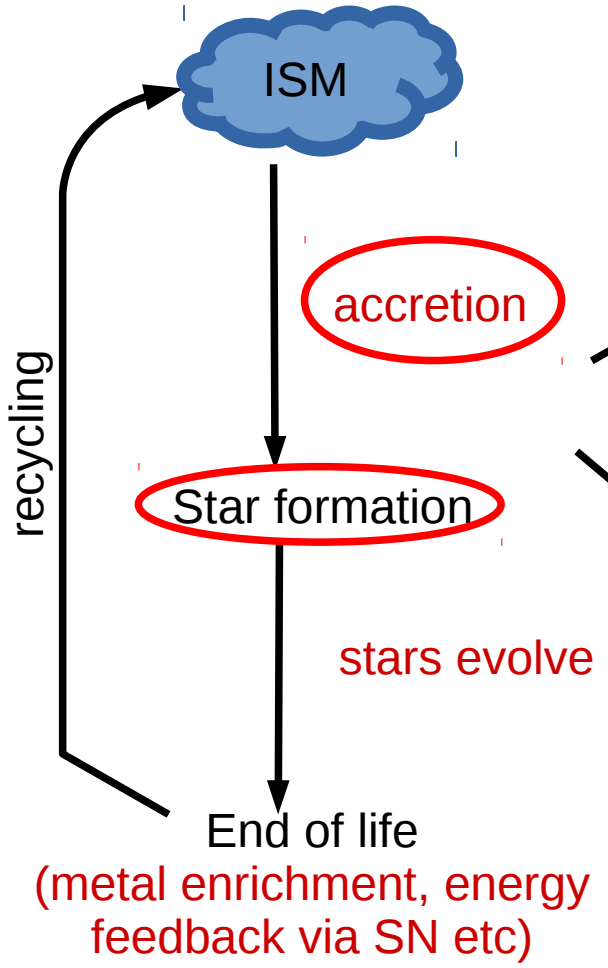
University of Western Australia

International Centre for Radio Astronomy Research

Curtin University

The University of Western Australia

Galaxy Evolution



Internal secular evolution:

- DM halo
- Galactic winds
- Nuclear black holes etc

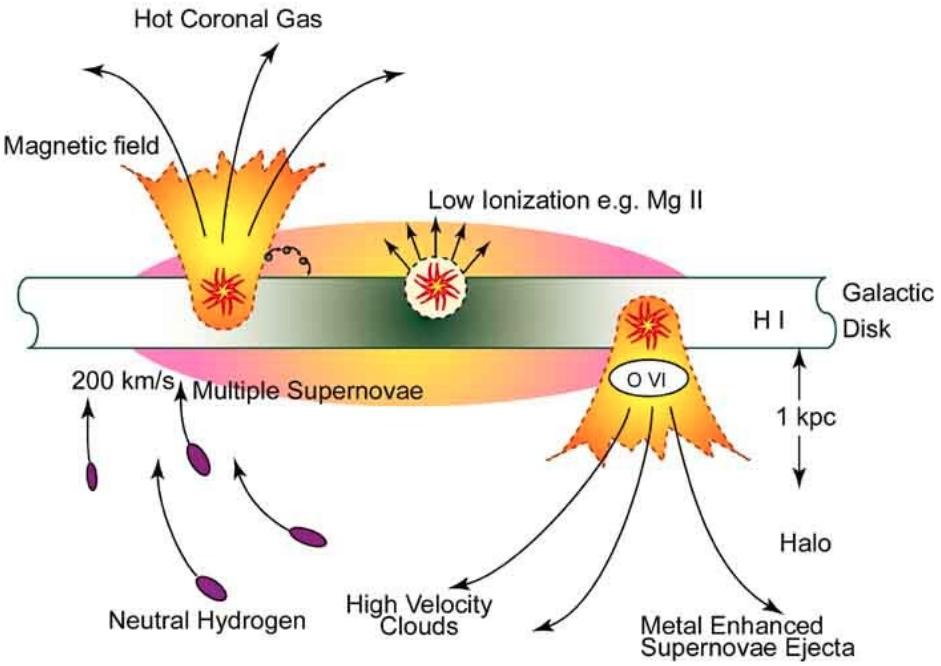
Environmental Effect:

- Mergers
- Galaxy harassment
- Ram-pressure stripping
- etc

IC 3418
Credit: NASA/JPL

How do galaxies accrete gas and form stars?

Galaxies are actively forming stars. They will run out of fuel --> turn “red” and dead.



Fountain model

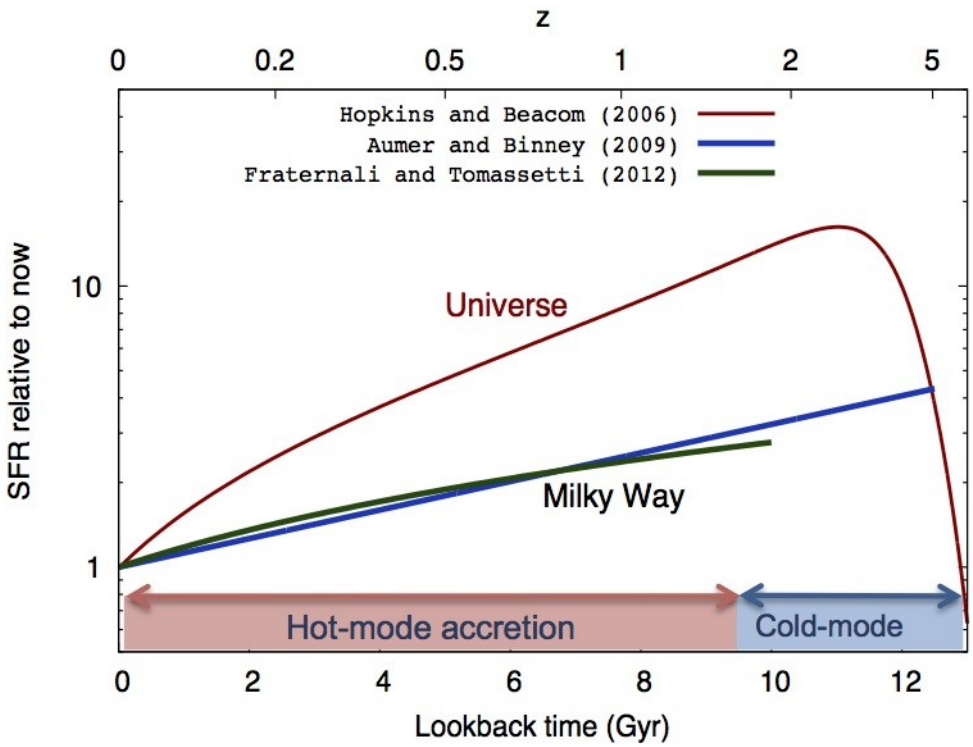
Merger events:
major and minor

How do galaxies accrete gas and form stars?

Cosmological models:

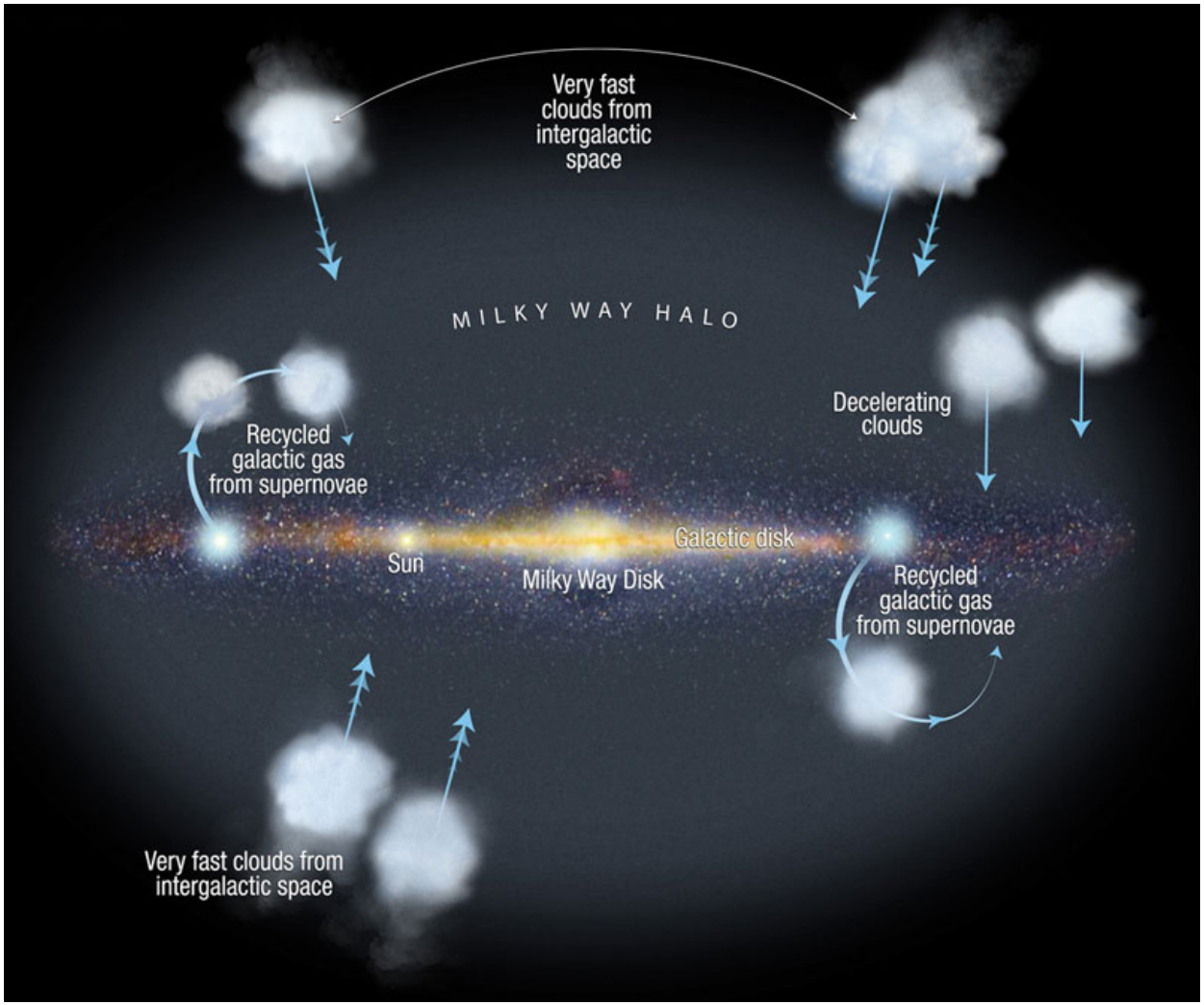
- Hot mode
  – gas cool within the halo, falls back to the center, massive halo (low z)

- Cold mode
  – gas tunneling in via filaments, low to intermediate mass halo (high z)



F. Fillipo
arXiv:1310.2956
[astro-ph.CO]

HI clouds



- HVC
- IVC
- Extraplanar gas
- Tidal debris
- etc

Previous Studies

- **14 nearby disk galaxies (Schulman et al. 1994): 10 with high velocity wings, 6x10^7 – 4x10^9 Msun**

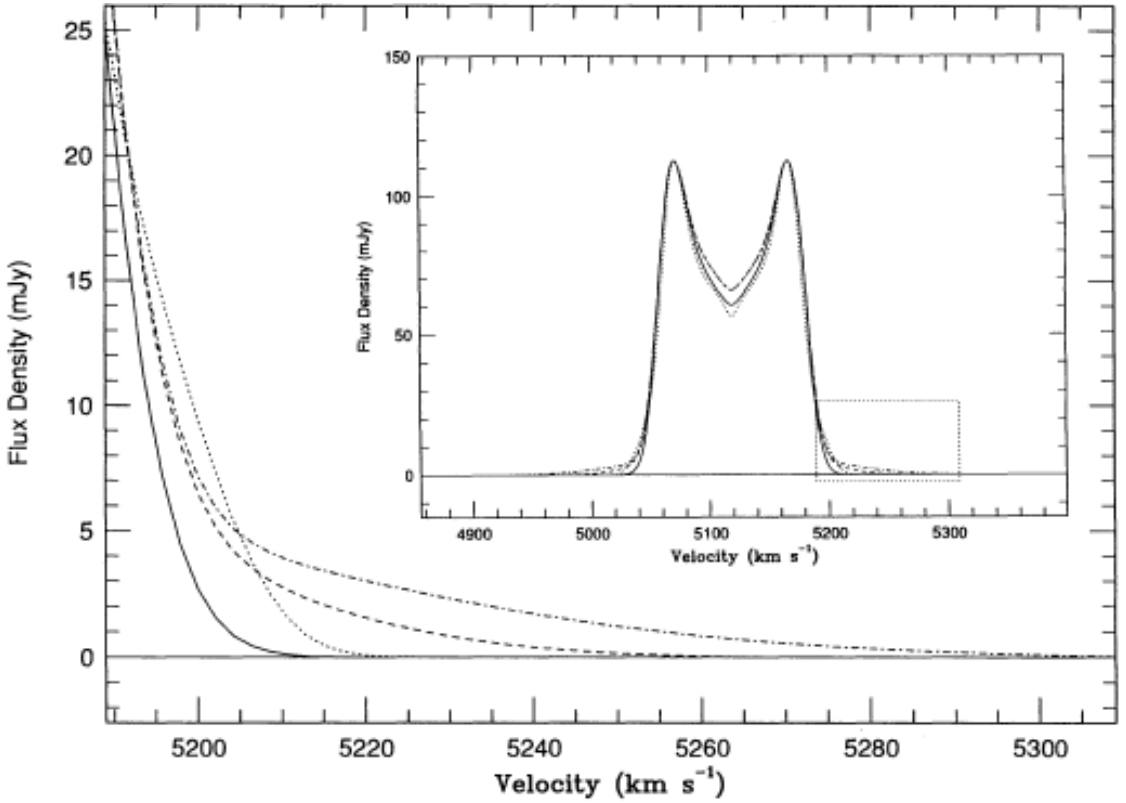
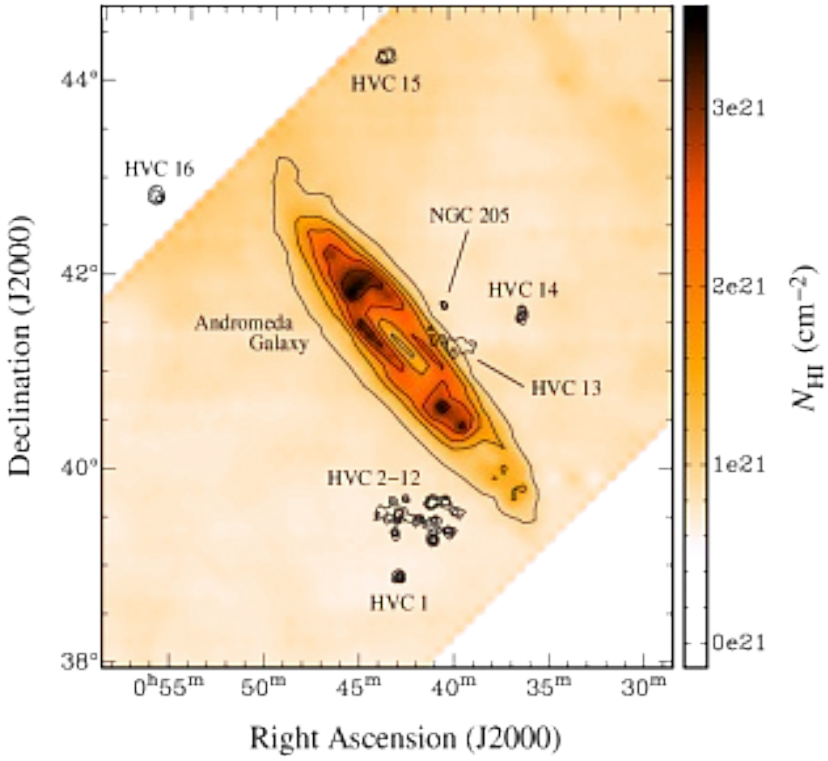
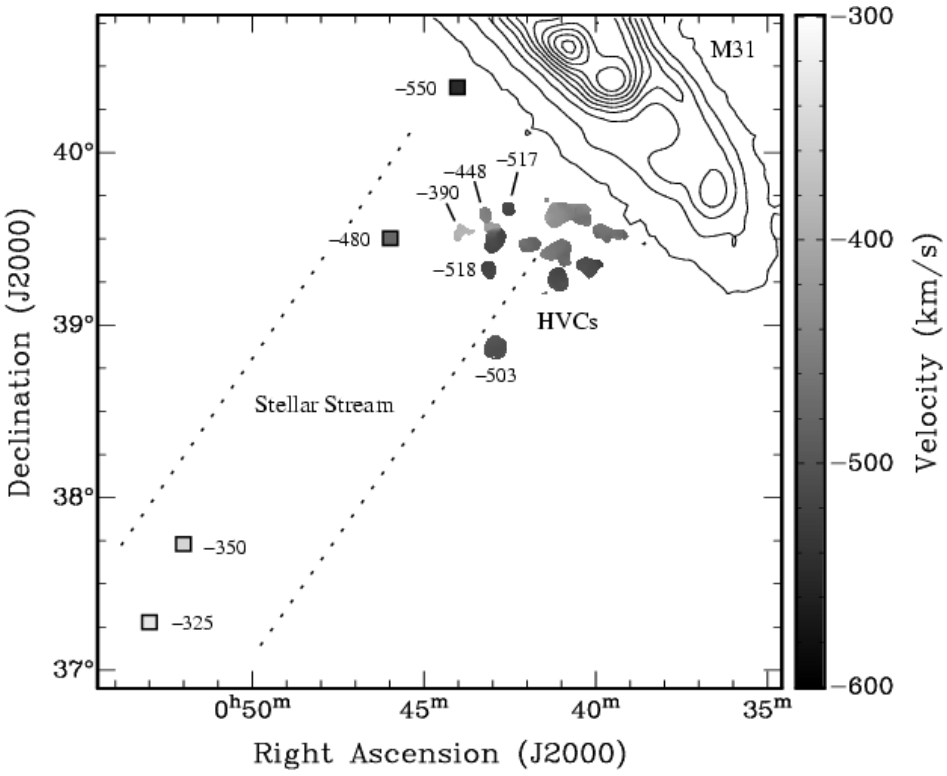


FIG. 1.—Wings of four H I profiles produced by different disk galaxy models of NGC 765: a model with no high-velocity material (*solid line*); a model with a warp along the major axis (*dotted line*); a model with high-velocity clouds having a velocity dispersion of 50 km s^{-1} (*dashed line*); and a model with high-velocity clouds having a velocity dispersion of 30 km s^{-1} (*dash-dot line*). The inset shows the entire H I profiles, and the dotted box indicates the magnified region.

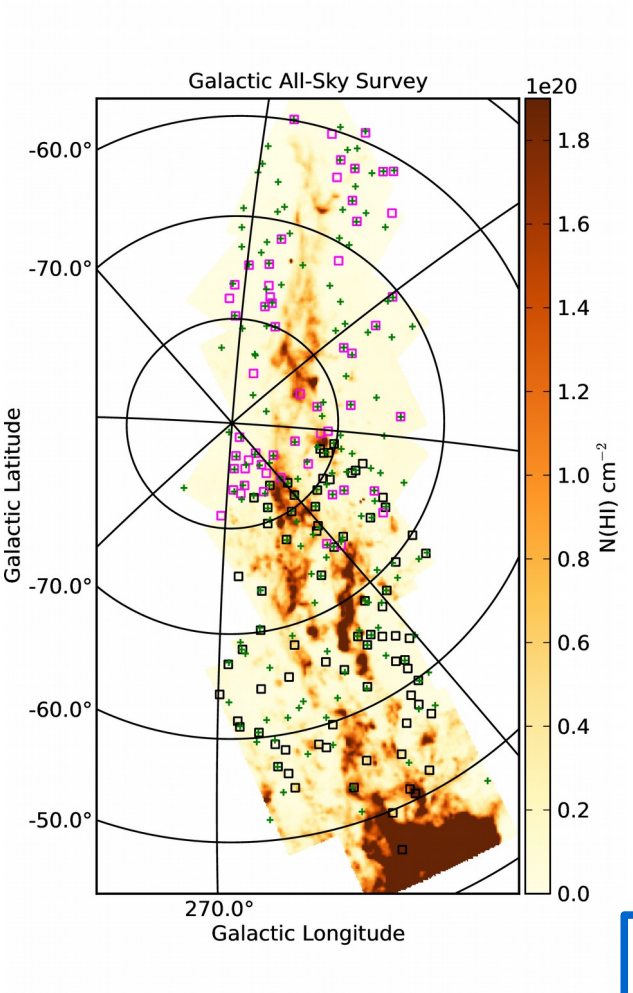
Previous Studies

- **11 dwarf galaxies in loose groups (Pisano et al. 2004): no detection (< 10^8 Msun)**
- **M31 and M33 (Westmeier et al. 2005): 16 + 1 (10^5 Msun), tidal origin**

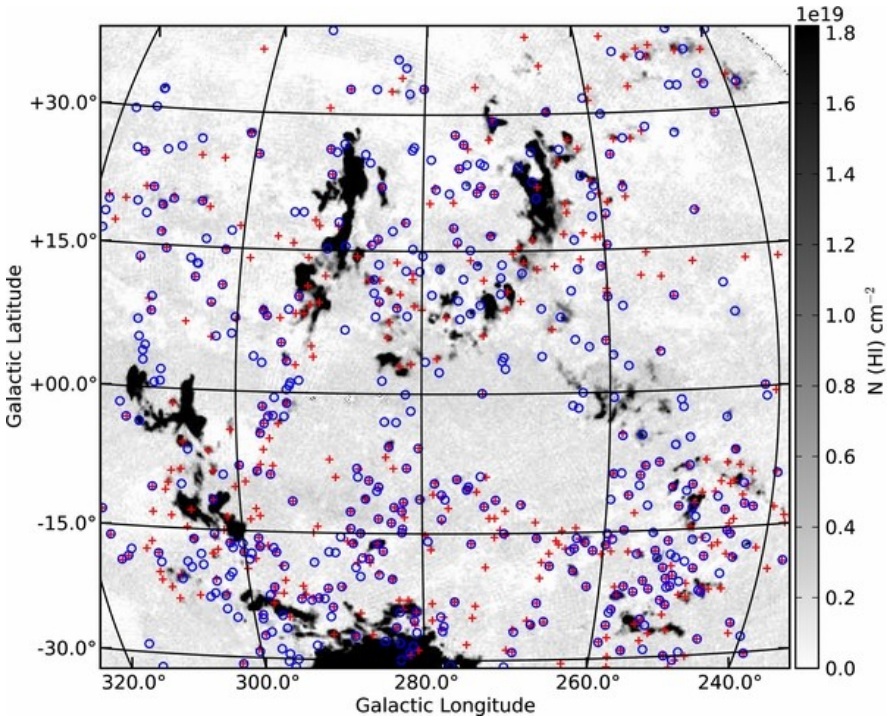




Previous Studies



For et al. (2014)



For et al. (2013)

The Magellanic Stream and Leading Arm(s) HVCs: tidal origin

HVC studies

1. How common are HVCs around galaxies?
2. Are HVCs more common in galaxy group environments?
3. Are they tidal debris?
4. Do they have stellar counterpart? If not, are they dark galaxies?
5. Do HVCs contribute significantly to the SFR of galaxies?

1, 2 → gas accretion

3 → environmental effect

4, 5 → multiwavelength studies

ALL → impact on galaxy evolution and formation

WALLABY + (Early Science ASKAP-12)

- **PI: Baerbel Korbalski (CASS) & Lister Staveley-Smith (UWA/ICRAR)**
- **Large, unbiased samples, large FOV**
- **WALLABY early science: 10^6 Msun HVCs, nearby galaxies**

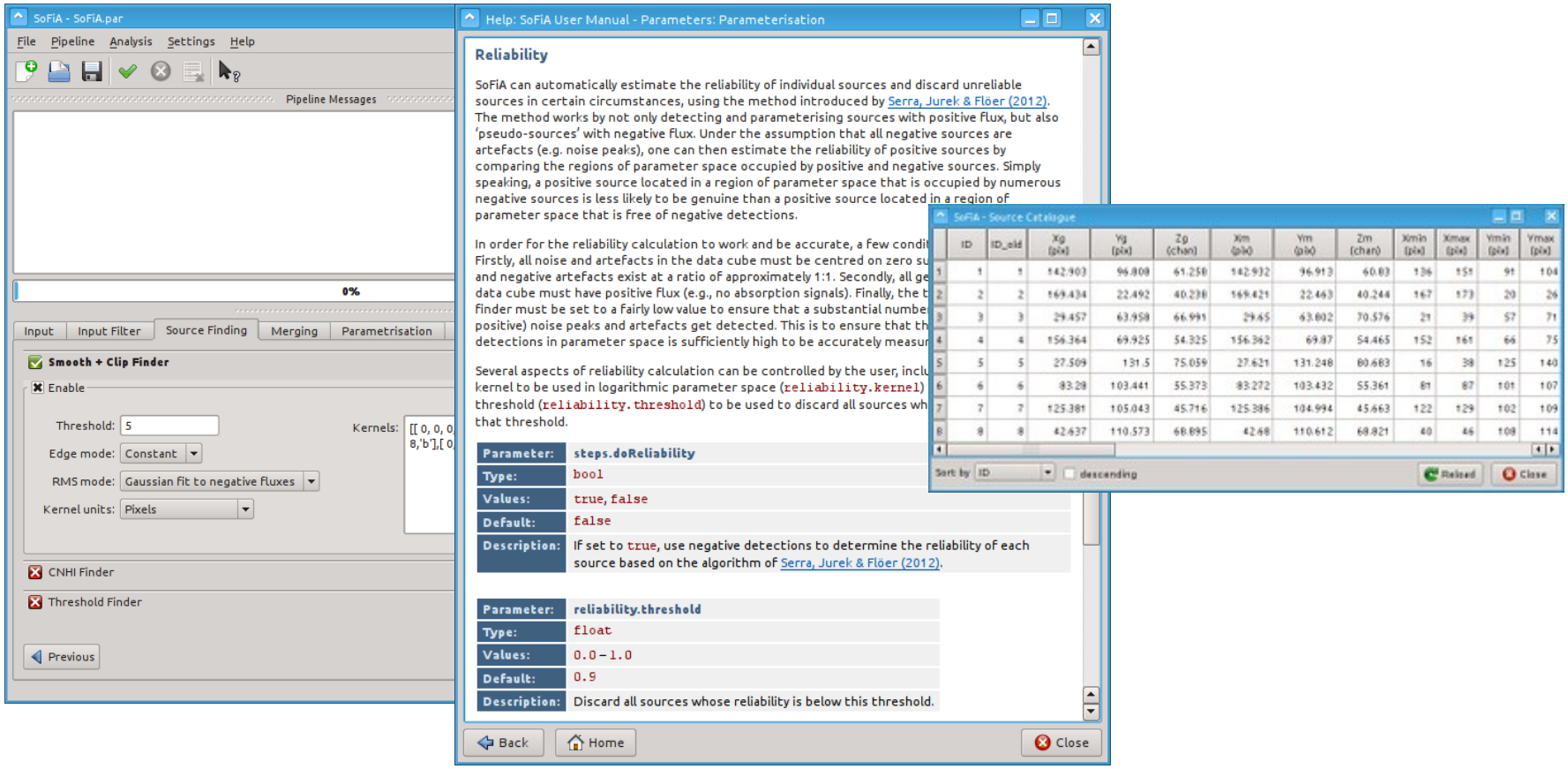
WALLABY

Update (on behalf of WALLABY team)

- Early science observation began in Oct 2016
- ~500hr to date, 36 beams (FOV 30deg)
- 48 MHz → 192 MHz → 304 MHz?
- Fields :
  - NGC 7232 & Fornax cluster (completed)
  - Dorado & M83 group (ongoing)
- Source finding WG: SoFiA (Serra et al. 2015)
- Kinematics WG: 2DBAT (Oh et al. submitted), FAT (Kamphuis et al. 2015) etc
- Data processing WG (ASKAP team): includes data validation (weekly meeting)
- Science papers: WALLABY team

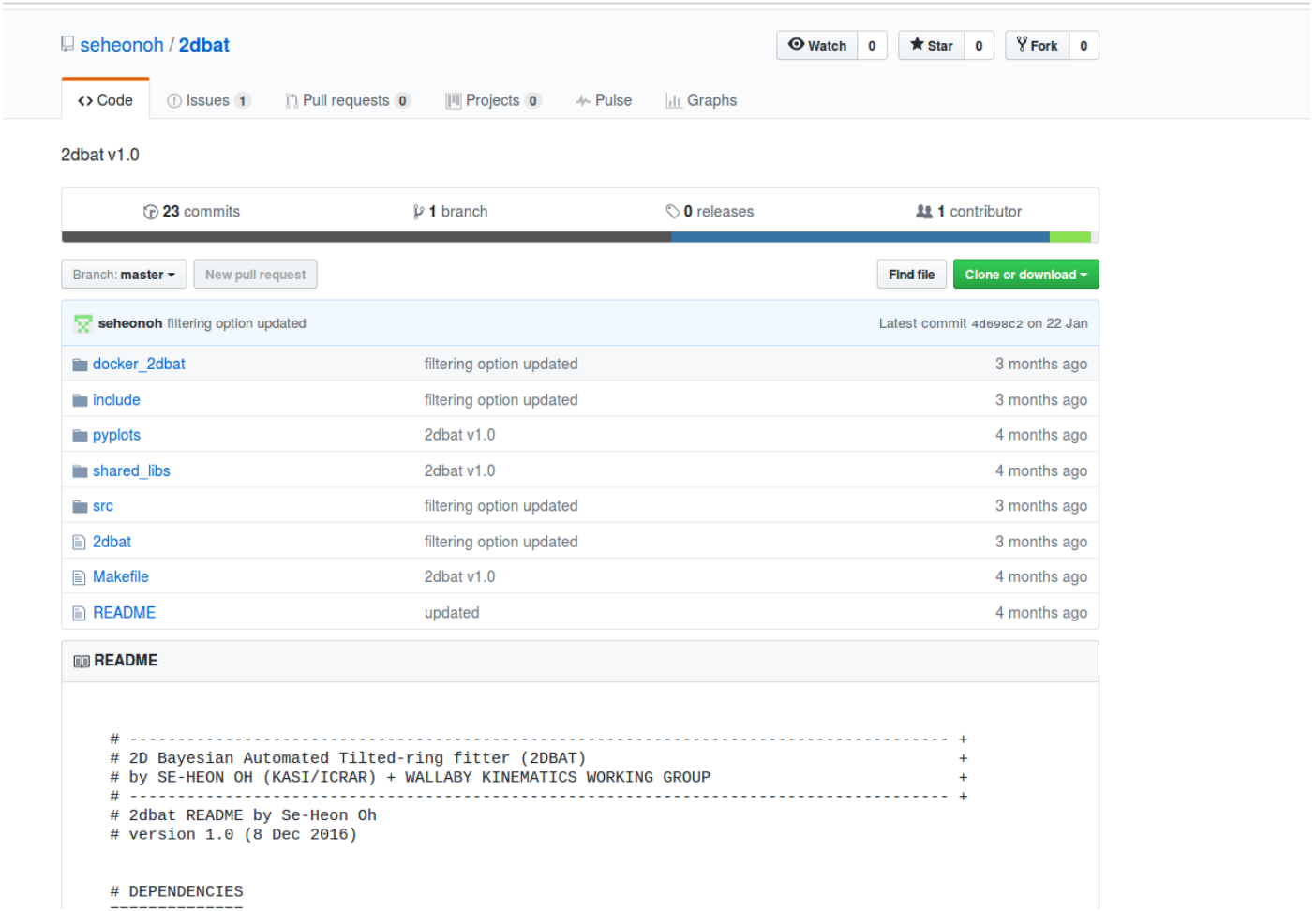
No observations since Jan 2017 due to firmware/softwares problem

SoFiA
Source Finding Application



http://www.atnf.csiro.au/people/Tobias.Westmeier/tools_software_sofia.php

2DBAT



seheonoh / 2dbat

Watch 0 | Star 0 | Fork 0

Code | Issues 1 | Pull requests 0 | Projects 0 | Pulse | Graphs

2dbat v1.0

23 commits | 1 branch | 0 releases | 1 contributor

Branch: master | New pull request | Find file | Clone or download

seheonoh filtering option updated — Latest commit 4d698c2 on 22 Jan

docker_2dbat	filtering option updated	3 months ago
include	filtering option updated	3 months ago
pyplots	2dbat v1.0	4 months ago
shared_libs	2dbat v1.0	4 months ago
src	filtering option updated	3 months ago
2dbat	filtering option updated	3 months ago
Makefile	2dbat v1.0	4 months ago
README	updated	4 months ago

README

```
# ------------------------------------------------------------------------------------- +
# 2D Bayesian Automated Tilted-ring fitter (2DBAT)                                      +
# by SE-HEON OH (KASI/ICRAR) + WALLABY KINEMATICS WORKING GROUP                         +
# ------------------------------------------------------------------------------------- +
# 2dbat README by Se-Heon Oh
# version 1.0 (8 Dec 2016)


# DEPENDENCIES
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```

https://github.com/seheonoh/2dbat

Data processing WG

WALLABY

ASKAP WALLABY Spectral Line Validation Page

NGC 7232 group

Filename	RMS
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image.i.N7232.cube.SB2338.NGC7232_A_T0-0A.beam04.restored	LINK
image.i.N7232.cube.SB2338.NGC7232_A_T0-0A.beam05.restored	LINK
image.i.N7232.cube.SB2338.NGC7232_A_T0-0A.beam06.restored	LINK
image.i.N7232.cube.SB2338.NGC7232_A_T0-0A.beam07.restored	LINK
image.i.N7232.cube.SB2338.NGC7232_A_T0-0A.beam08.restored	LINK
image.i.N7232.cube.SB2338.NGC7232_A_T0-0A.beam09.restored	LINK
image.i.N7232.cube.SB2338.NGC7232_A_T0-0A.beam10.restored	LINK
image.i.N7232.cube.SB2338.NGC7232_A_T0-0A.beam11.restored	LINK
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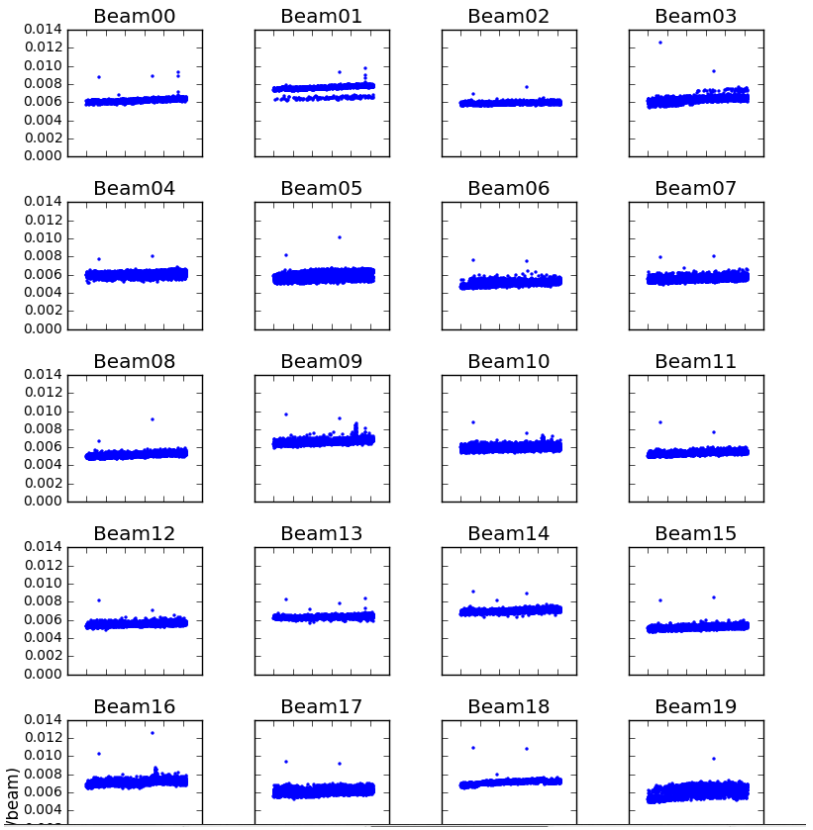

Work in progress….

http://ict.icrar.org/store/staff/biqing/WALLABY/html/validation.php

Thank you