(Radio-) astronomy at Chilean Universities

Summarized by:

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Univ. De Concepcion, Chile

with some slides and statistics contributed by:

Monica Rubio & Sebastian Lopez (Univ. De Chile)

Institutions in Chile

Departamento de Astronomía
Universidad de Chile

BS, MSc and PhD (1999) in Astronomy

www.das.uchile.cl

Monica Rubio

Institutions in Chile

Departamento de Astronomía y Astrofísica
Pontificia Universidad Católica

BSc and PhD
in Astronomy

www.astro.puc.cl

Institutions in Chile

Grupo de Astronomía
Facultad de Ciencias Fisicas y Matematicas
Universidad de Concepcion

BSc Astronomy
PhD in Physics (Astrophysics)

www.astro-udec.cl

Institutions in Chile

Grupos de Astronomía,

Universidad de la Serena

Universidad de Valparaíso

Universidad Católica de Antofagasta

Universidad de Tarapacá

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Astronomers in Chilean Institutions

Roughly doubled in the last 10 yr

Hope to double in the next 10 yr

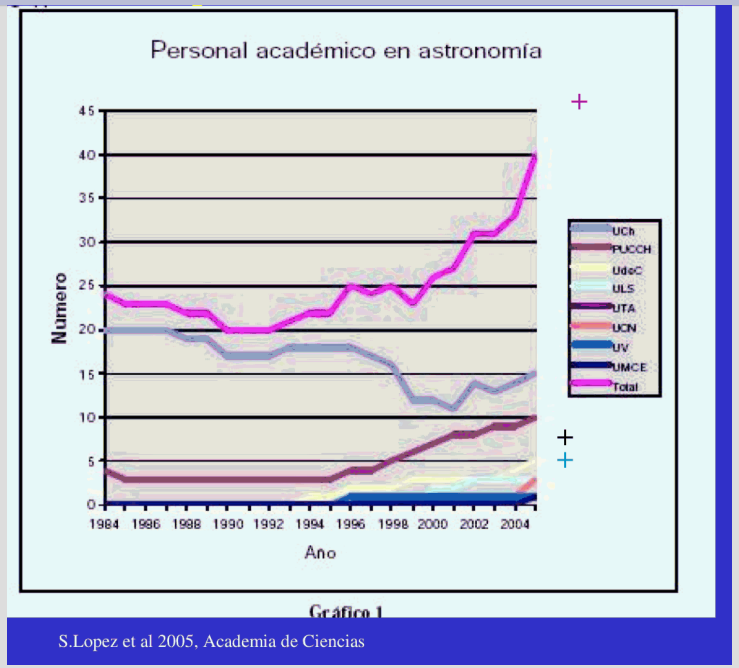

Gráfico 1

S.Lopez et al 2005, Academia de Ciencias

Near future: U de Concepcion (3 new professors)
U. Valparaiso (1 new professor?)

Astronomers at Chilean Institutions

	Ph.D. Prof	Postdoc	Postgrad	Education
U. de Chile	15 (5)	9 (2)	29	B.S.,M.Sc,Ph.D.
P. U. Catolica	11 (1?)	5 (1)	30	B.S., Ph.D.
U. Valparaiso	5.5 (-)	2 (1)	-	
U. Concepcion	5 (1)	7 (1)	5	B.S.,Ph.D.
U. La Serena	3 (-)	1 (-)	-	
U. C. Del Norte	2	2	-	
U. Tarapaca	1	-	-	
IIN	1	1	-	
Total	43 (6)	27 (3)	> 65	+ Engineering/Software

Areas in Astronomy

Data and Physical Processes	7
Astronomical Instrumentation	0
Data Bases	0
Astrometry an Celestial Mechanics	3
The Sun	1
Solar System	2
Stars	20
ISM	8
The Galaxy	11
Galaxies	19
Cosmology	10

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Areas in Radioastronomy (Chilean Universities)

- Star Formation (Molecular Clouds and Massive Stars)
  - G. Garay, L. Bronfman, D. Maradones, J. May (UCH)
- Magellanic Clouds
  - M. Rubio (UCH)
- Extragalactic & Cosmology
  - N. Nagar (UdeC), G. Galaz (PUC)
- Instrumentation: U.Chile (J. May, L. Bronfman), UdeC ? (Nagar, TIGO)
- Postdocs: P. Cortes, J. Cortez (UCH), J.B. Juin (UdeC),

  S. Khan (PUC), L. Eyles (Valparaiso)

Other Radioastronomy Related activities

U Tecnico Federico Santa Maria, Valparaiso:
ALMA Telescope Control Software

P.U. Catolica: Atacama Cosmology Telescope (ACT)
(science and instrumentation collaborations)

U. de Chile : ASTE, NANTEN support
radioastronomy laboratory

U. de Concepcion: TIGO VLBI & Geodesy Observatory (BKG)
CBI support

Astronomy in Chile: funding

- Funding
  - 10% telescope time
  - International (ALMA, ESO, Gemini): US$ 1.2 million/yr
  - FONDAP CenAstro. (2000-2010): US$ 1 million/yr
  - Other CONICYT open to all fields: US$ 0.5 million/yr
- Used (and important) for: (Thanks to ESO/NRAO/Japan)
  - Hiring new Professors (2 or 3 year bridge positions)
  - Postdocs, students, laboratories, travel (no overheads!)
- FUTURE:
  - BASAL – minimum of US$ 1 million / year for 10 years
  - New "Technology funds" : TBD

Astrophysics Center :FONDAP

Research Areas

- Large Scale Structures in the Universe
- Stellar Populations in the Local Universe
- Extragalactic Distance Scale
- Star Formation
- Brown Dwarfs and Planetary systems
- Supernovas and Dark Energy

US$ 1.000.000 for next 5 years (2006-2010)

Universidad de Chile	50%
Universidad Catolica de Chile	30%
Universidad de Concepcion	20%

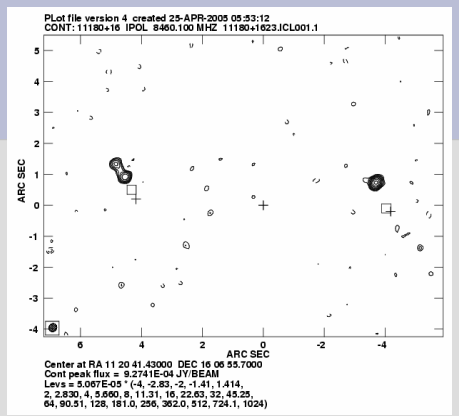
Applying for the Chilean 10%

- Chilean National TAC (CNTAC): CTIO, Las Campanas, ASTE
  - At least 1 year at a Chilean Institution (9 months minimum)
- CONICYT: Gemini & APEX
  - At least 1 year at a Chilean Institution
- ESO TAC:
  - Handles all Chilean ESO proposals
- ALMA: ?

New Initiatives:
TIGO VLBI Observatory

- Astro-UdeC + TIGO Instrumentation
  - 183GHz Water Vapor Radiometers (ALMA testbed)
    - Wet path calibration for relatively wet atmosphere
    - Potential design of a 50GHz Oxygen-line radiometer
    - Nucleus of a future site testing group
  - Digital mm VLBI backend in Chile
    - Eventually help support VLBI at ALMA

New Initiatives: Extragalactic & Cosmology



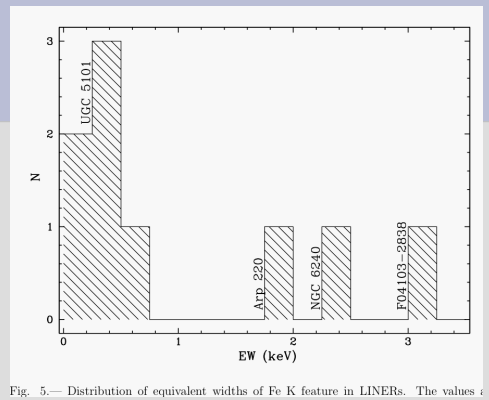
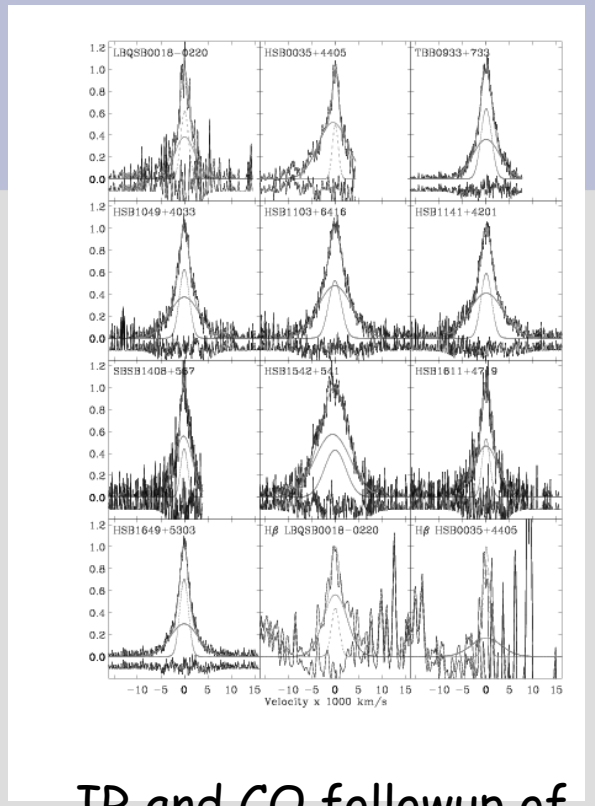


Fig. 5.— Distribution of equivalent widths of Fe K feature in LINERs. The values

Radio to X-ray in ULIRGs



IR and CO followup of
z ~ 2 SCUBA sources

- Low-z SMGs and ULIRGs
  - ULIRGs: VLA/VLBA, Chandra, XMM, Suzaku; ALMA
  - SMGs next week: z < 0.2 Abell clusters with ASTE/AZTECA
- Sunyaev-Zel'dovich Effect:
  - numerical simulation of results from large surveys
  - Contamination from SMGs

Teng et al.
Nagar et al.
Juin et al.

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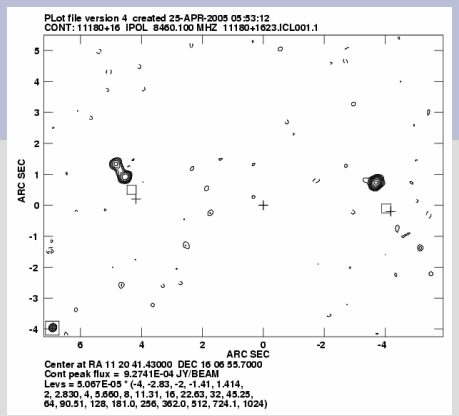
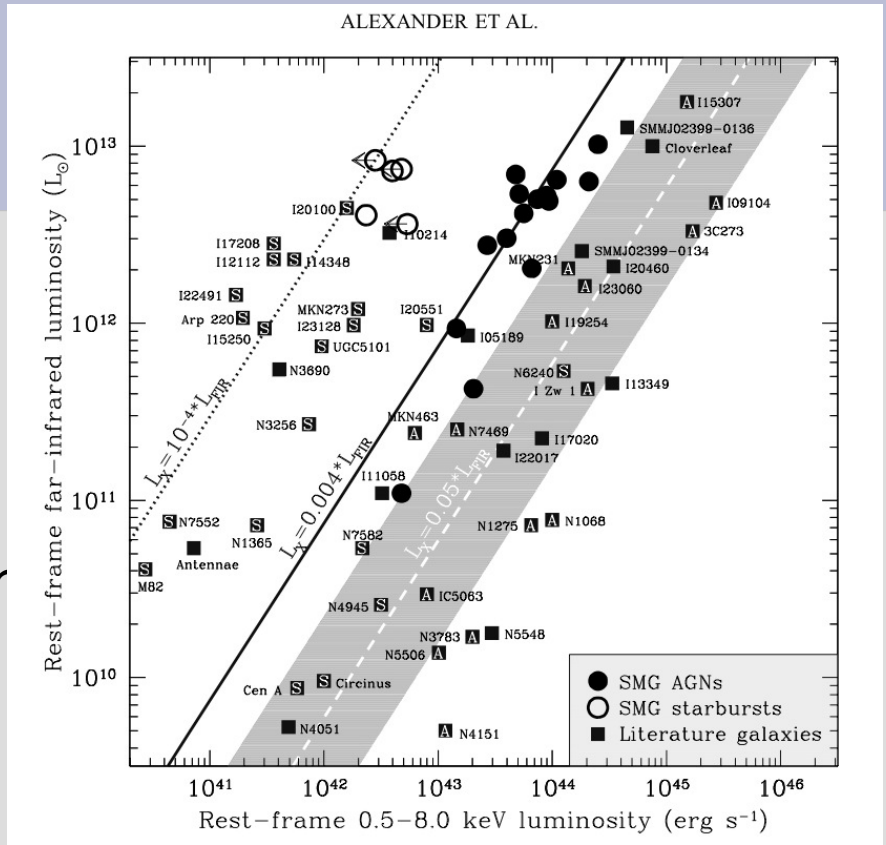
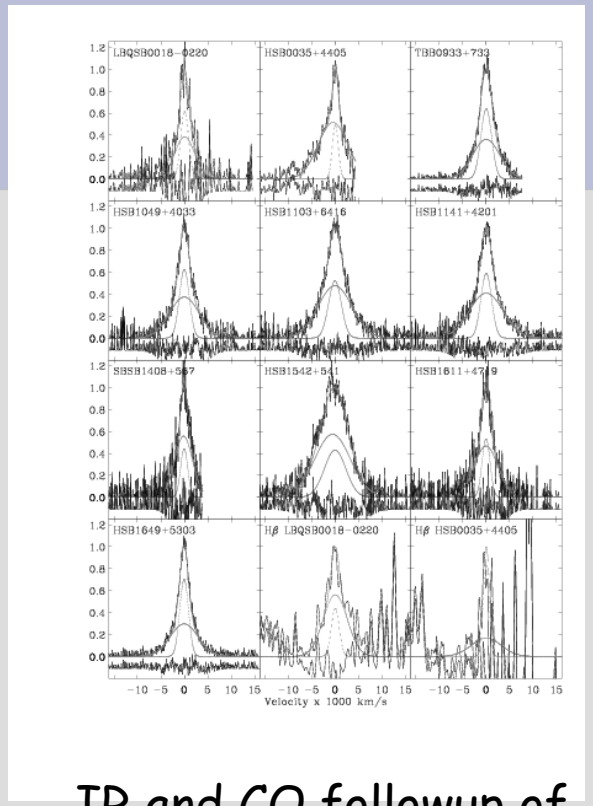


Radio to X-r





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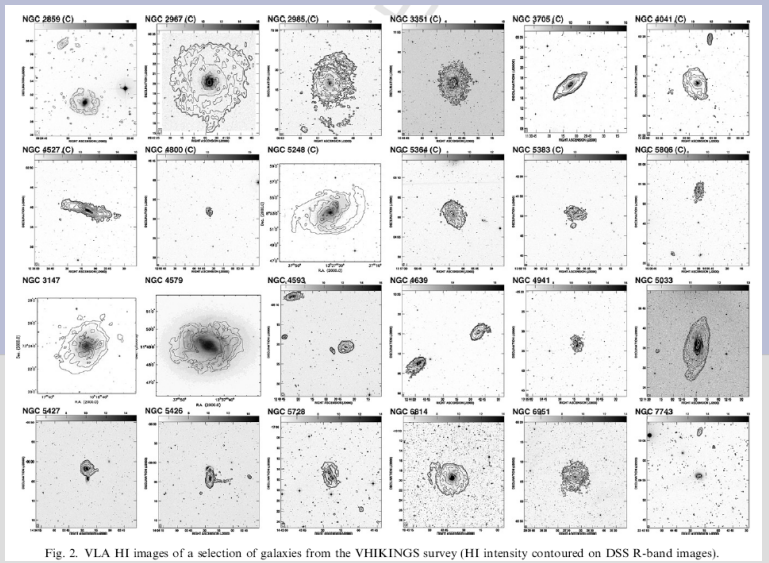
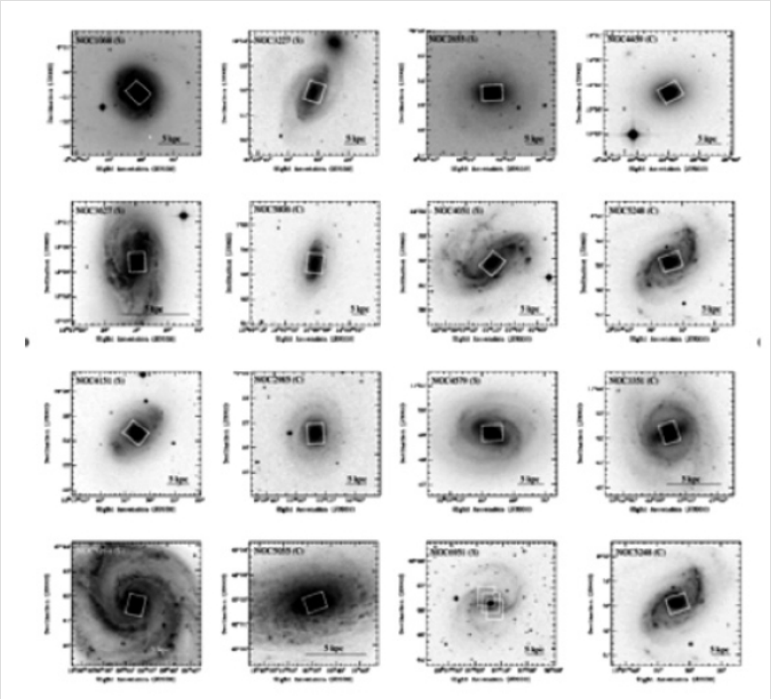


Fig. 2. VLA HI images of a selection of galaxies from the VHIKINGS survey (HI intensity contoured on DSS R-band images).



Dumas et al. 2007
Mundell et al. 2007
Westoby et al., in prep

- MASKS: Molecular Atomic Stellar Kinematics in a large Sample
  - 15 nearby Seyferts/Controls with WHT/SAURON
  - 30 SDSS Seyferts/Controls with Baade/IMACS-IFU
  - HI with the VLA (25)
  - Molecules with ALMA

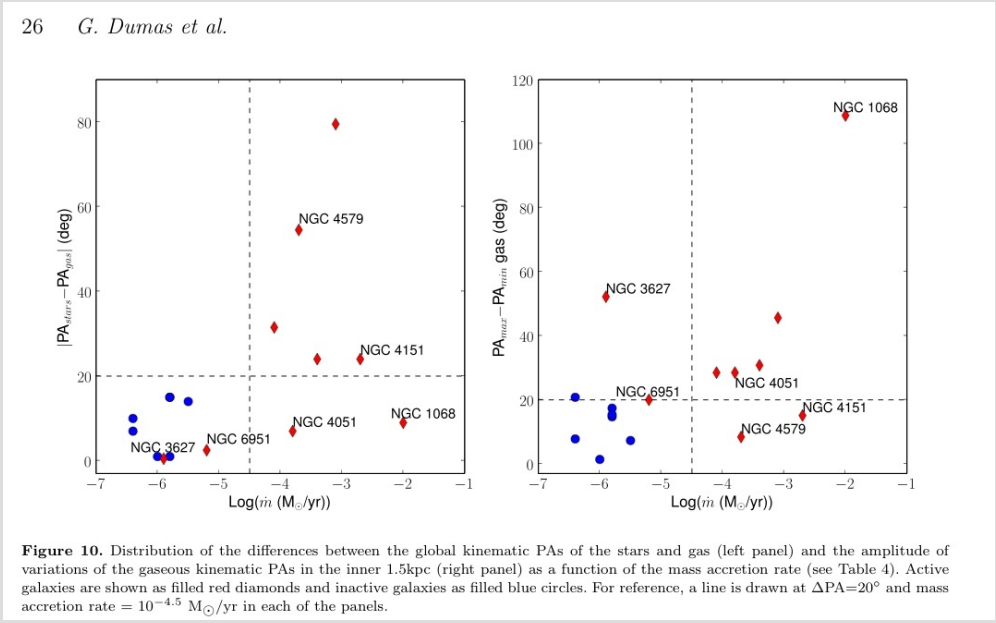
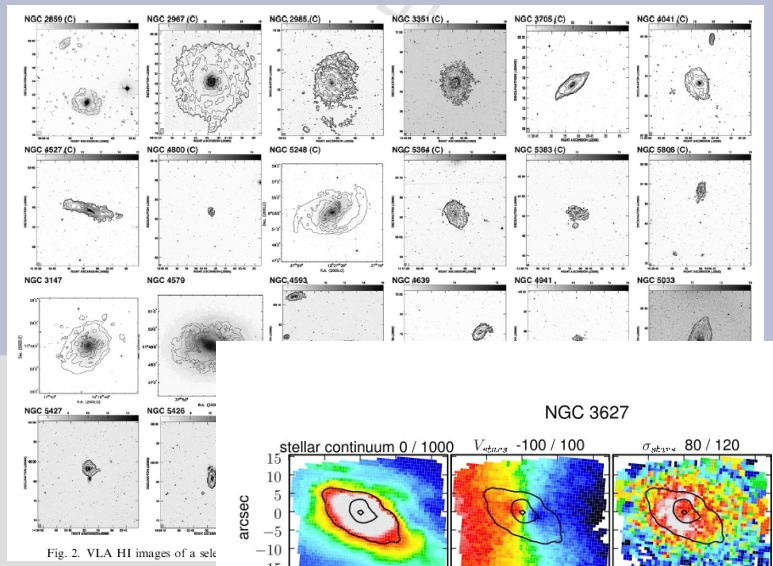
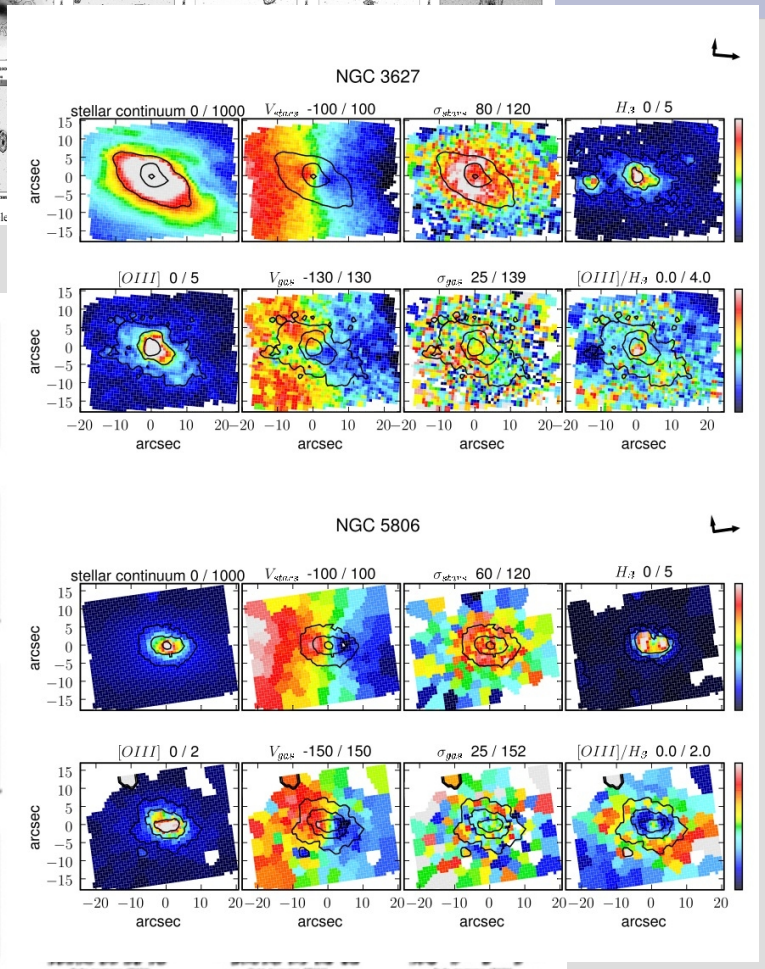


Figure 10. Distribution of the differences between the global kinematic PAs of the stars and gas (left panel) and the amplitude of variations of the gaseous kinematic PAs in the inner 1.5kpc (right panel) as a function of the mass accretion rate (see Table 4). Active galaxies are shown as filled red diamonds and inactive galaxies as filled blue circles. For reference, a line is drawn at ΔPA=20° and mass accretion rate = $10^{-4.5}$ $M_\odot$/yr in each of the panels.





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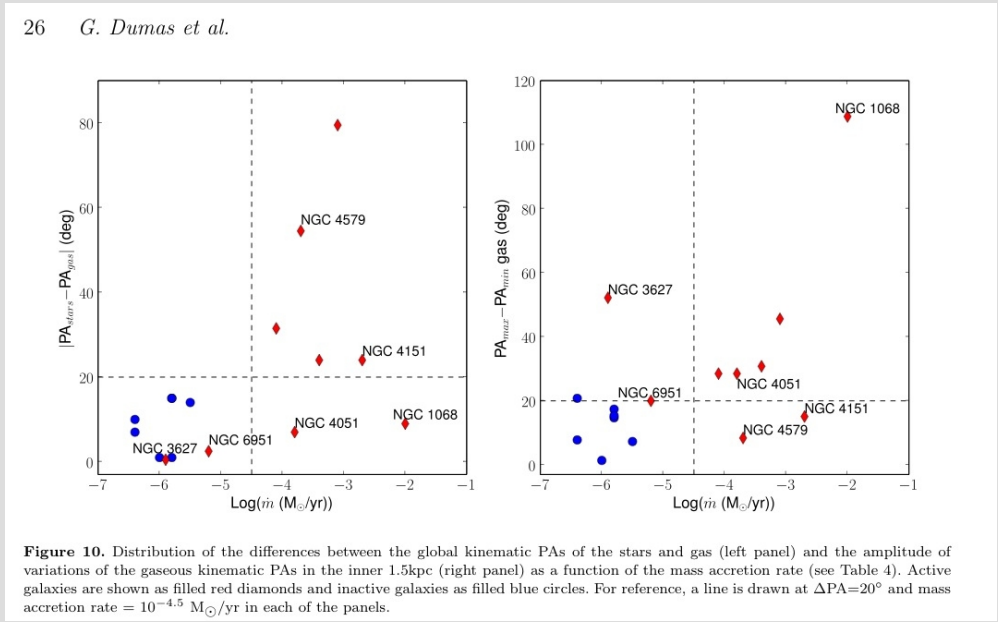

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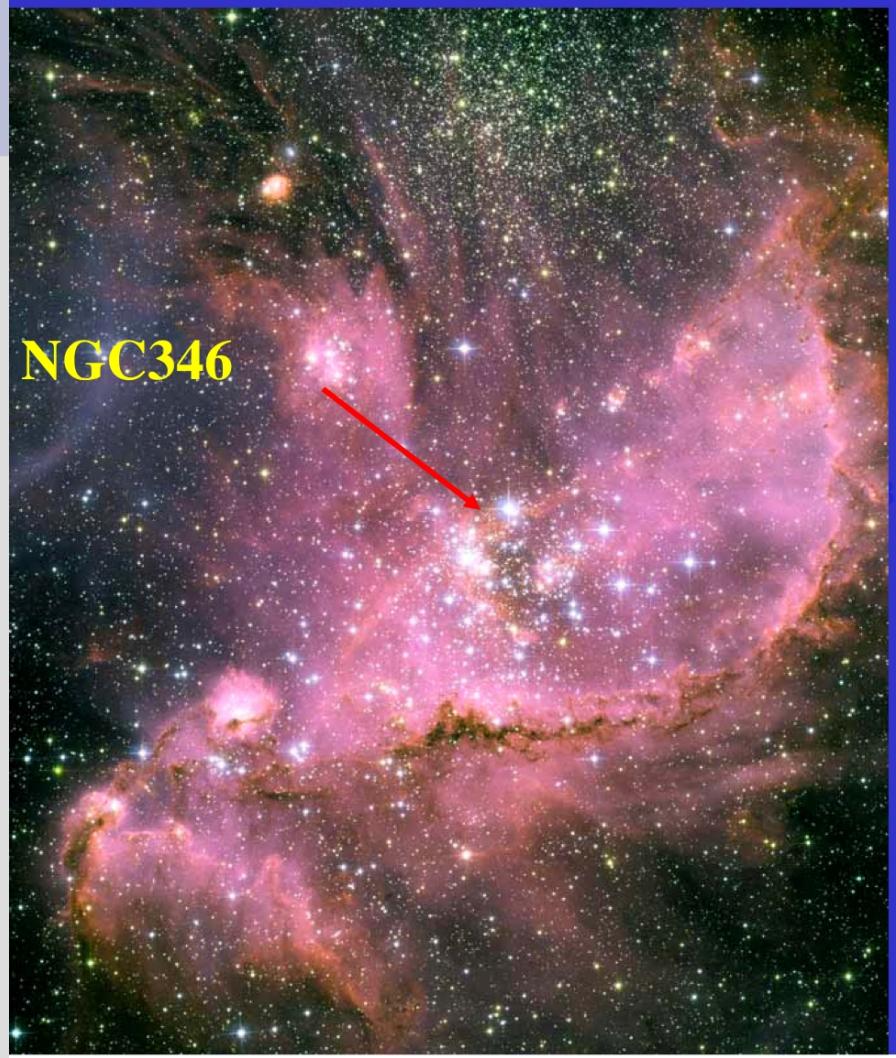


N66 in SMC

33 O stars

11 brighter than O.6

Central cluster
NGC346
22 O stars

N66 : The continuum at 1.2 mm

CO(2-1) and SIMBA 1.2 mm

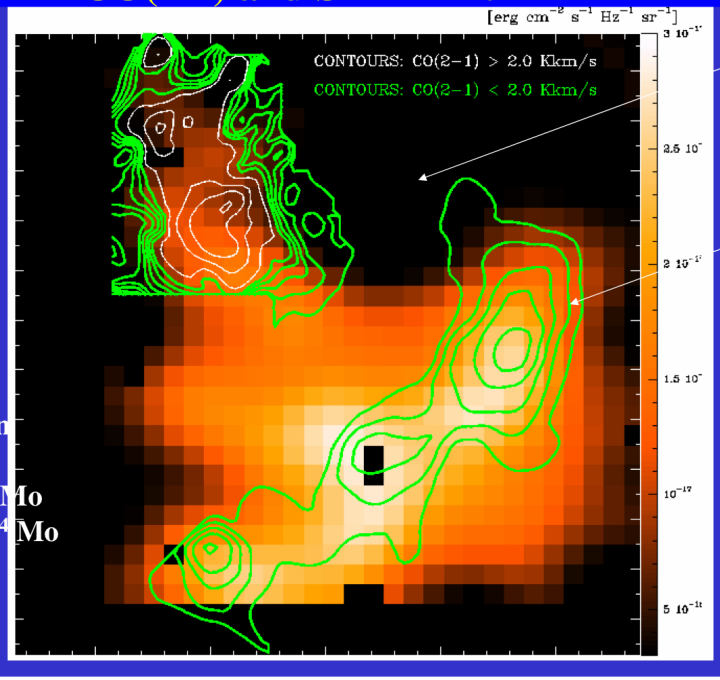
mc
$S_{1.2mm}$ = 98 mJy
=>
M_{gas} = 8x10^4 Mo

M_{vir} = 5x10^{4}Mo

HII
$S_{1.2mm}$ = 331 mJy

Dominated by
Free-free emission

M 1.2mm = 3x10^5 Mo
Mco = 8x10^4 Mo



mc

HII region

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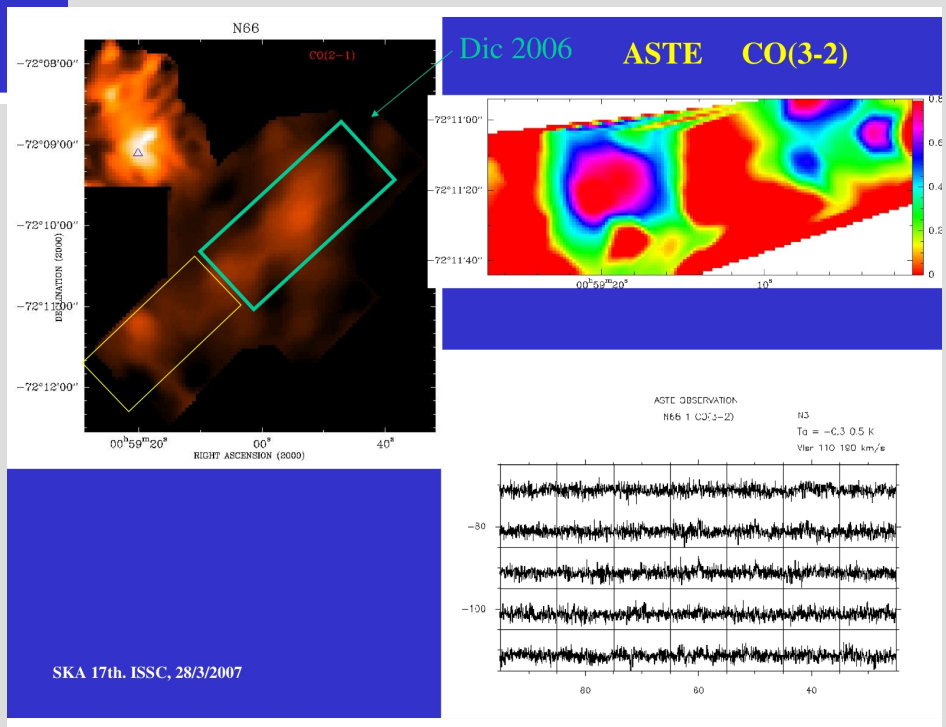
Rubio et al., in prep.



(Radio-)Astronomy in Chile

- Small, but growing community
- International astronomy funding and FONDAP are key motivators of the fast growth. BASAL in future?
- Increasing Chilean funding and interest in instrumentation/technology
- Uniquely able to immediately commence large ALMA programs
- Able to perform large optical/IR followups