JEts & Disks @ INAF

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+ JEDI collaboration

JEDI - JEts and Disks@INAF

http://www.oa-roma.inaf.it/irgroup/JEDI

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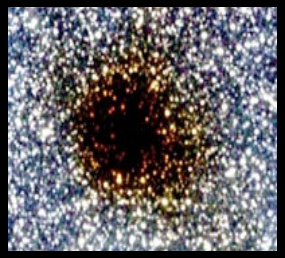
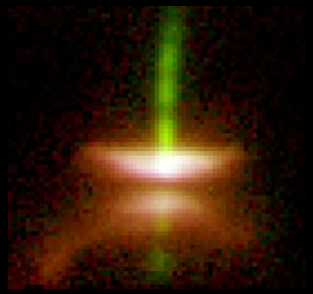
Topics:

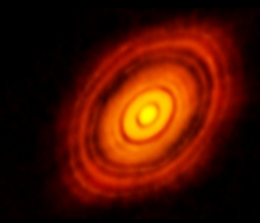
Pre-stellar cores
Molecular jets in Class 0 sources
Physical and chemical diagnostics of stellar jets
Time variability of the accretion process
Evolution of disk mass accretion rates in young stars
Gas and dust in disks: grain growth and disk evolution

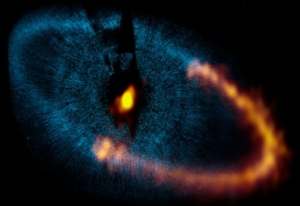
Image credit: ESO/L. Calçada/M. Kornmesser











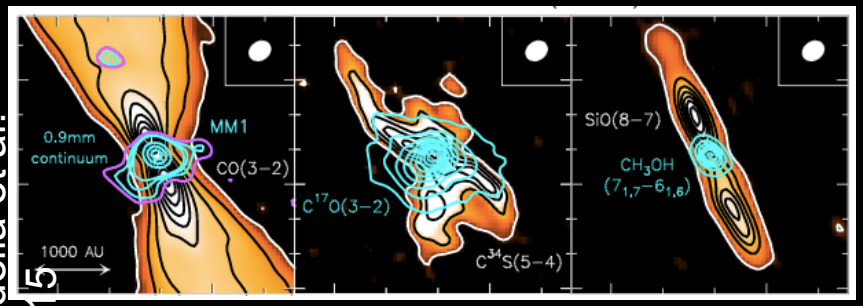
Key questions:

→ Study the evolution of circumstellar disks in solar-type stars from proto-stellar to planet formation phase

→ Disk dispersal mechanisms: accretion,jets,winds

→ Settle the initial condition for planets formation

→ Solve the angular momentum problem from core-collapse to proto-planetary disks

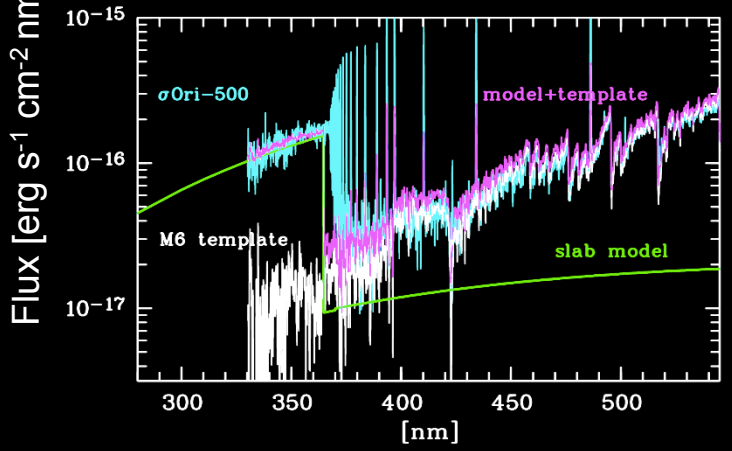


Codella et al. 2015

Initial phases of star formation:

Cores and low mass protostars

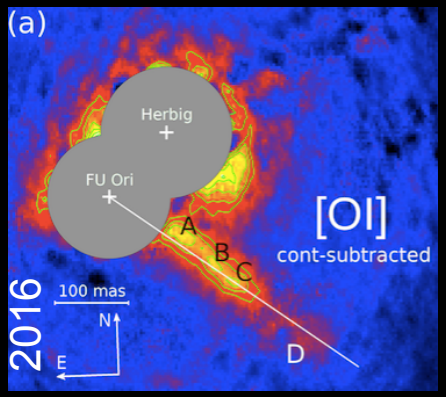
→ far-IR, sub-mm (ALMA, PdBI, Herschel)



Alcala' et al. 2014

Evolution of mass accretion:

→ VLT (X-shooter, UVES), LBT



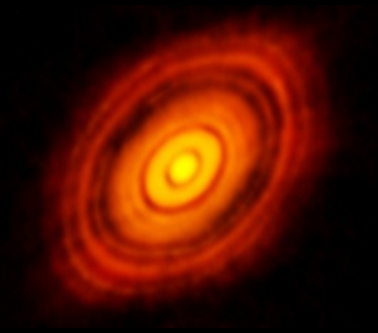
Antoniucci et al. 2016

Jets, winds:

→ HST, VLT(X-shooter, SPHERE), LBT

Proto-planetary disks and planets formation

(ALMA,VLA, LBTI)



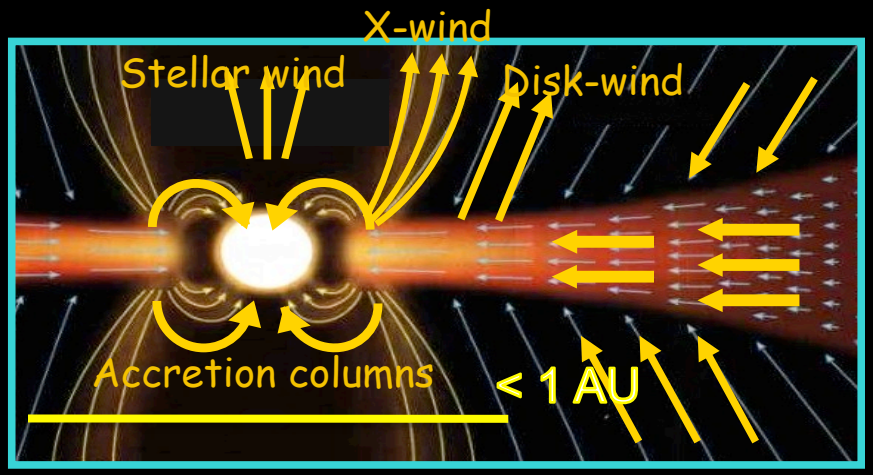
ALMA collab. 2015

OUR STRENGTH →

Synergy between different competences

Multi-wavelength approach (form X-ray to radio)

The X-shooter survey of T Tauri stars

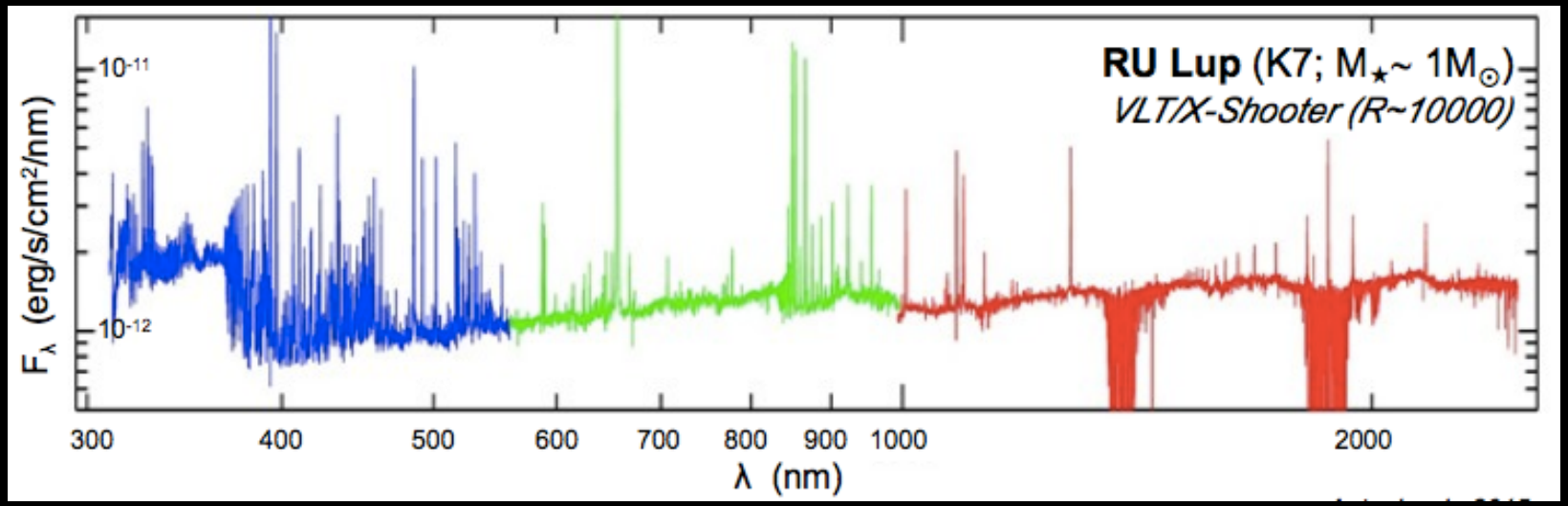


In a single spectrum:

- Disk Accretion
- Stellar photosphere
- Mass ejection (jets/winds)

Main goals:

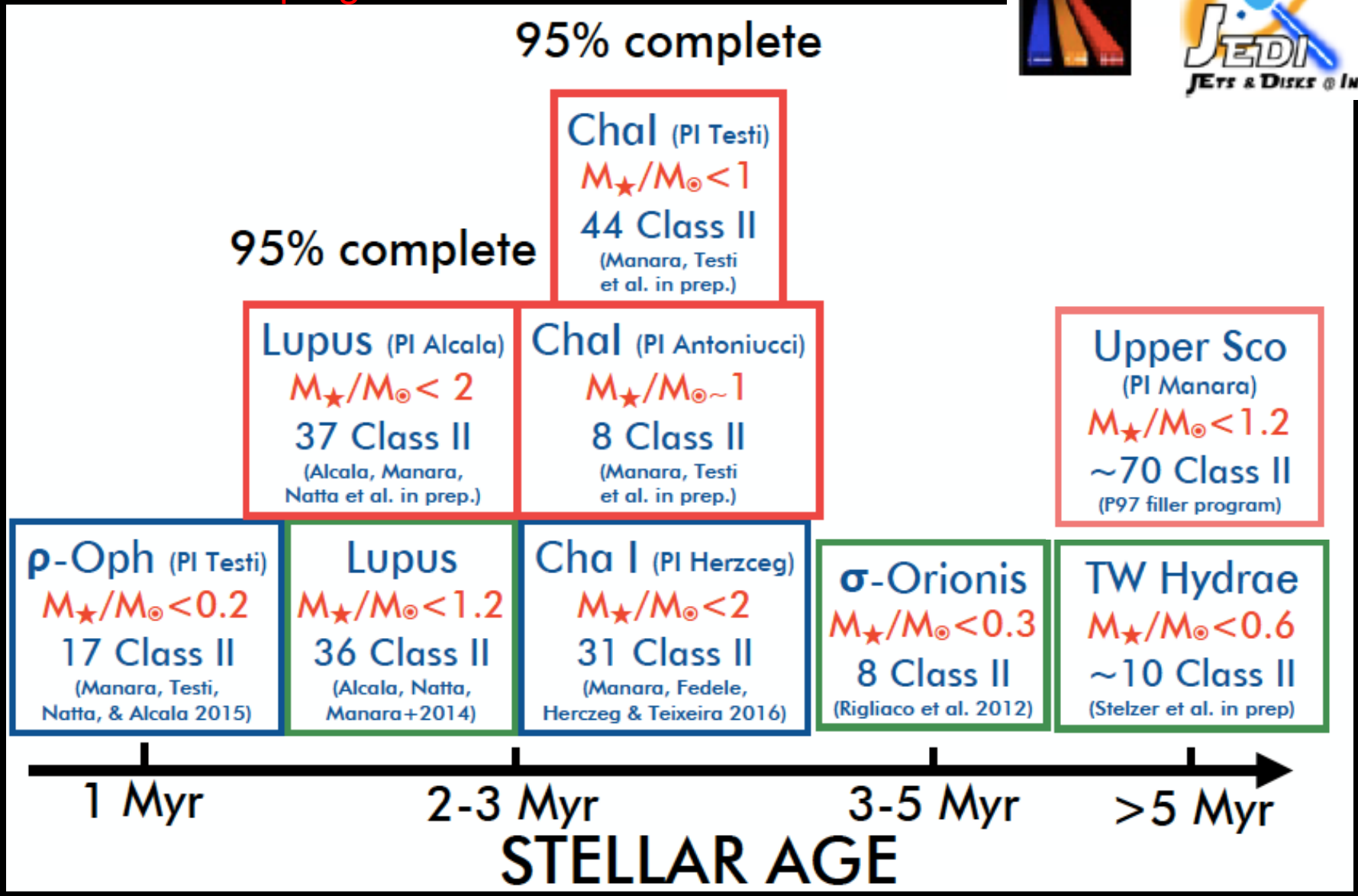
- physics of gas in the disk habitable zone (<1 AU)
- Connect them to properties of the central young star

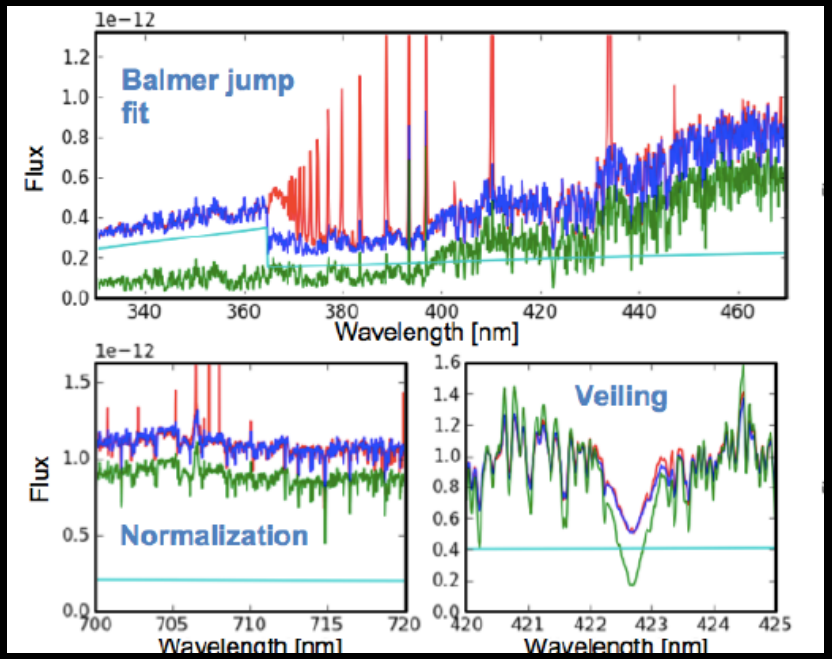


The X-shooter survey of TTauri stars:

Italian GTO program (P.I. J. M. Alcala')

Individual GO programs





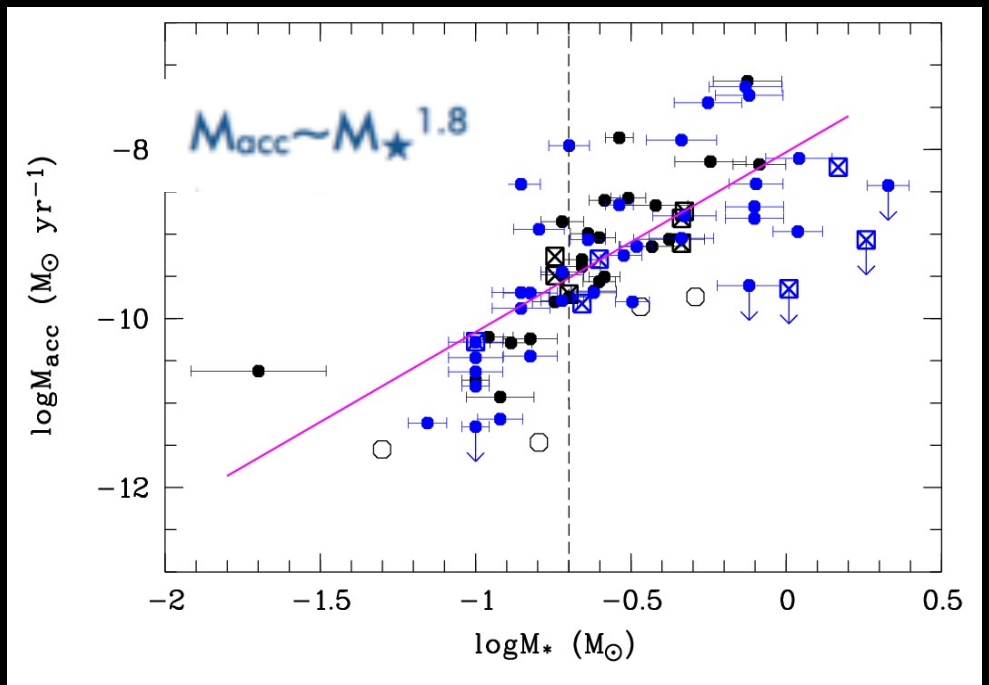
Properties of the accreting gas (Manara + 2013, Antoniucci + 16)
Stellar parameters (M*,L*, Teff, veiling, vseni, log(g)) (Manara +2013, Frasca + 2016)
Abundance determinations (Biazzo + 2016)

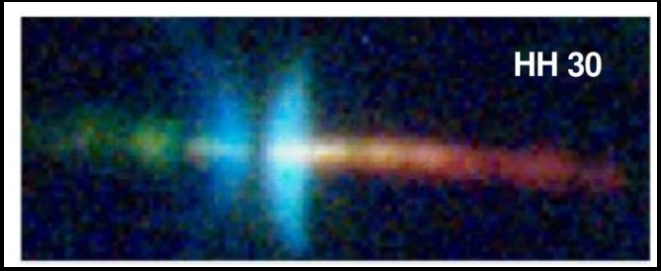
→ Analysis tools to be applied to future instrumentation (e.g. E-ELT@HIRES)

Mass accretion rate vs stellar mass:

- Test disk evolution processes

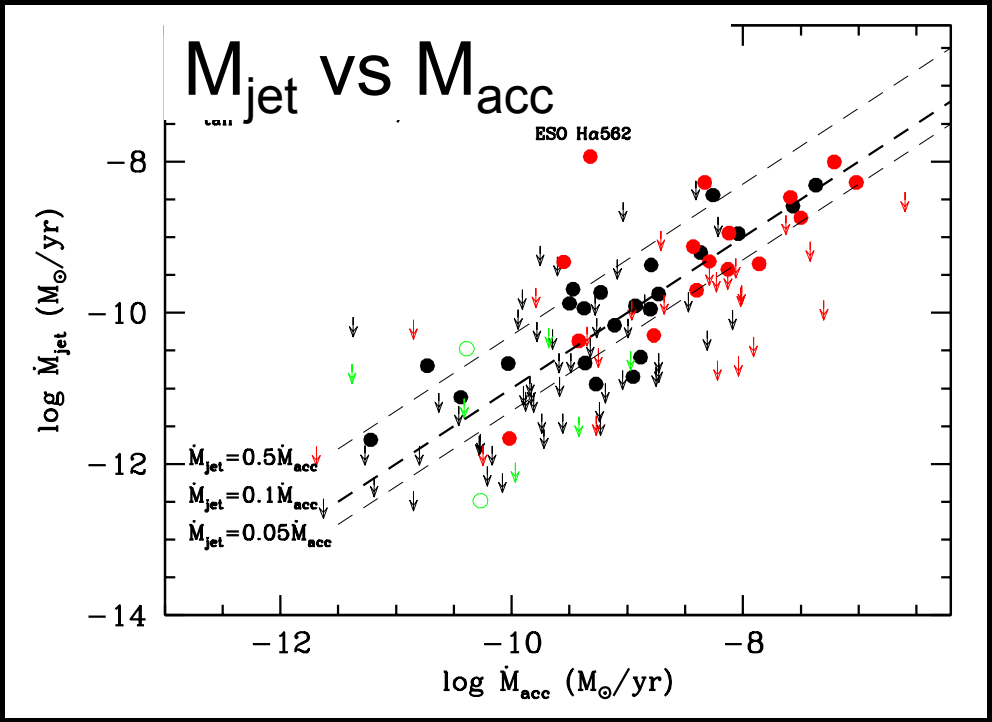
Alcala' + 2014, 2016
Manara + 2015, 2016

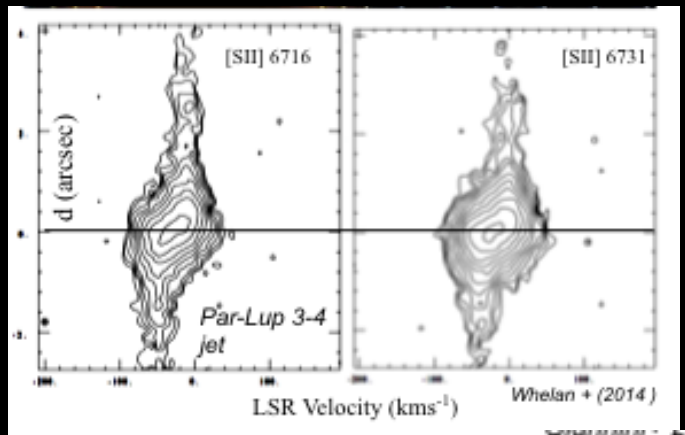


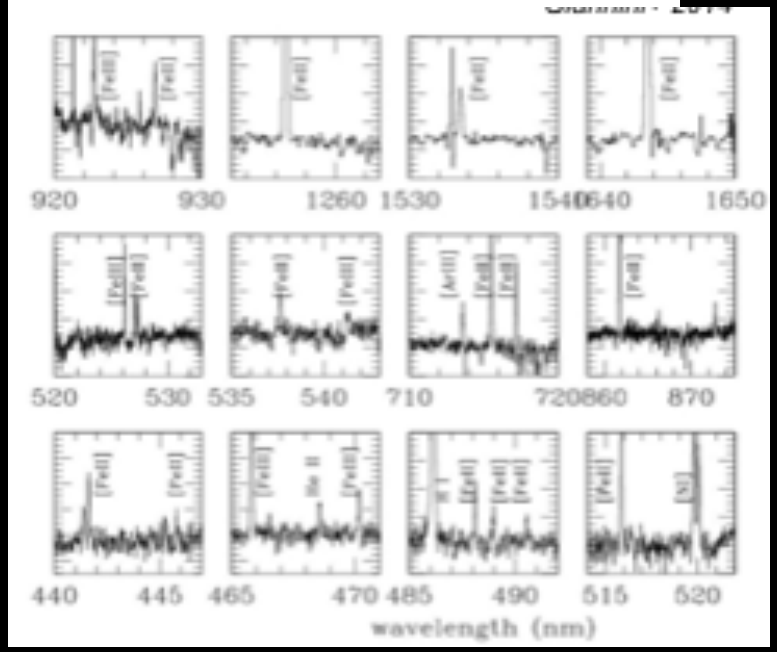


Forbidden lines: probe of jets & winds

- Efficiency of mass ejection in jets
- Role of neutral winds in disk dispersal



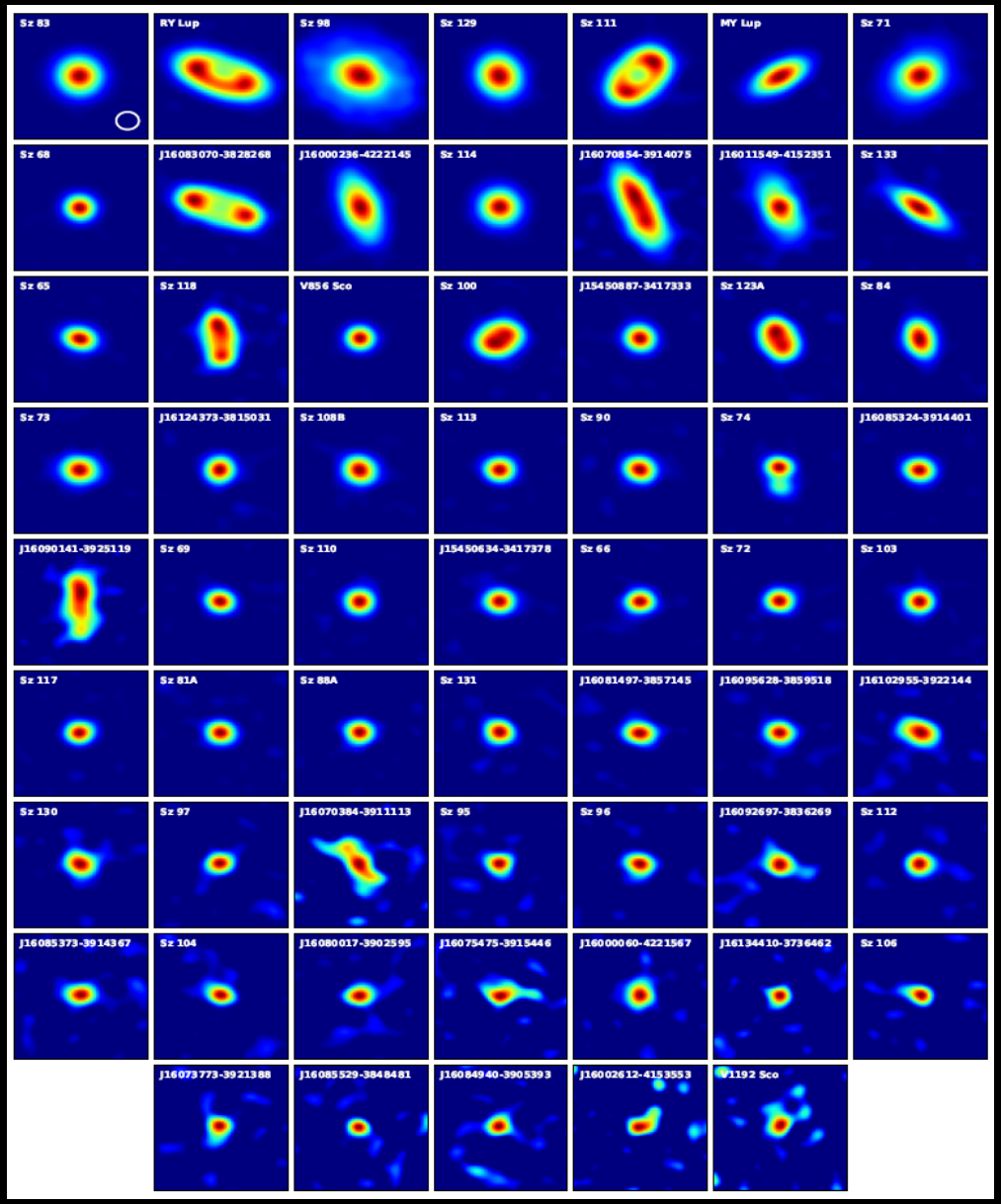




Nisini et al. in prep; Natta et al. 2014, Bacciotti et al. 2012, Giannini et al. 2014

X-shooter – ALMA Synergy

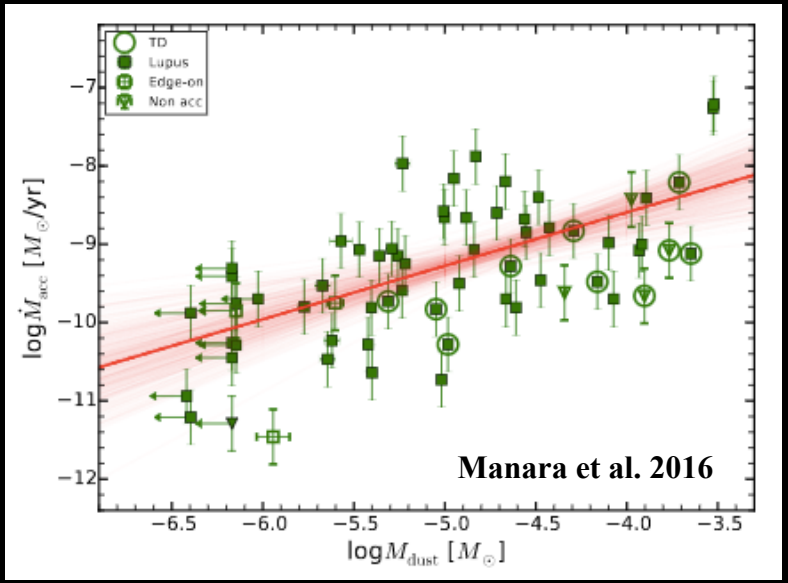
Ansdell et al. 2016



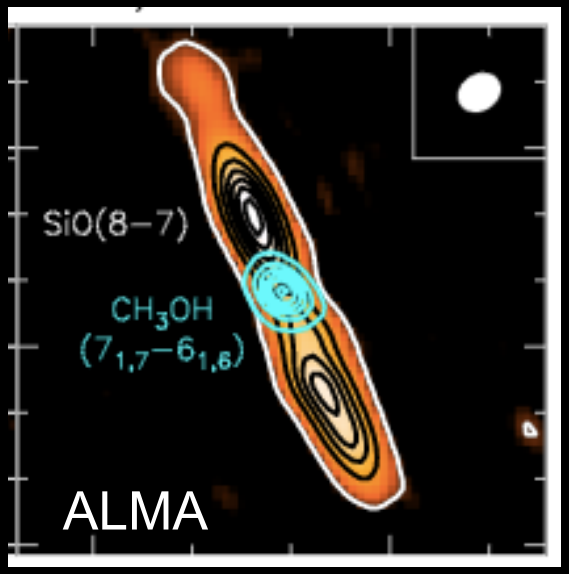
ALMA sistematic surveys of X-shooter samples in Lupus/Cha

CONNECT DUST AND GAS IN PROTOPLANETARY DISKS

Macc vs Mdisk



The Jets engine: ALMA and AO

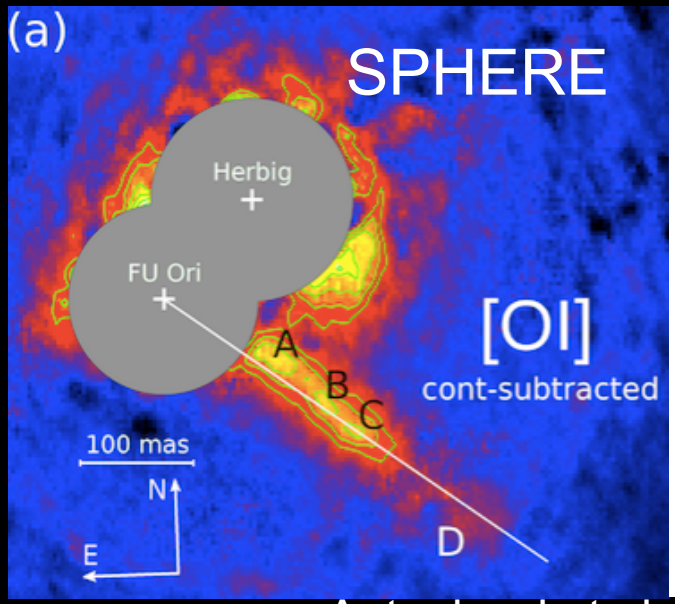


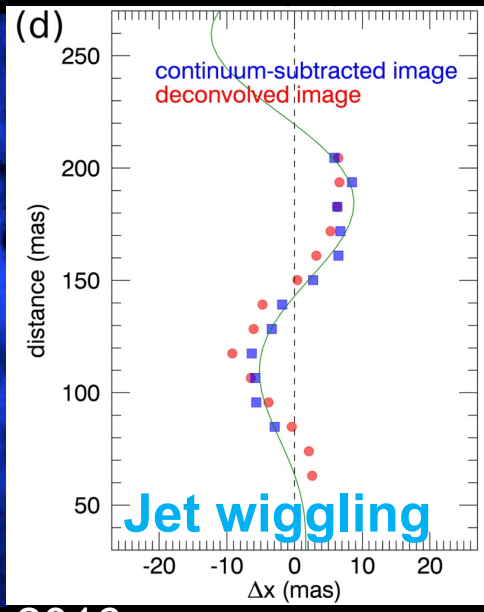
Codella et al. 2014

- Angular momentum removal from pristine disks
- Evolution of jets-disk interaction

Indirect probe of past accretion bursts and unresolved massive planets/BD companions

See talk by Bacciotti

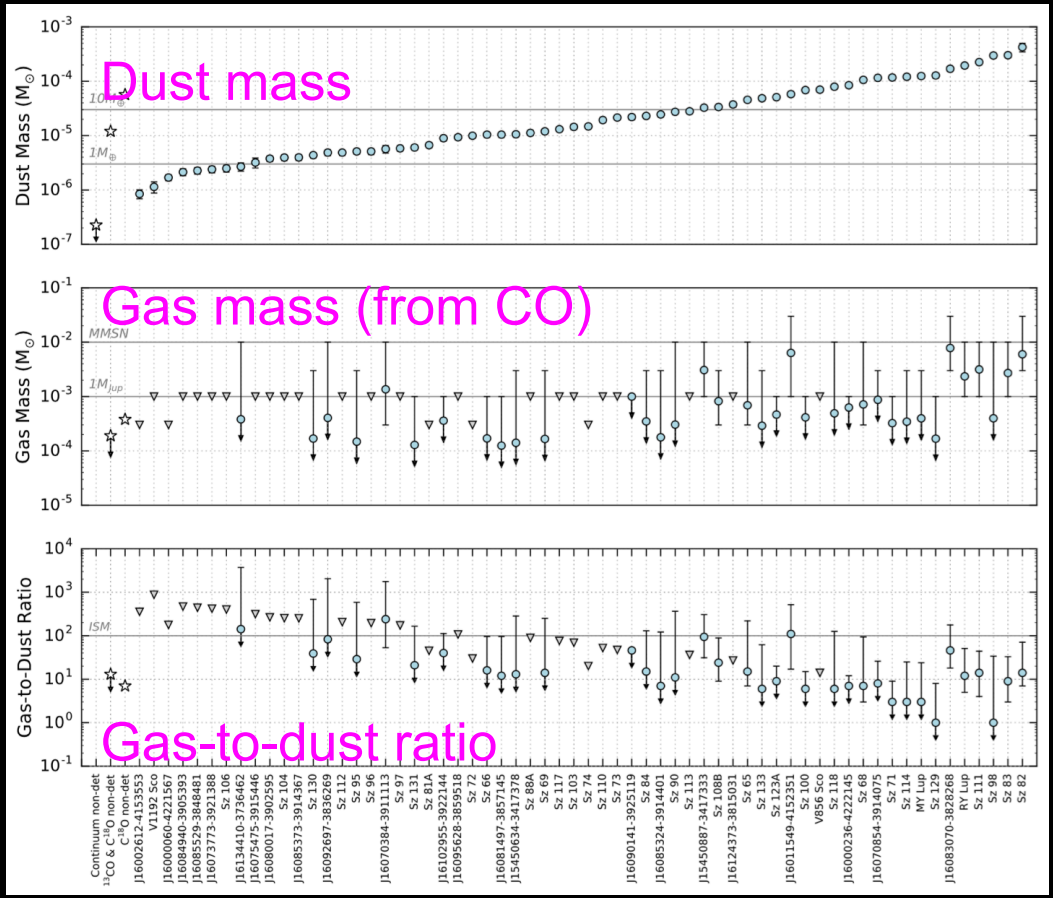




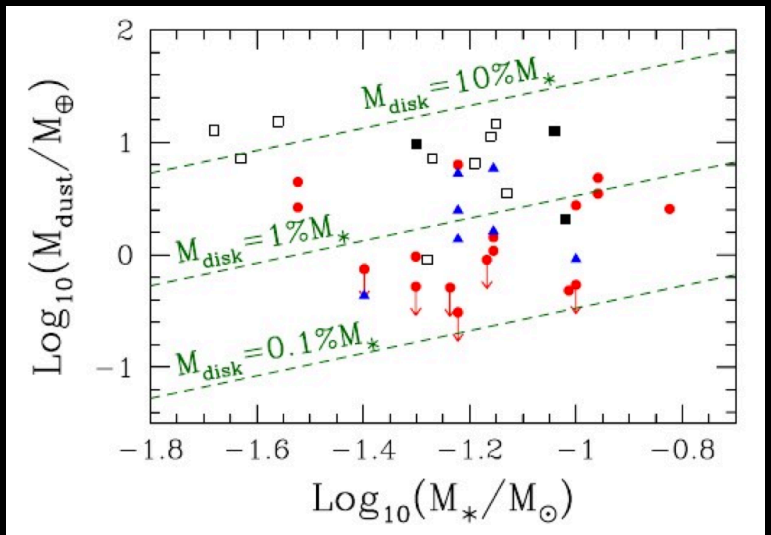
Antoniucci et al. 2016

Protoplanetary disks with ALMA

- Systematic surveys
  - Evolution of gas and dust during planet formation
  - Role of disks in forming stars (and Brown Dwarfs)

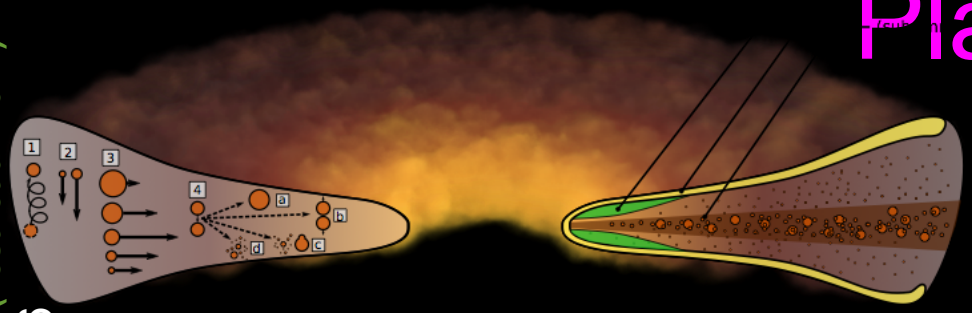


Ansdell+2016, Miotello+2016, Tazzari+2016



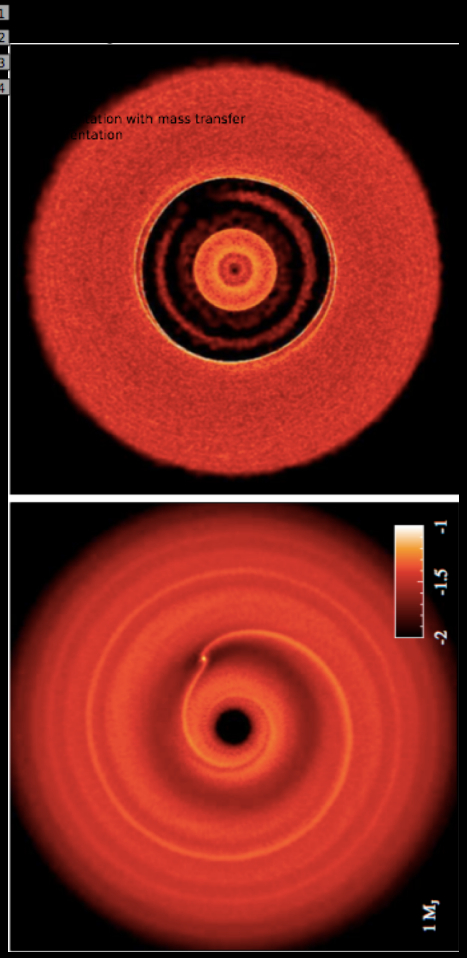
Oph: Testi+2016

Planet formation

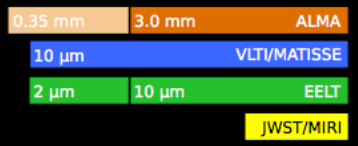


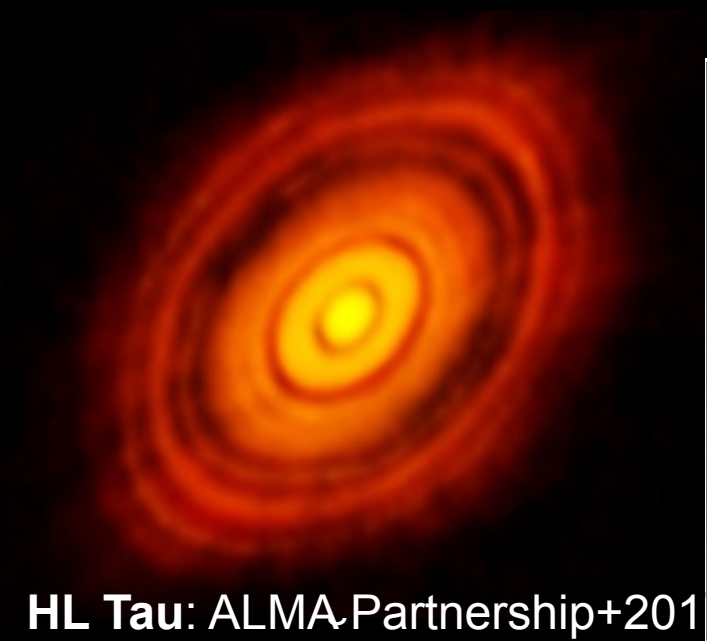
(Testi et al. 2014)

- Grain growth
- Gas evolution
- Disk-planet interation
  - Midplane dust:

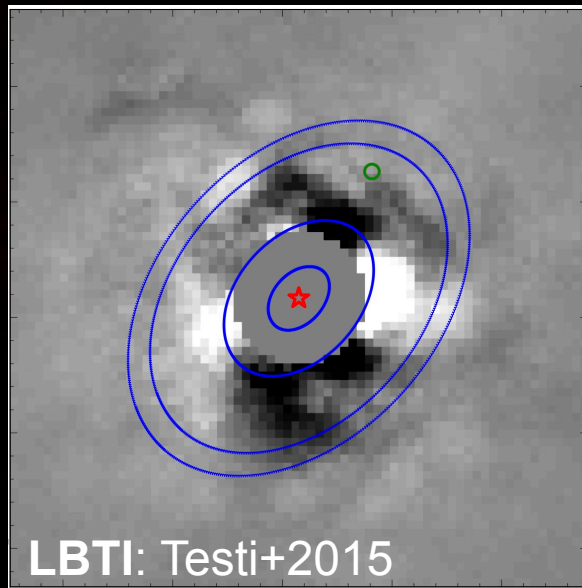


Gas+dust+planet simulations: Dipierro+2016



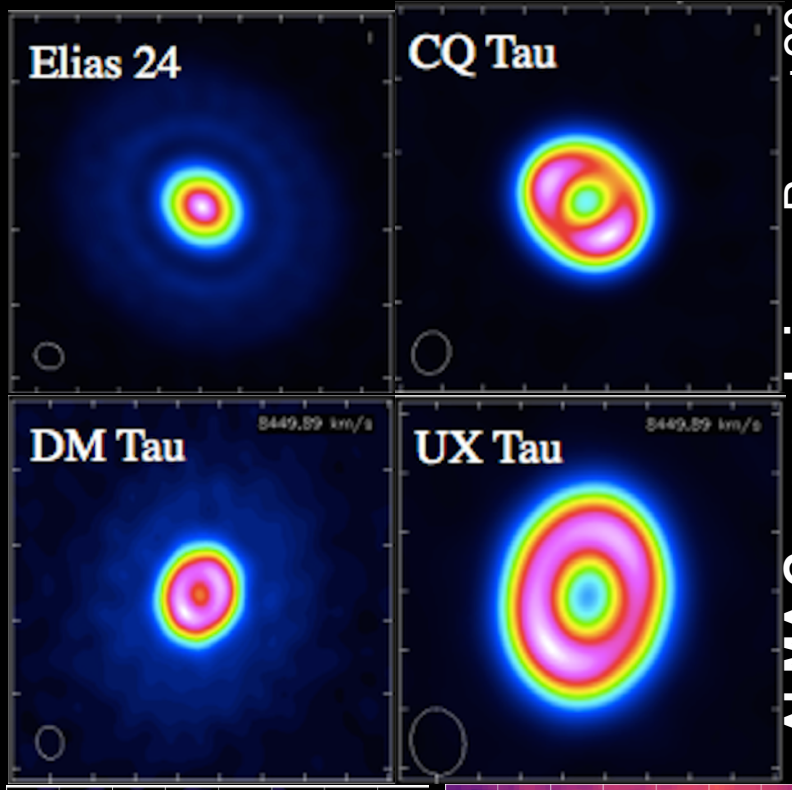


HL Tau: ALMA Partnership+201



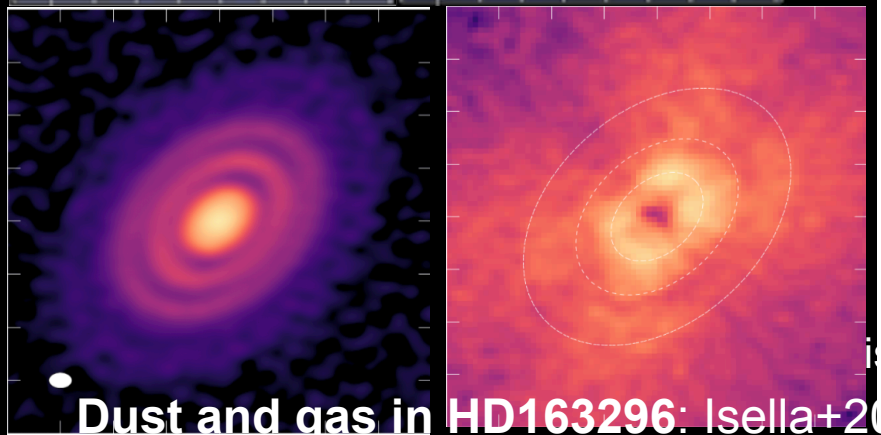
LBTI: Testi+2015

Rings, spiral and dust: ALMA/VLA



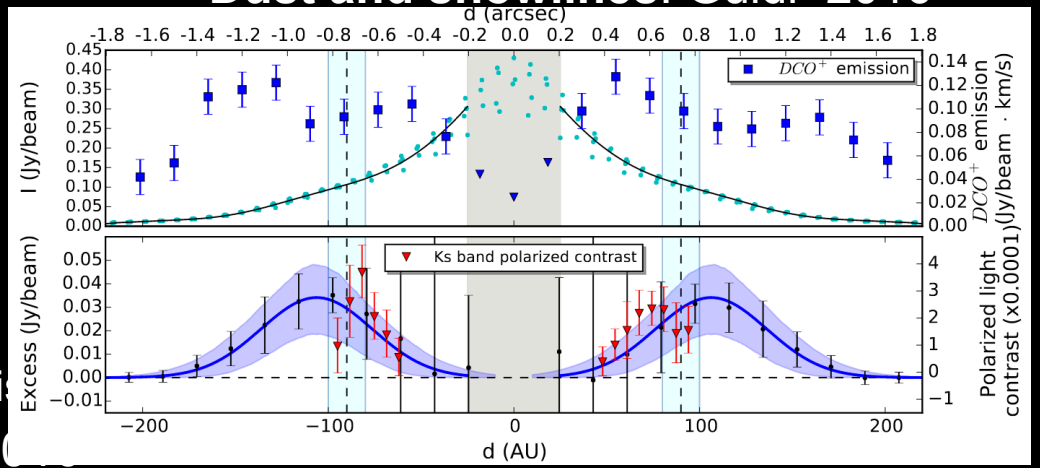
ALMA Gaps and rings: Perez+2016

- Systematic characterization of ring structures
- Systematic study of dust evolution
- Systematic comparison with IR AO imaging



Dust and gas in HD163296: Isella+20

Dust and snowlines: Guidi+2016



Future perspective

ALMA + X-shooter

Extensive combined surveys in progress

- Probe disk evolution in a wider range of masses and ages
- New developments: ALMA Band 2+3 (in progress as part of iALMA)

AO imaging with VLT/LBT/LBTI/JWST

- Young (proto)planets in disks: detection and characterization
- Jet-disk interactions

JWST + X-Shooter

- Disk accretion in younger sources
- Connect gas in the inner and outer region

VLA+SKA:

Dust evolution and pre-biotic molecules

E-ELT (MIDIR+HIRES)

- Complete characterization of dynamics and physics of gas in proto-planetary disks
- Spectroscopy of accreting proto-planets

HIRES@E-ELT & JEDI

- Atomic and molecular gas in the inner disk (winds, disk bound gas)
- Constraints on jet launcing mechanism
- Magnetic fields topology
- Accretion and stellar properties in BD, low metallicity pms stars, embedded sources..
- Planet accretion

- Comunita’ giovane e agguerrita
- Attivita’ coordinata fondamentale per utilizzo facility presenti e future