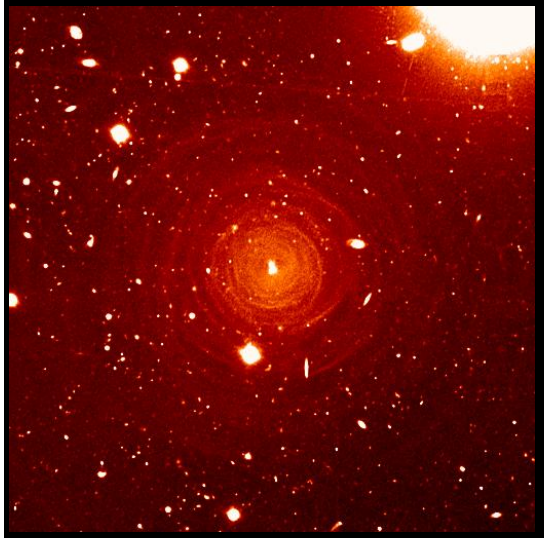
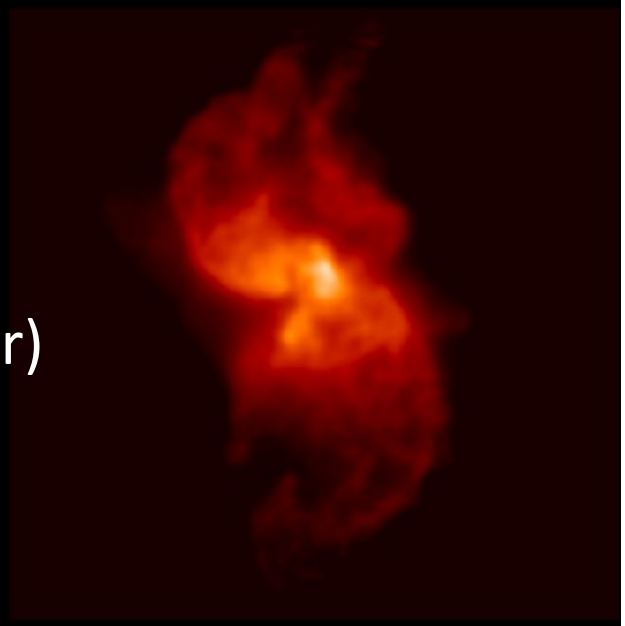
Dust from the AGB to the PN phase



Eric Lagadec

(Cornell University,

Observatoire de la Cote d'Azur)

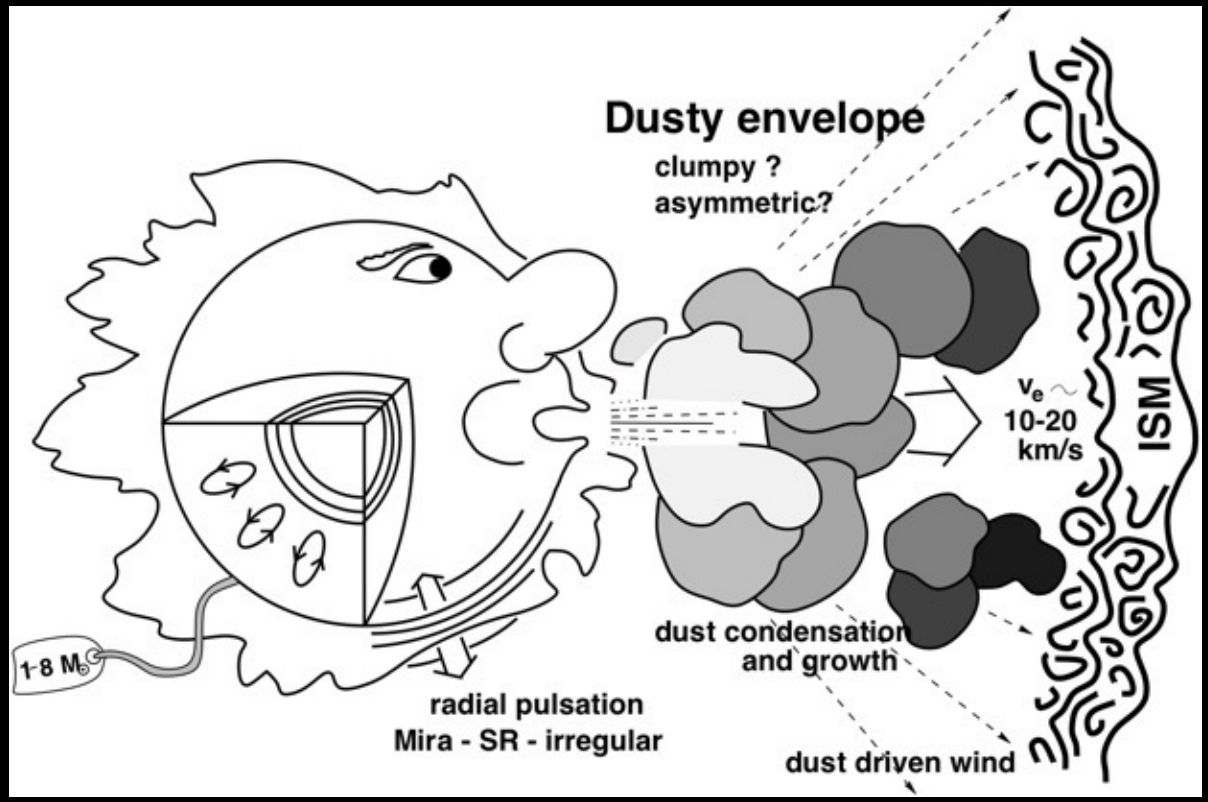


Main co-workers:

Greg Sloan (Cornell), Albert Zijlstra (Manchester), Liz Guzman, Dave Jones (ESO), Olivier Chesneau (Nice), Claire Lykou (Vienna), Claudia Paladini (Bruxelles)

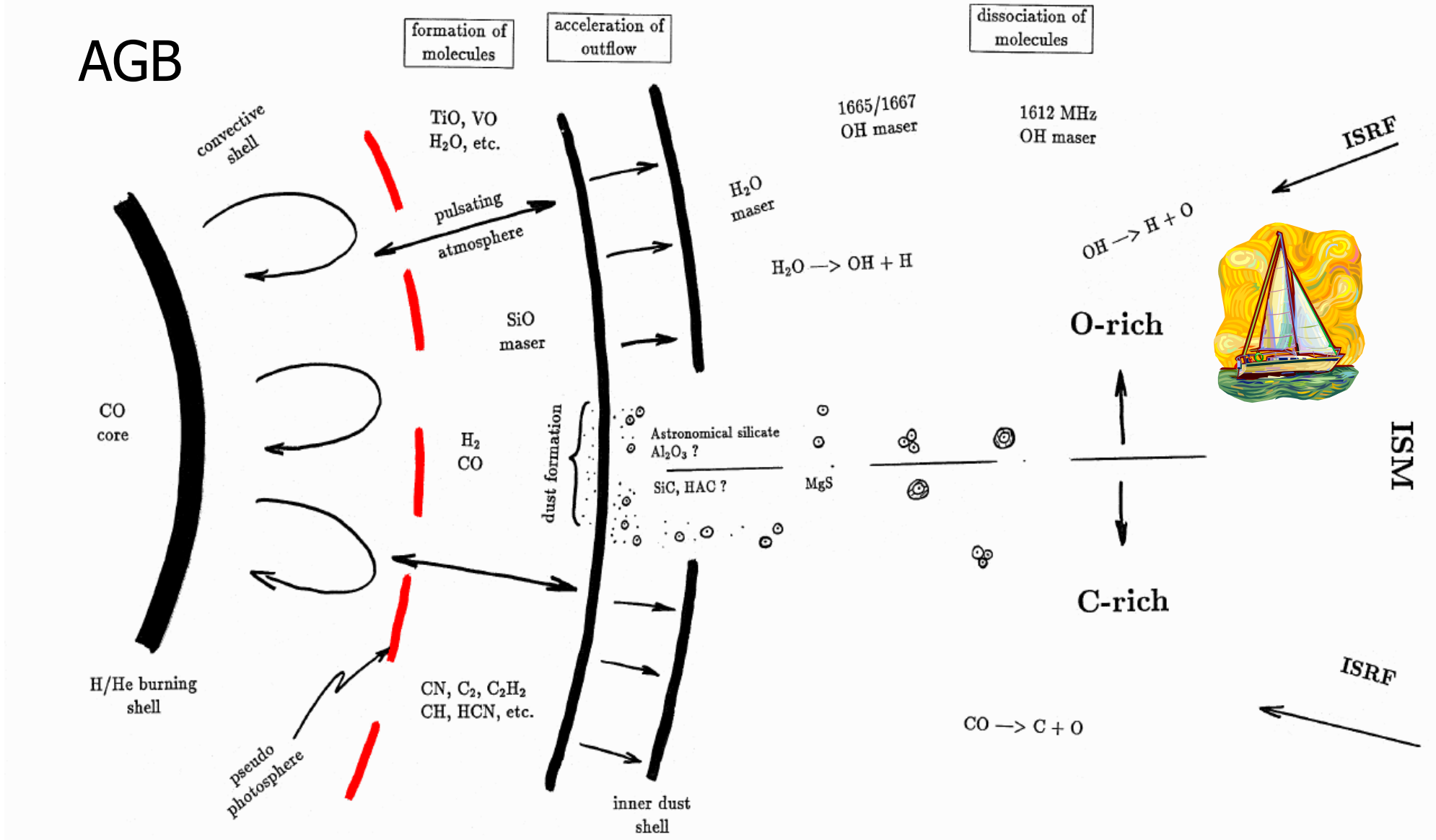
APN6, Playa del Carmen, Mexico

Dust on the AGB



- Pulsation+ shocks: dust formation
- Radiation pressure on dust: mass loss
- 90% of Galactic stardust (Gehrz, 1989)

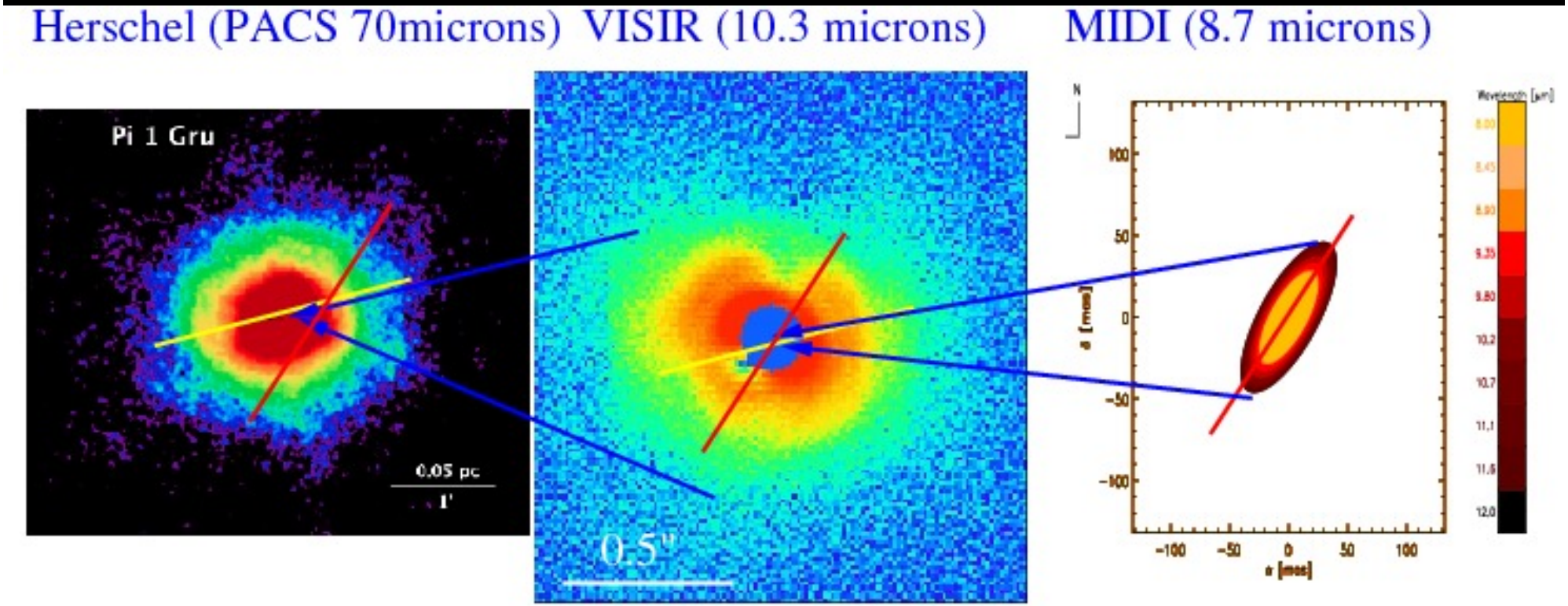
AGB



	1	10	R (stellar radius)	1000
From Le Bertre			Angular diameter for d=100 pc (")	
et al. 1997	0.01	0.1		10

Mapping dust around AGB stars

- Mass-loss history (departure from spherical symmetry)
- ≠ composition: ≠ opacity



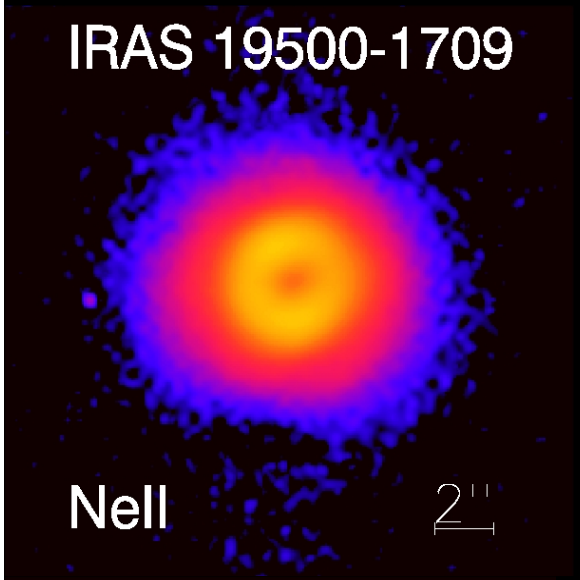
Lagadec et al., in prep, see Claudia Paladini's talk

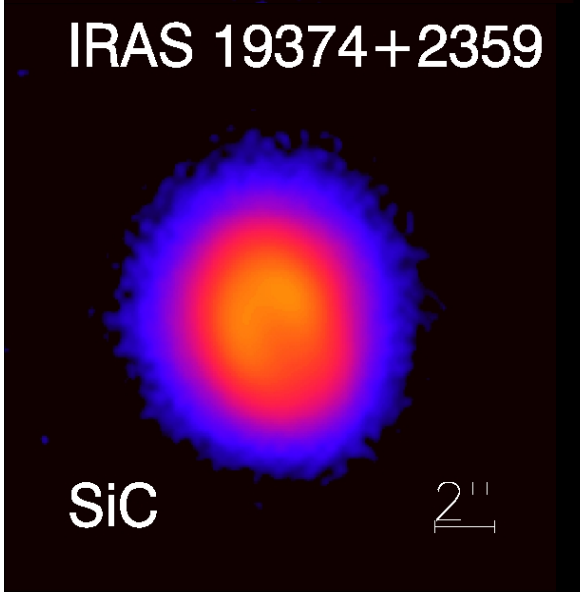
Dust after the AGB

- Shells detached: cooler dust
- Hotter star: harsher radiation field
- Torii/discs (binaries?): dust processing
- Complex chemistry: PAHs, fullerenes, 21 micron features…

What is the effect of the dust spatial distribution on the dust composition?

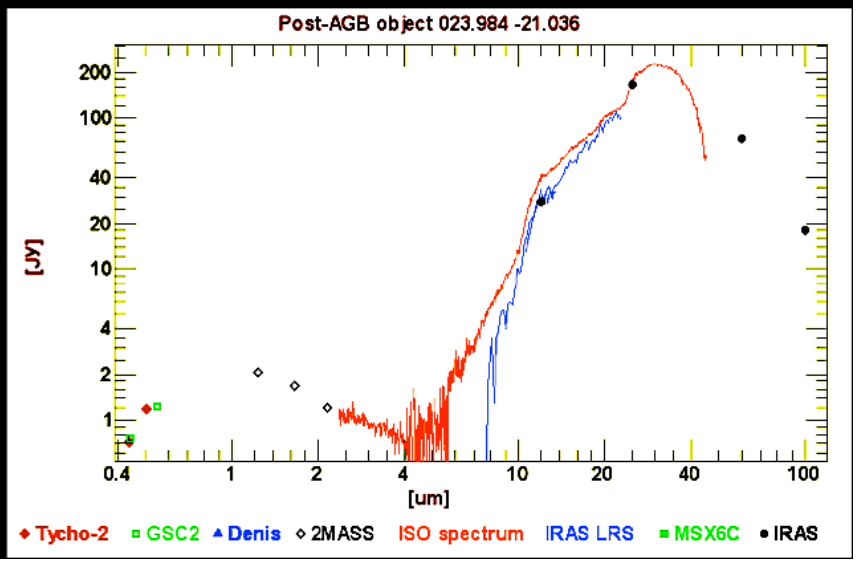
Detached shells



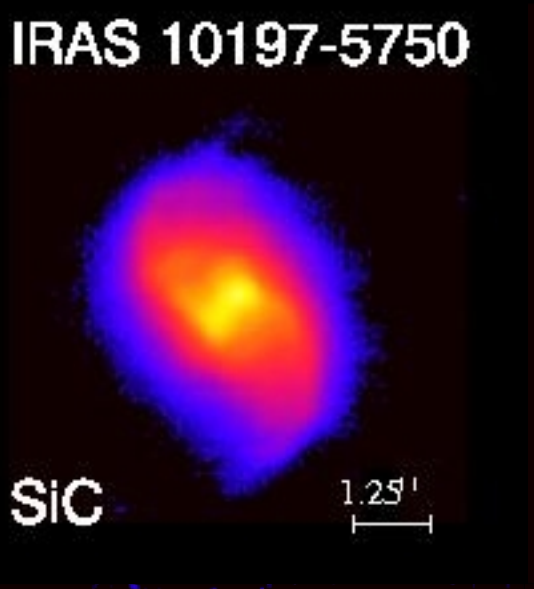


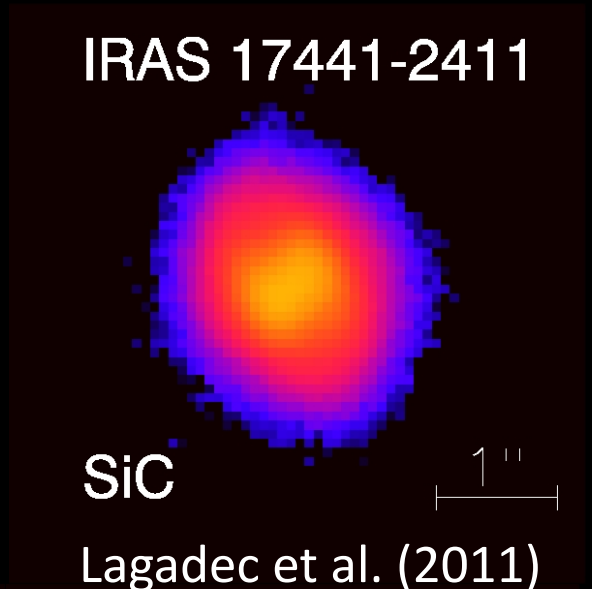
Lagadec et al. (2011)

- All elliptical
- Clear double peaked SED
- Cool dust

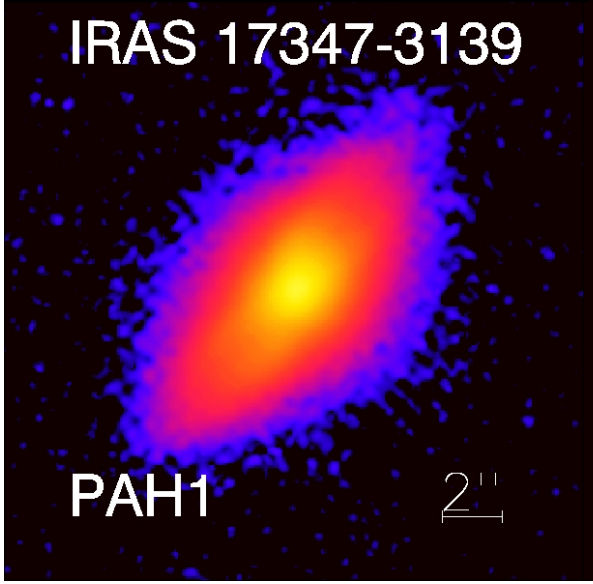


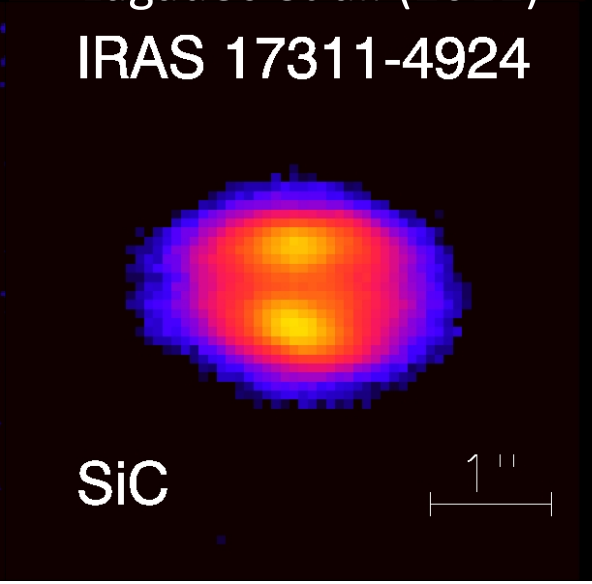
Dusty torii/discs



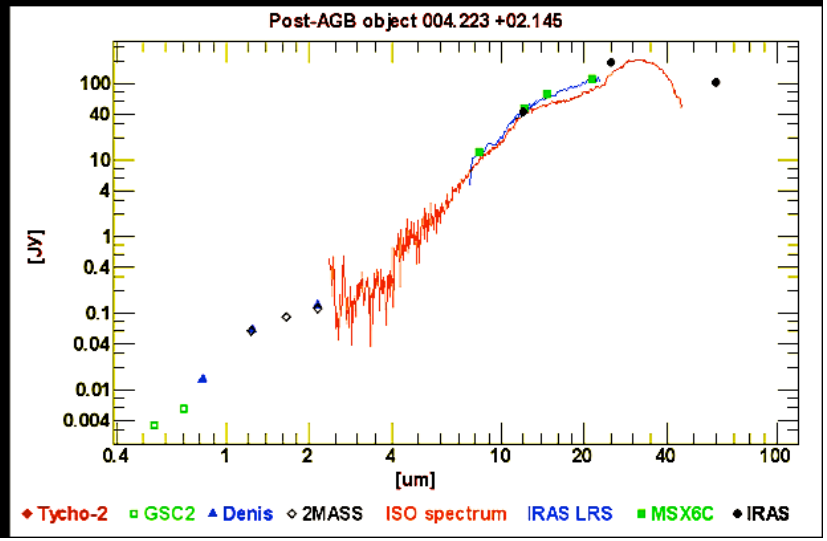


Lagadec et al. (2011)



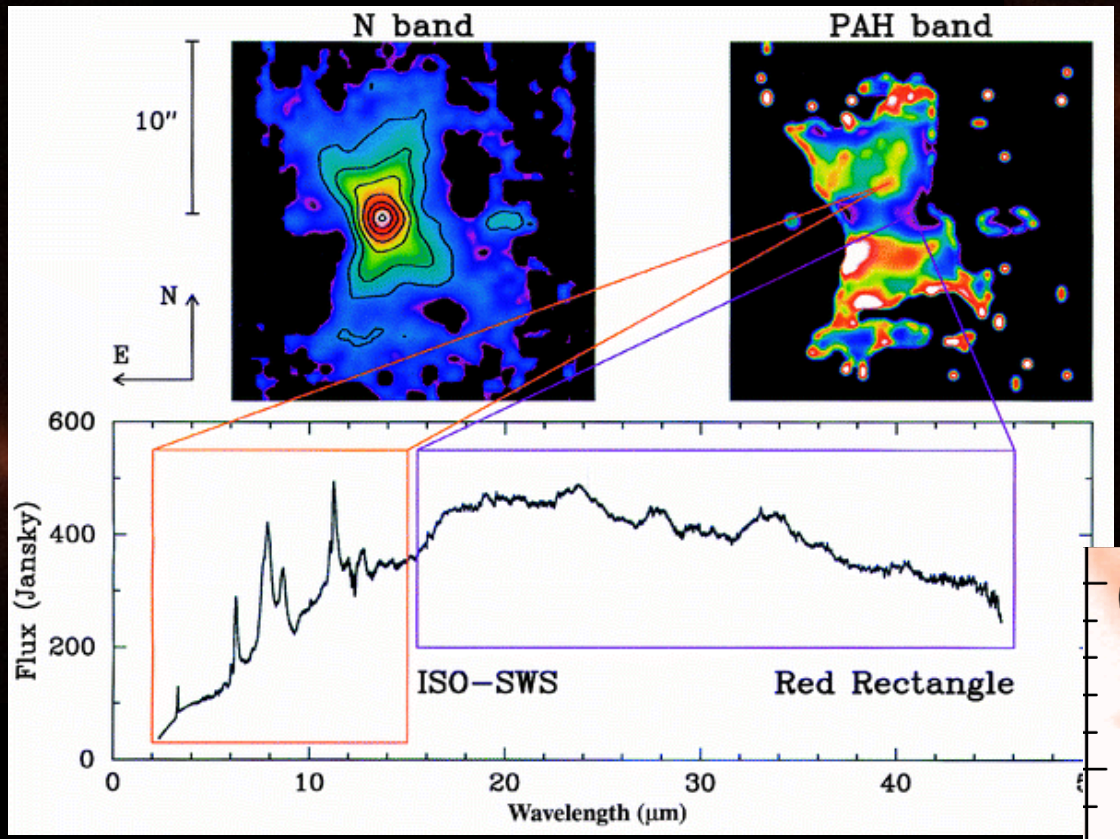


- All sources are bipolar
- Near-infrared excess
- Hot dust trapped

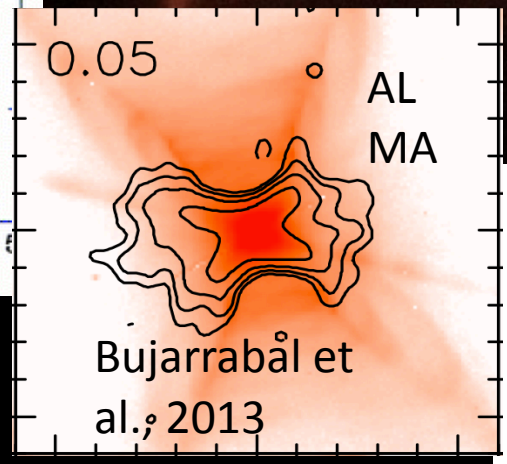


Dual chemistry in C-rich objects

The Red Rectangle



Waters et al., 1998



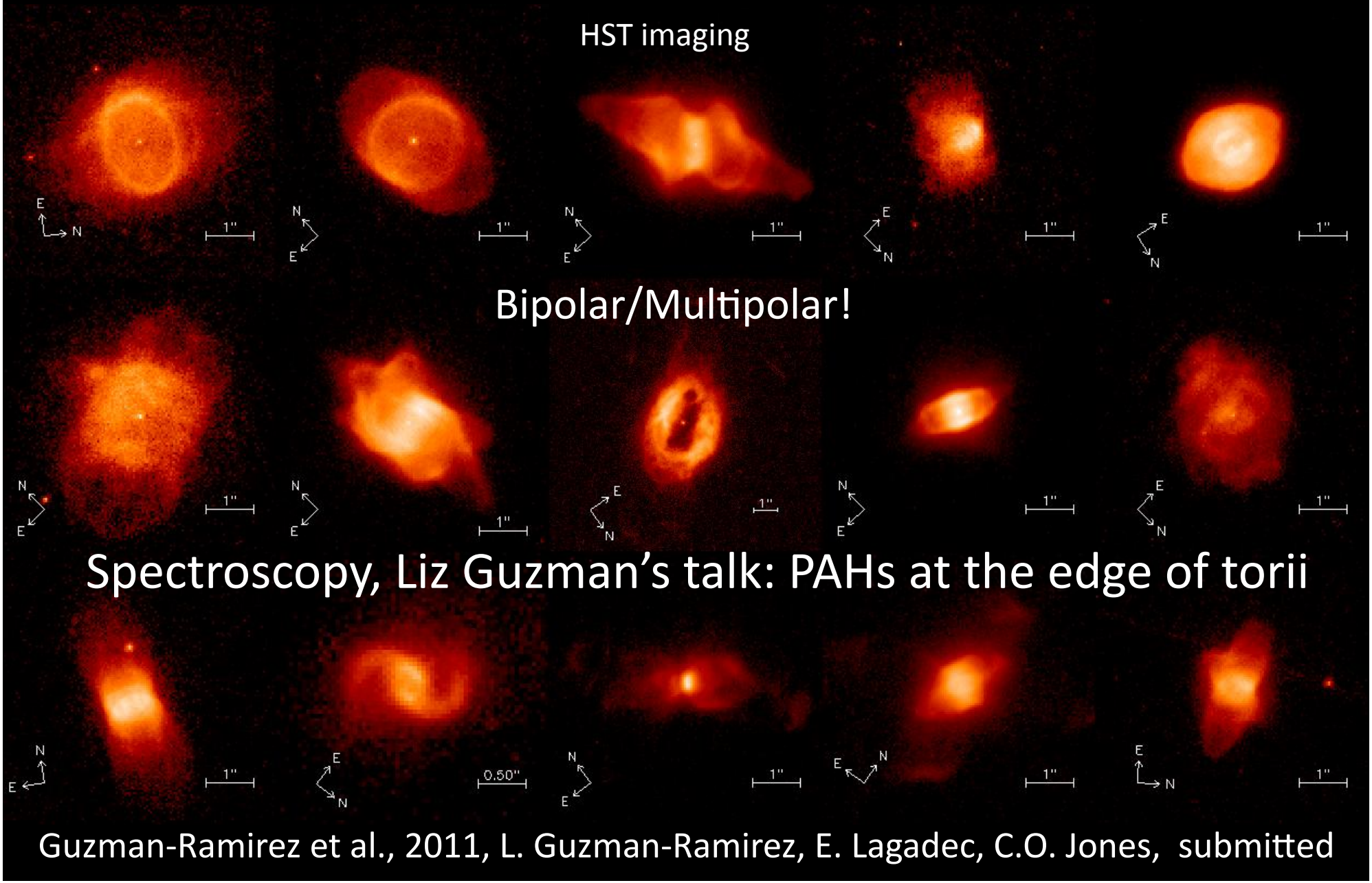
Dual chemistry in C-rich objects

- [WC] central stars (Waters et al., 1998a)
- Red Rectangle (Waters et al., 1998b)
- O-rich material in old disc
- PAHs in outflows
- Linked to binarity? (De Marco, APN3, 2004)

PNe in the Bulge

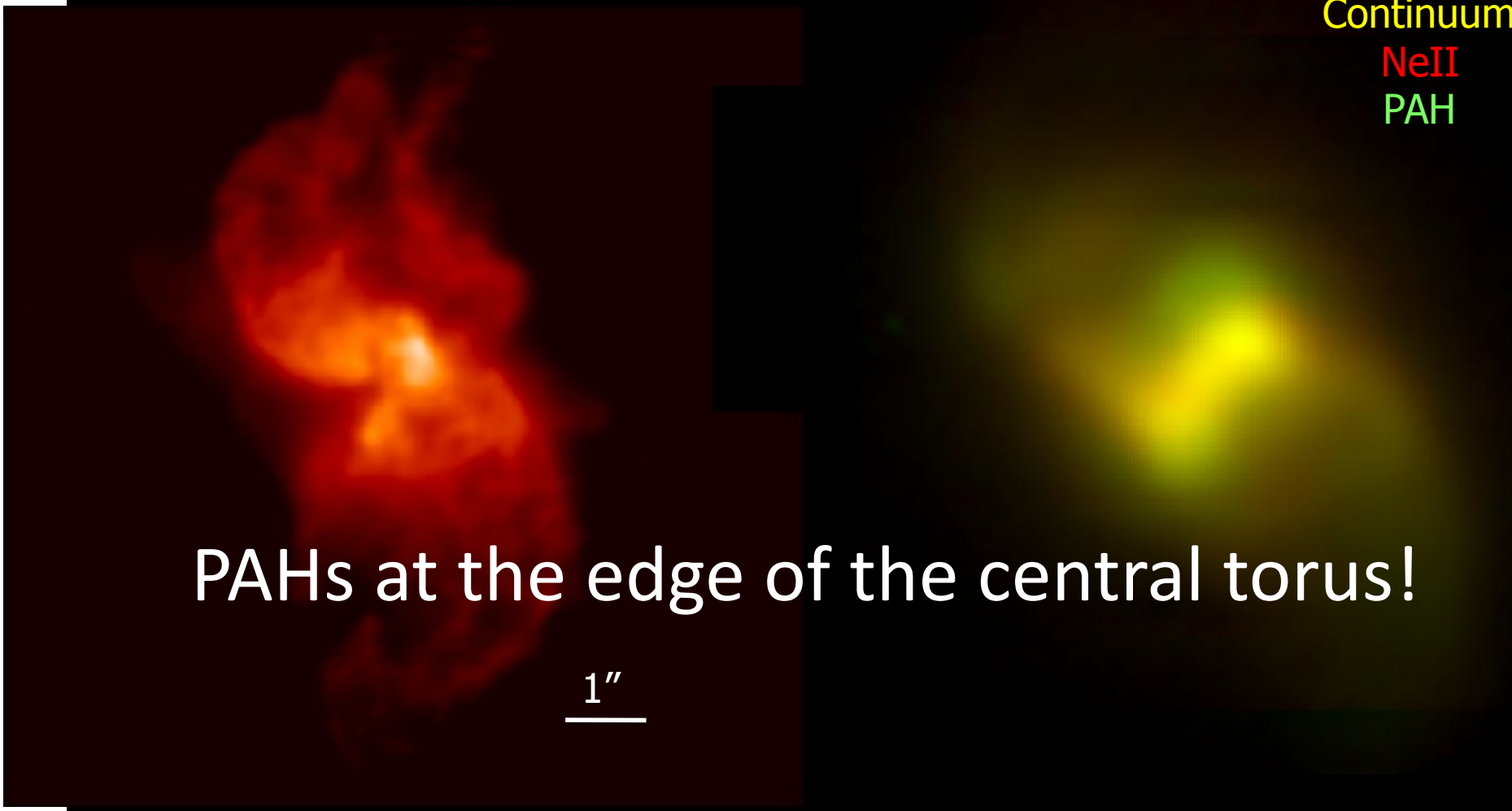
- Common dual chemistry (Gutenkunst et al., 2008; Perea-Calderon et al., 2009)
- Low mass stars: O-rich (not enough dredge-up)
- C-rich dust in O-rich environment!
- CO photodissociation+PAH formation on a torus? (Guzman-Ramirez, 2011)

PNe in the Bulge



Guzman-Ramirez et al., 2011, L. Guzman-Ramirez, E. Lagadec, C.O. Jones, submitted

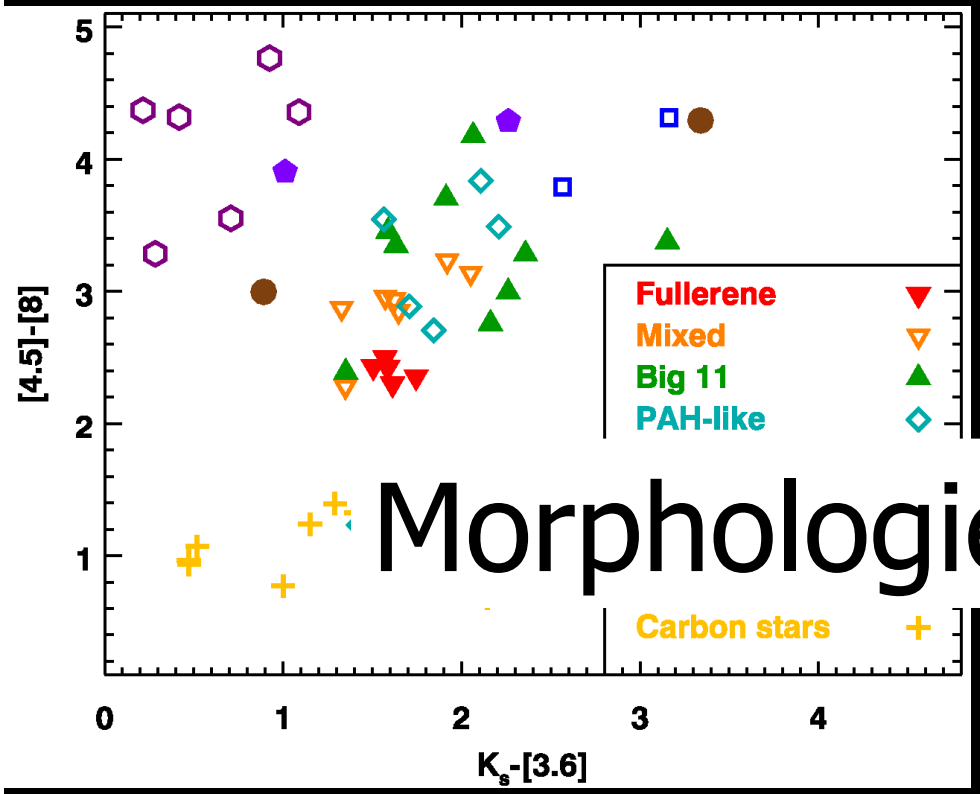
Dual chemistry in Roberts 22

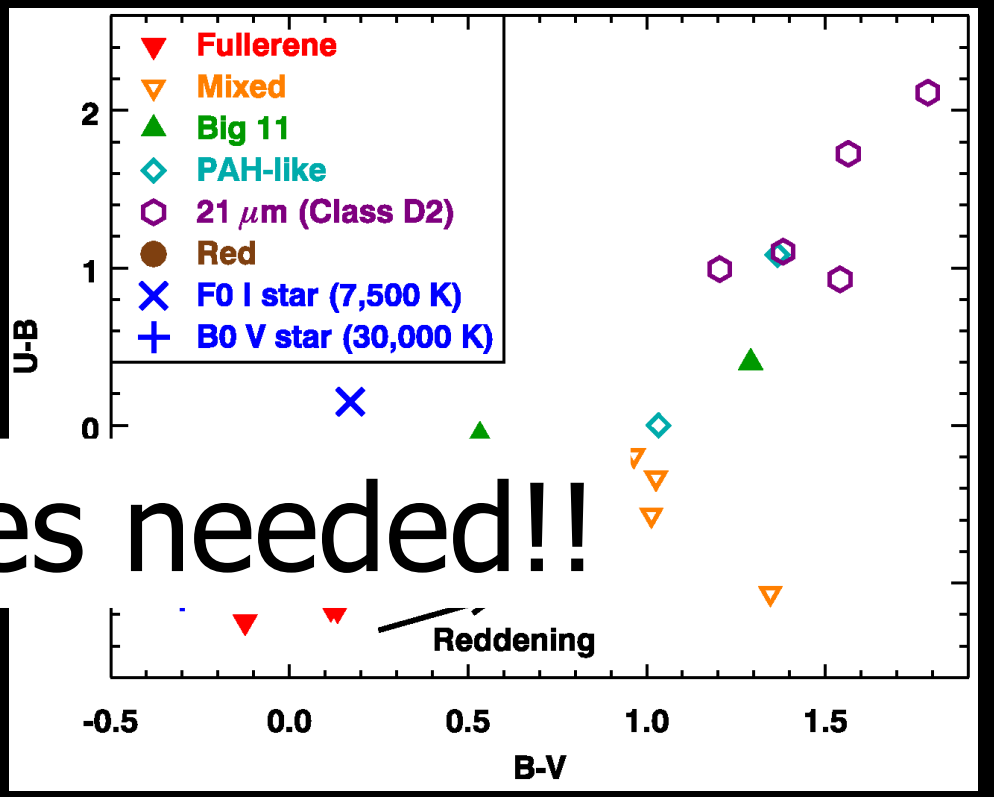


NACO/VLT (2.12µm) Lagadec et al., submitted VISIR/VLT 2-colors image (MIR)

C PAGB dust in the Magellanic Clouds

- 43 carbon PAGB stars
- 5 classes (Big 11, PAHs, Fullerenes, Mixed, 21 μ m)



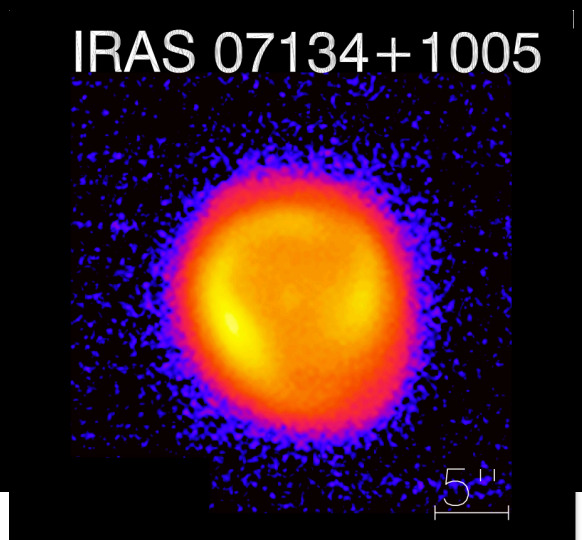


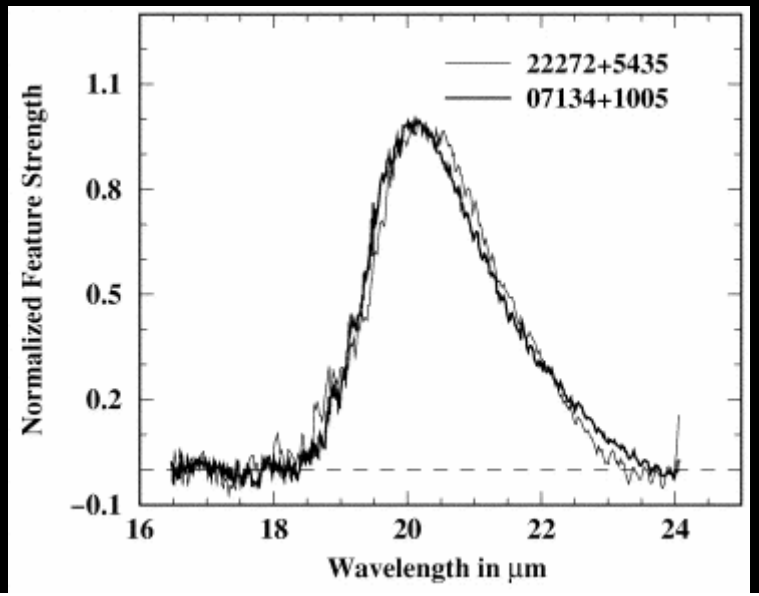
Morphologies needed!!

Sloan, Lagadec et al., 2013, submitted

21 micron sources

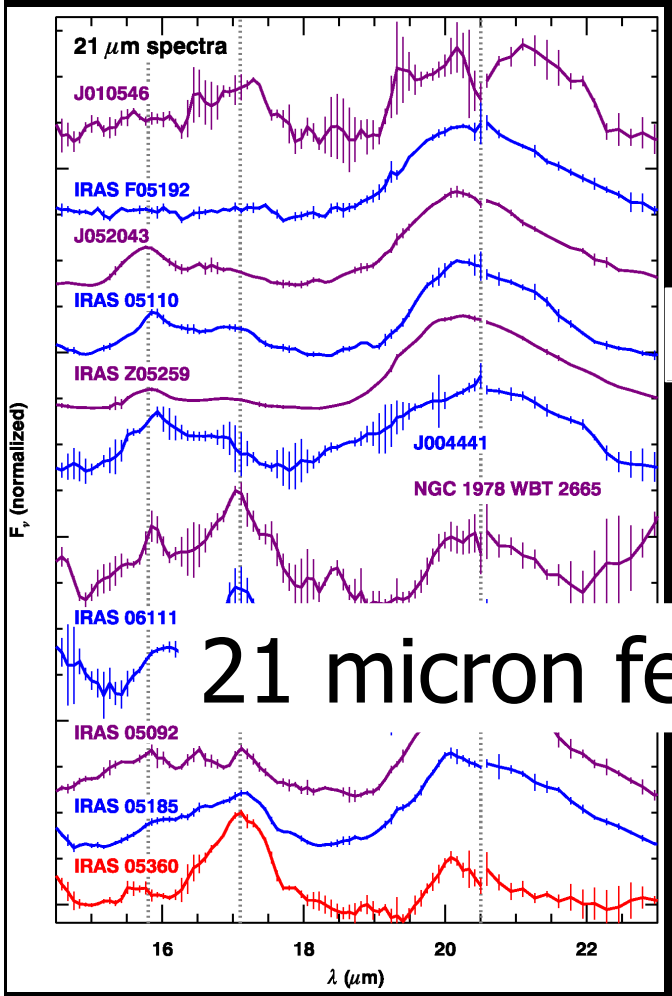
- Seen only in som C-rich PAGB
- Always with PAHs
- Associated to hydrocarbons? (Cerrigone et al., 2011)
- Associated with unidentified 15.8 and 17.1 micron features





21 micron sources

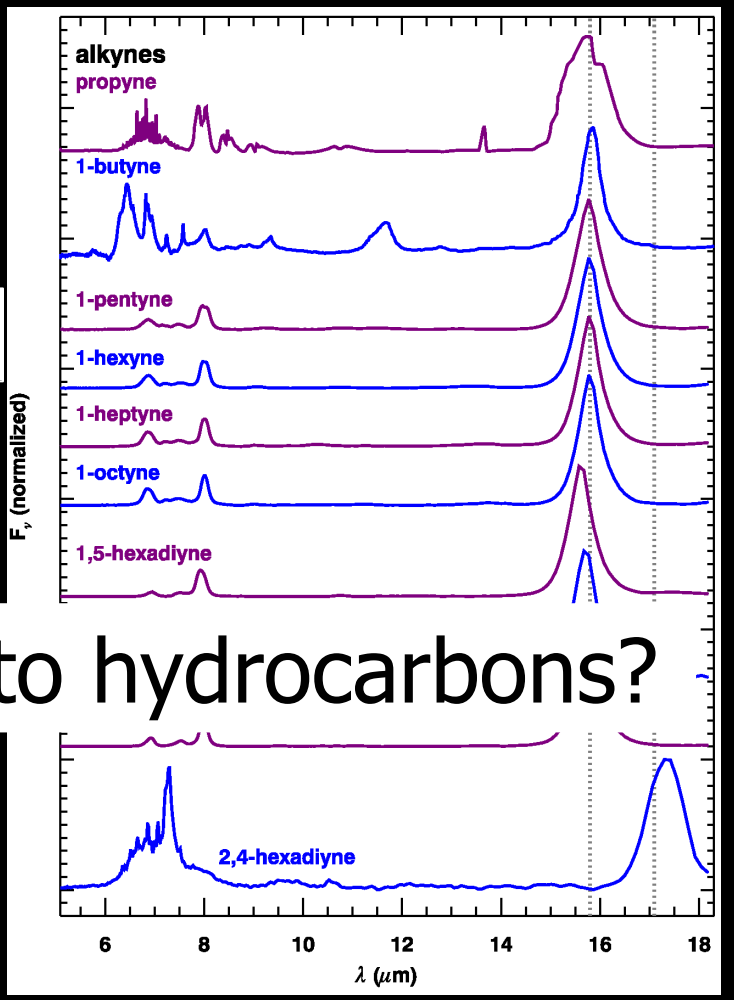
15.8 and 17.1 micron features identified?



Alkynes

$HC{\equiv}C{-}CH_3$

$HC{\equiv}C{-}CH_2CH_3$



21 micron feature linked to hydrocarbons?

Sloan, Lagadec et al., 2013, submitted

Conclusions and perspectives

- Mapping AGB dust: mass-loss history + location dust species
- Dust processed after the AGB
- Dual chemistry in O objects: CO photodissociation, PAHs growths on torii
- Need to know morphologies to understand dust composition
- 21 micron feature due to hydrocarbons?