

Synergy between ALMA and VLT/MATISSE: the ATOMIUM ALMA Large program

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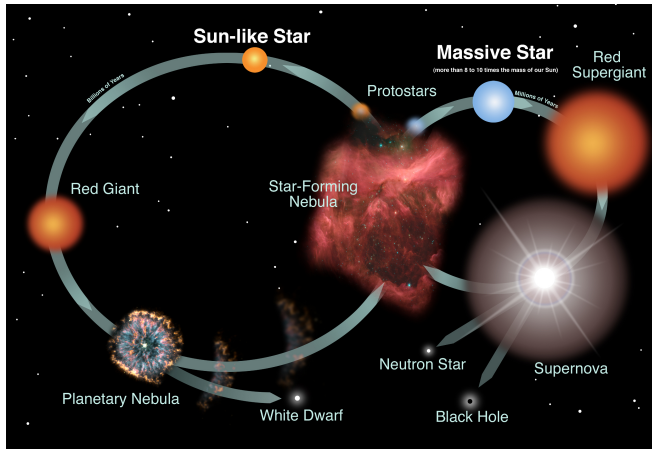
KU LEUVEN



SF2A S04 - Nice
14th May 2019

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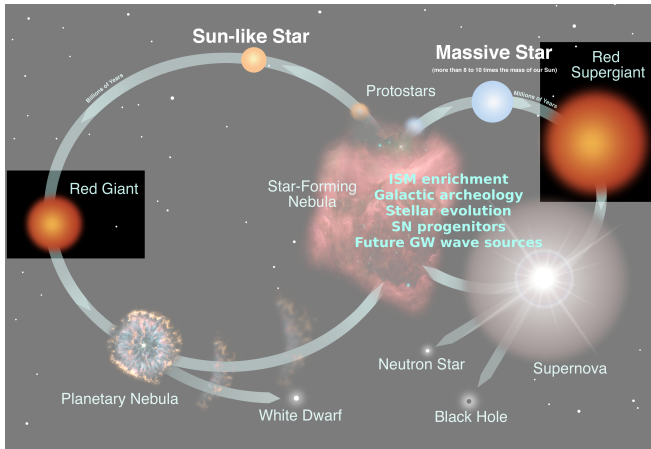
The mass loss of cool evolved stars, why ?



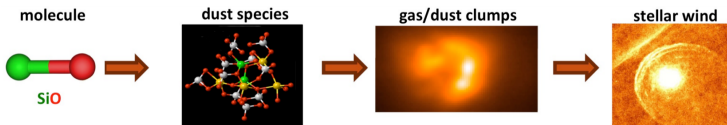
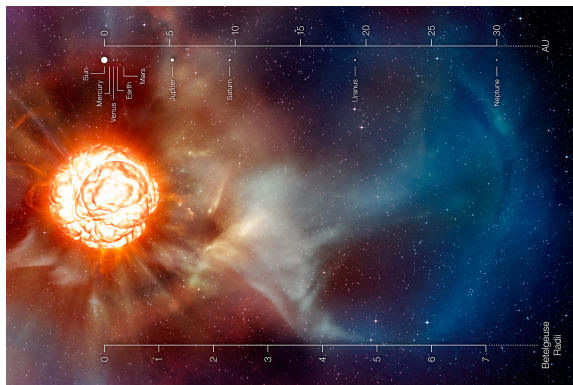
The mass loss of cool evolved stars, why ?

ALMA Tracing the Origins of Molecules In dust-forming oxygen-rich M-type stars

PIs : L. Decin (KU Leuven, Belgium) & C. Gottlieb (Harvard-Smithsonian CfA, USA)

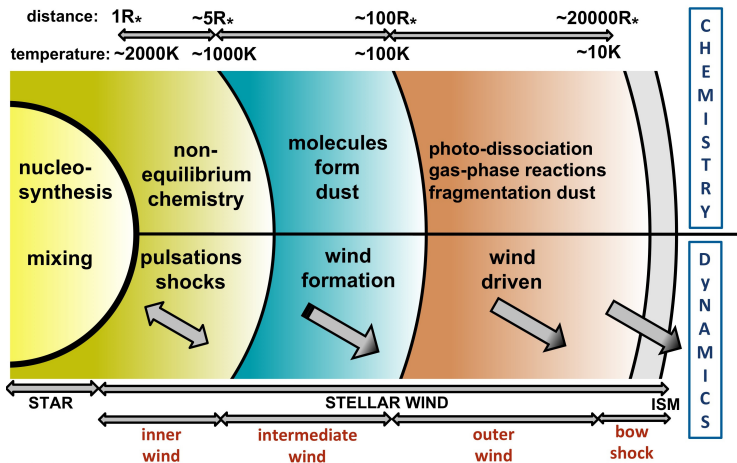


The winds of evolved stars : general picture



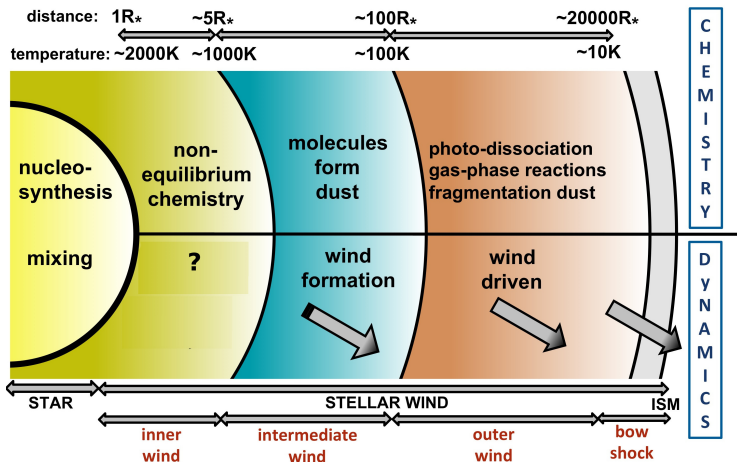
The winds of evolved stars : general picture

AGB stars

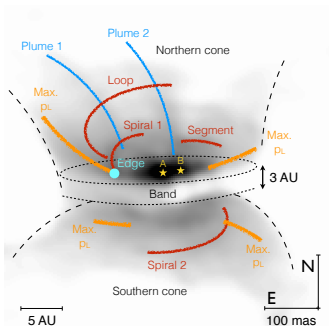


The winds of evolved stars : general picture

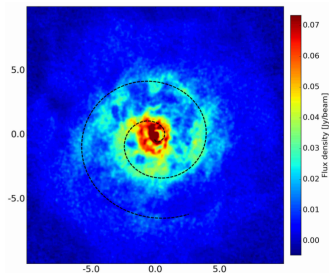
RSG stars



The wind of evolved stars : the complexity

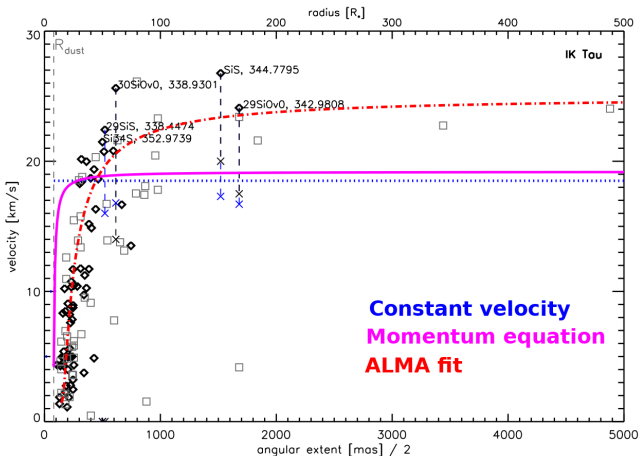


L2 Pup (disk)
Kervella et al. 2015



EP Aqr (spiral)
Homan et al. 2018

The wind of evolved stars : the complexity



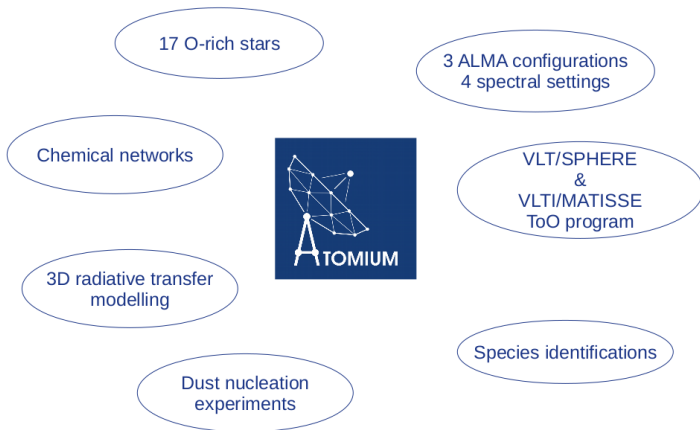
IK Tau (acceleration law)

Decin et al. 2018

Problematics

- Dynamics
Wind initiation ? acceleration ?
- Morphology
How does it influence the mass loss ? Role of binarity ?
- Chemistry
Dust nucleation ? Non-equilibrium gas phase chemistry ? Species ?
- Stellar characteristics
How do they influence all the above ?

The ATOMIUM project



The ATOMIUM project



USA



Belgium



UK



France



Germany

The
Netherlands

Sweden



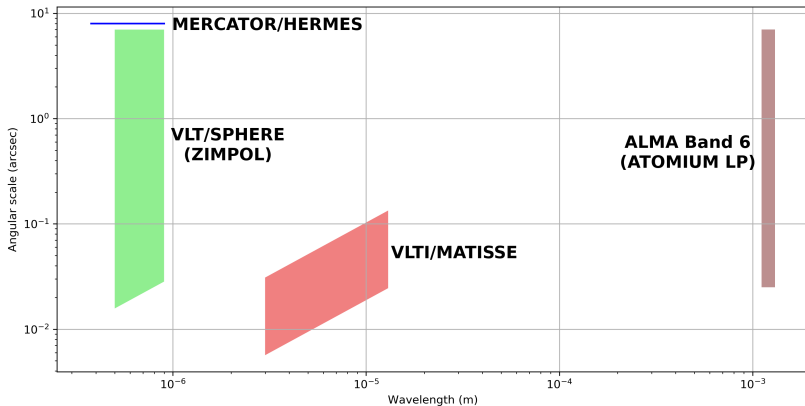
Australia

2 Pls + 40 Cols

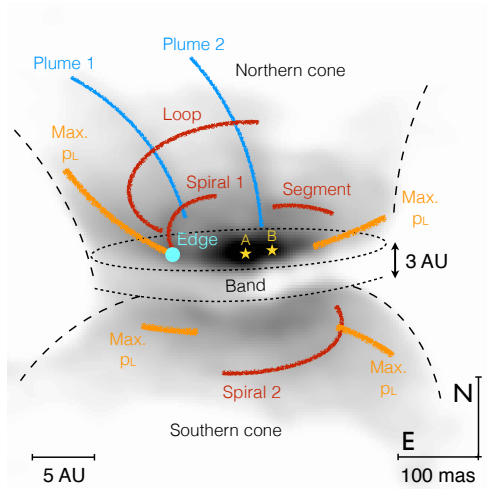
Observation plan

- ALMA intermediate configuration
October - November 2018
 - ALMA compact configuration
January and March 2019
 - ALMA extended configuration
June - July 2019
- VLT/SPHERE + VLT/MATISSE + MERCATOR/Hermes
Same time

Angular resolution vs wavelength

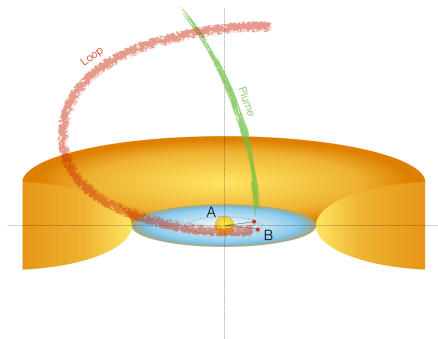
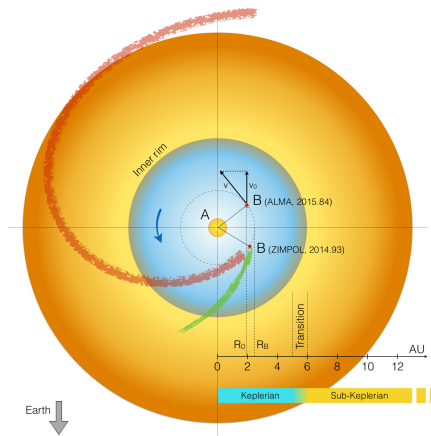


Dust localisation: an example with L₂ Puppis



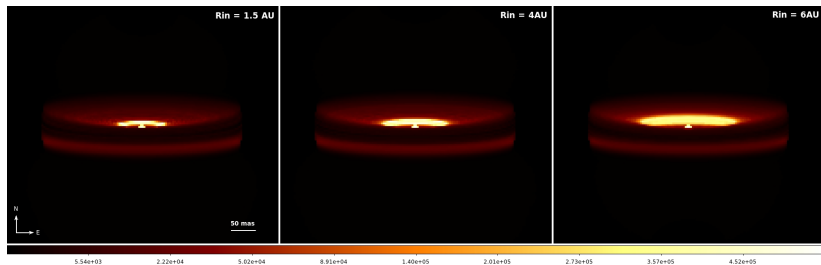
Kervella et al. 2015

Dust localisation: an example with L₂ Puppis

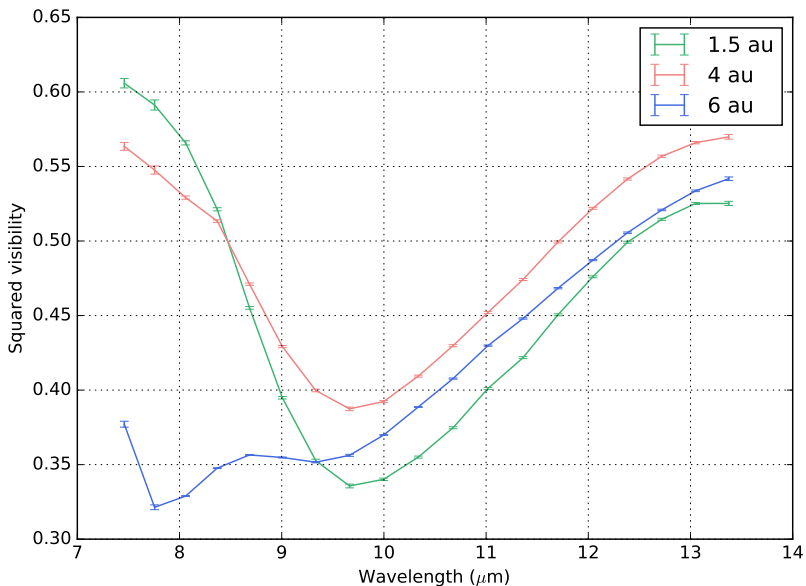


Kervella et al. 2018

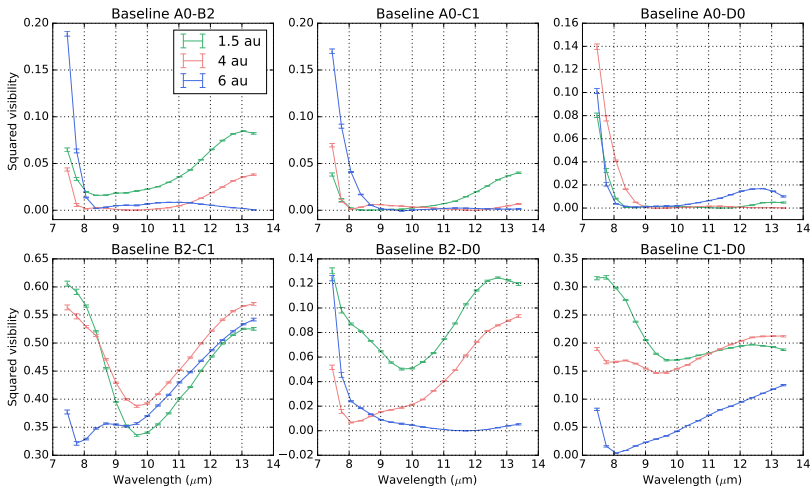
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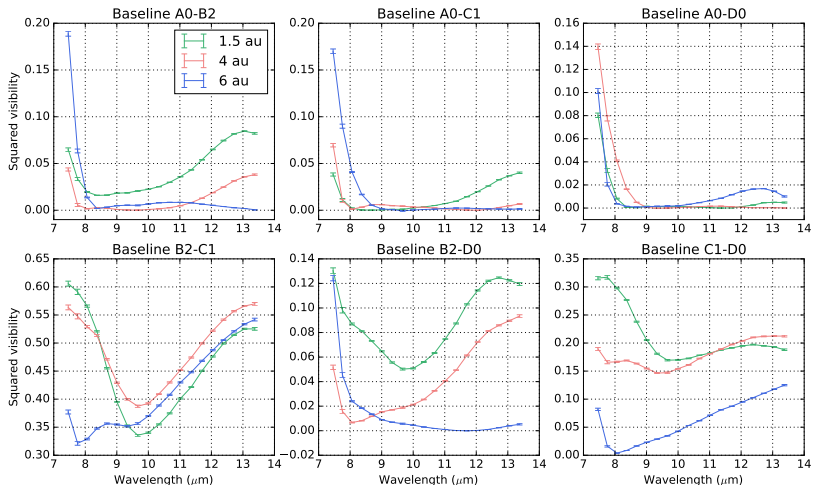
Dust localisation: an example with L₂ Puppis



Dust localisation: an example with L₂ Puppis



Dust localisation: an example with L₂ Puppis



ALMA : gas dynamics and chemistry

VLTI/MATISSE : unambiguous dust location