First images from the PIONIER/VLTI optical interferometry imaging survey of Herbig Ae/Be stars

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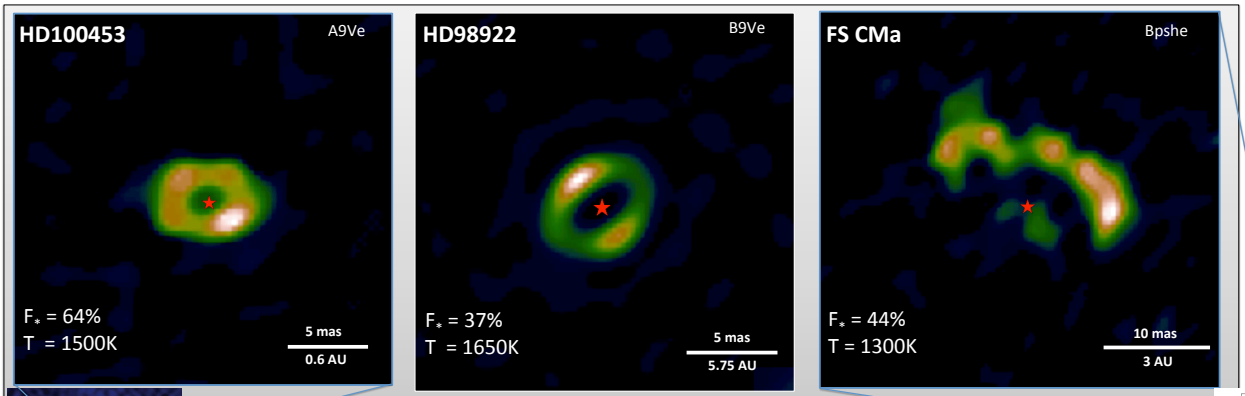
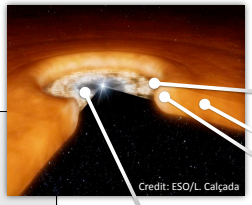


The stellar flux ratio F* and the color temperature T are directly derived from the interferometric observations (see Sect. 3).

FIRST RESULTS



Disk wind ?

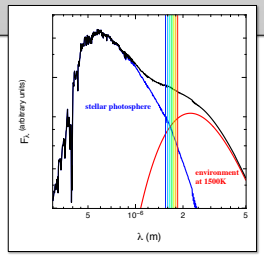
Planet formation ?

Puffed-up inner rim ?

Gaseous inner disk ?

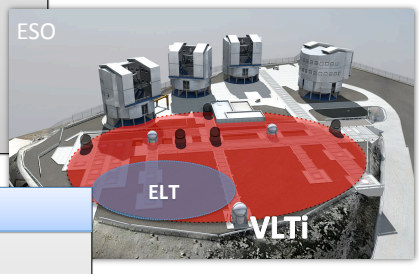
1. Inner parts of Young stars

- **Infrared excess :** Young stellar objects (YSOs) are known to have an infrared excess in their spectral energy distribution (SED) due to their dusty and gaseous environement.
- **Complex geometry :** The SED of the inner parts of the disks could be fitted by numerous models with different geometries (puffed-up inner rim (Isella & Natta 2005), disk winds (e.g. Bans & Königl 2012), dusty halo (Vinkovic et al. 2003), etc...).
- **Dust sublimation :** The dust sublimation temperature is around 1500K. The corresponding emission peaks in the near infrared (NIR). Observing in the NIR tells us about the first Astronomical Units (AUs) of the objects.
- **High angular resolution :** To constrain the geometry, high angular resolution instruments observing in the NIR are mandatory.



2. VLTi/PIONIER

- PIONIER is a **4 beams recombiner** operating at the VLT at Cerro Paranal, Chile.
- It can combine the ATs or the UTs.
- It operates in **near-infrared** : H and K bands.
- It provides 6 baselines and 3 independant closure phases
- The longest baseline is about 140m.
- The best resolution is about **2mas**.
- Its limit magnitude is **Hmag = 9**.

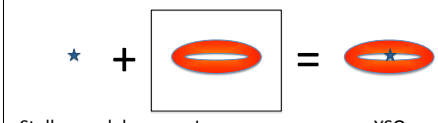


3. Image reconstruction

- Aperture synthesis : Image reconstruction aims to make **a synthesis of a telescope of 140m of diameter**.
- **Model independant**
- **Two components separation :** Separation of **the star** and **its environement**.
- **Chromaticity :** The different spectral indexes of the two components in the NIR induce a strong chromaticity of the observables.
- **Method** : Retrieving the **stellar flux**, the **environment spectral index** and the **image**

2 components modelisation :

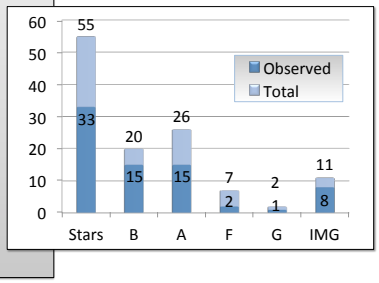
$F_\lambda \propto \lambda^{-4}$ $F_\lambda \propto \lambda^{d}$



Stellar model Image YSO

4. Survey

- **55 Targets**
  - Selected from existing SEDs (e.g.Malfait et al. 1998)
  - Young objects
  - NIR excess
- 2 aims :
  - **Statistics :**
    - Size vs.spectral type ?
    - Temperature of the environement ?
    - Stellar flux ratios
  - **Imaging :** >10 imaging targets
    - Reavealing **the morphology of inner parts of dusty disks** around intermediate mass stars.



5. First results

- Evolutionnary status :
  - ½ of the survey done.
  - 8 objects are sufficiently resolved to be imaged.
- Imaging :
  - Applying the **new imaging method** with success
  - **Resolving the inner parts of the YSOs**. Informations on the symmetry of the inner parts.
    - Inner rim vertical structure, dust distribution, accretion...
  - Finding an indication on **the temperature of the inner parts** of the environement.
  - Values of the stellar flux ratio for resolved objects.
- Next : from the images to the physical modelisation of the objects.

Aknowledgments : ANR POLCA is funding the PhD of J. Kluska