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WESTERHOUT 33

"CONSTRAINING THE ORIGIN OF STELLAR MASSES AND OF THE CHEMICAL COMPLEXITY IN HIERARCHICAL INFALLING CLOUDS"

Armante Mélanie

Perspectives

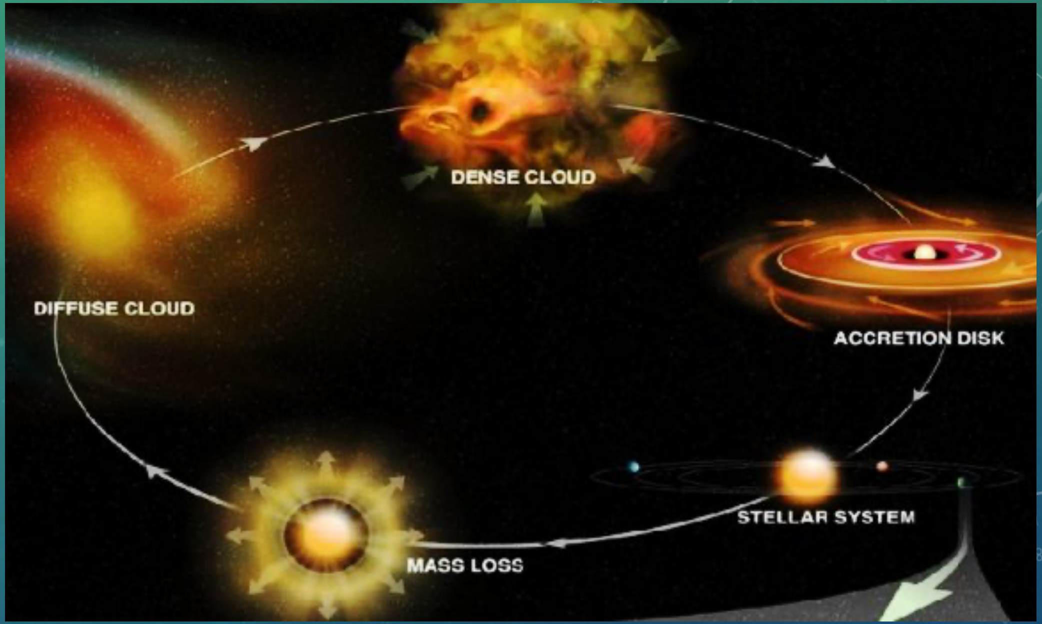
Massive star : > 8 x Sun (size and mass)

Massive stars are more likely created far from our sun (outside the Gould Belt)

We can observe those regions only for the past 15 years with the improvement in interferometry

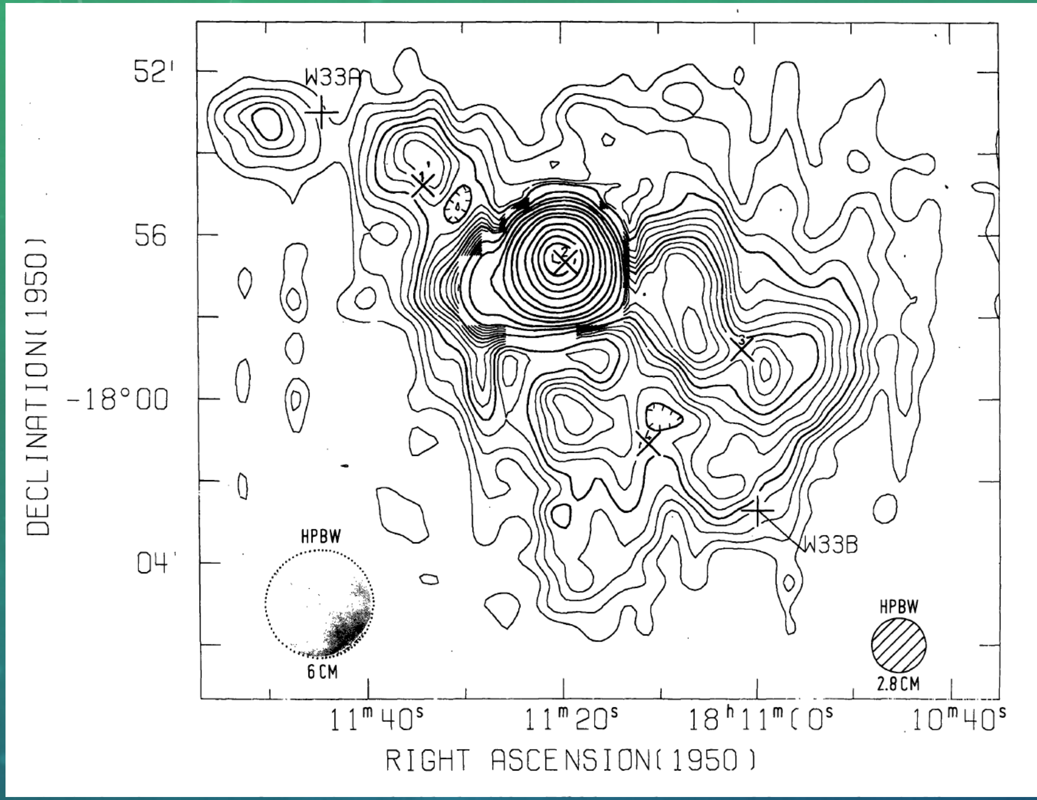
2 different processus in competition for massive star :

- The mass of the core determine the mass of the future star
- Only small cores are created, massive stars are then formed by coalition of small cores



Scheme of star formation

The ALMA-IMF campaign (2017), aims to observe the most statistically significant regions in our Galaxy

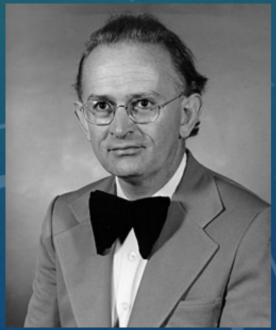


Continuum emission @2.8 cm, Effelsberg telescope , Goss and al, 1977

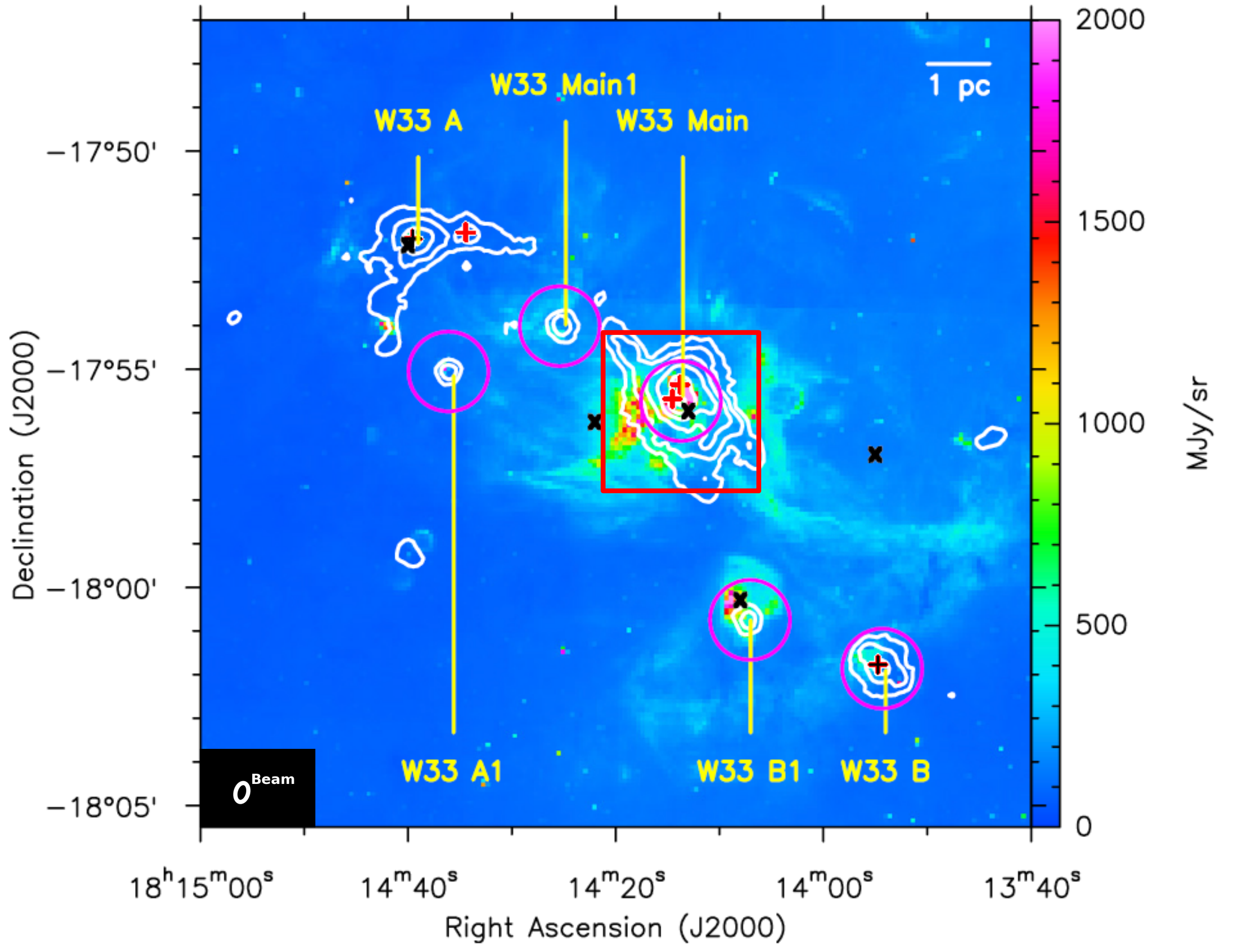
Westerhout 33 (W33) or G012.80

Westerhout 33 (W33)

- First detected by Westerhout in 1958
- Located in the Scutum spiral arm in the first quadrant of the Galaxy
- Distance 2.4 kpc
- Physical size : ~ 10pc / angular size : ~ 15 arcminutes
- Total bolometric luminosity : ~ 8x10^5 L$_{sun}$
- Total mass : ~ (80 000 - 800 000) M$_{sun}$



Gart Westerhout, U.S. Naval Observatory photograph, government agency



(a) Infrared emission at 8 μm (*Spitzer*/GLIMPSE survey).

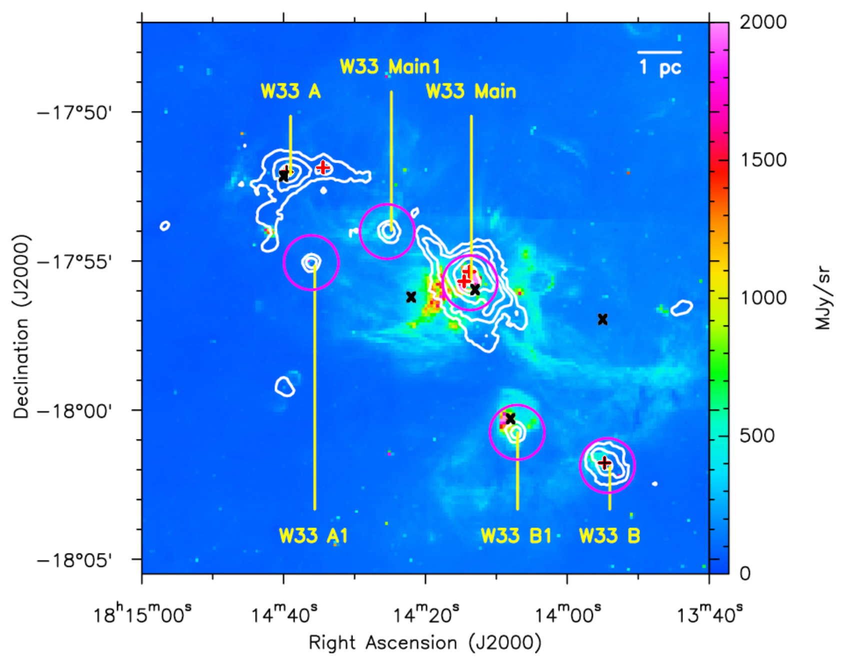
Precision ALMA, Immer and al, 2014, the white contours shows dust emission @ 870µm

Composition

- 3 large molecular clumps ($M \geq 2 \times 10^3$ M_{sun} & $r \geq 1pc$): W33 Main, W33 A and W33 B
- 3 smaller dust clumps ($M \leq 0.5 \times 10^3$ M_{sun} & $r \leq 0.6$ pc): W33 Main 1, W33 A 1 and W33 B1
- A few evolved O-type stars (+)
- One Wolf-Rayet star (hot star at about 10 M_{sun})
- Several dense molecular cores that may harbor proto clusters on the east side of the cloud (balck x).
- An infrared bubble
- A filament
- 2 supernova remnants in the north-west of the W33 complex

→ The star formation activity within the cores can be triggered by :

  - An interaction of the filaments
  - Previous generations of stars
  - The interactions with the supernova remnants



(a) Infrared emission at 8 μm (*Spitzer*/GLIMPSE survey).

Precision ALMA, Immer and al, 2014, the white contours shows dust emission @ 870µm

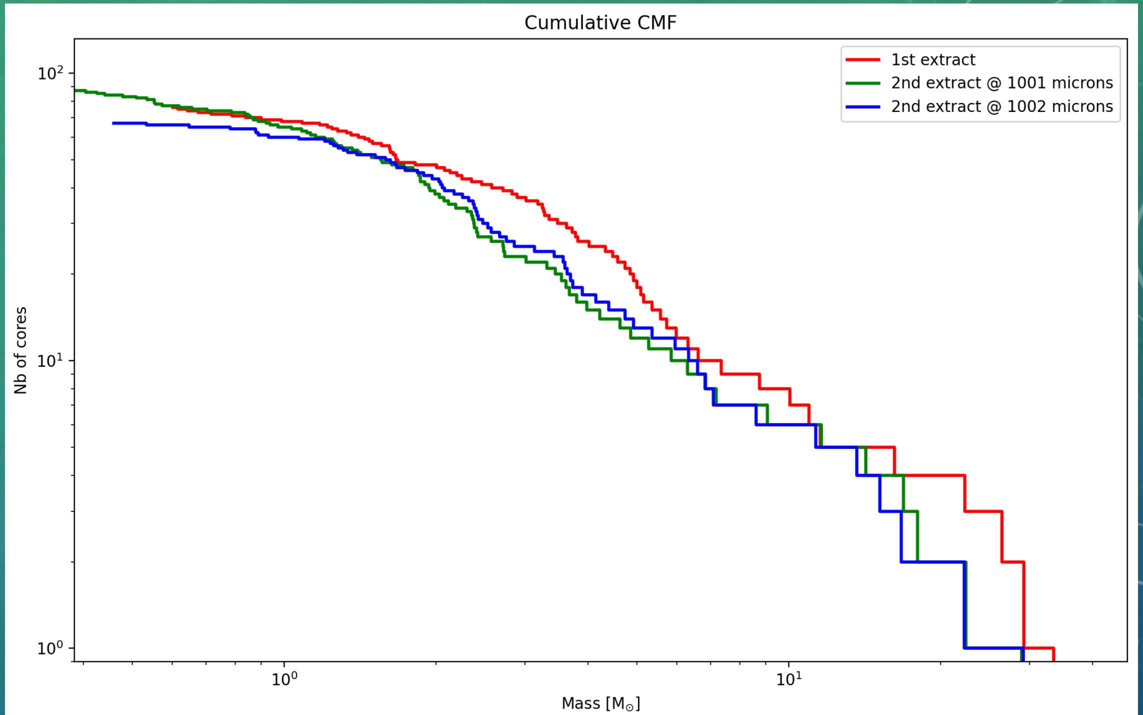
Plan (1/2):

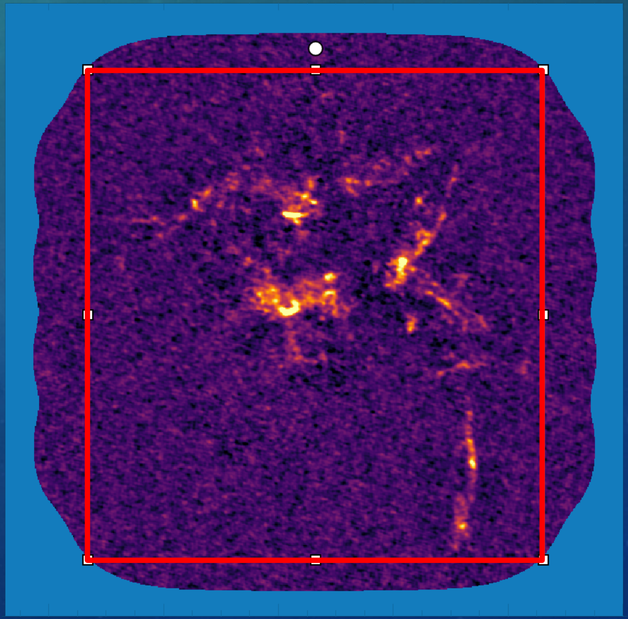
- Analysis of the cores in this region: build a CMF (Core Mass Function) using a core extraction catalog (so far 92 cores detected)

+ Mass computation for each core (between $0.2*M_{sun}$ and $40*M_{sun}$)

- Analysis of the data: Quality Assessment (QA) of the cubes available for this cloud : checking the quality to help the data reduction team

-> then be able to work on those cubes



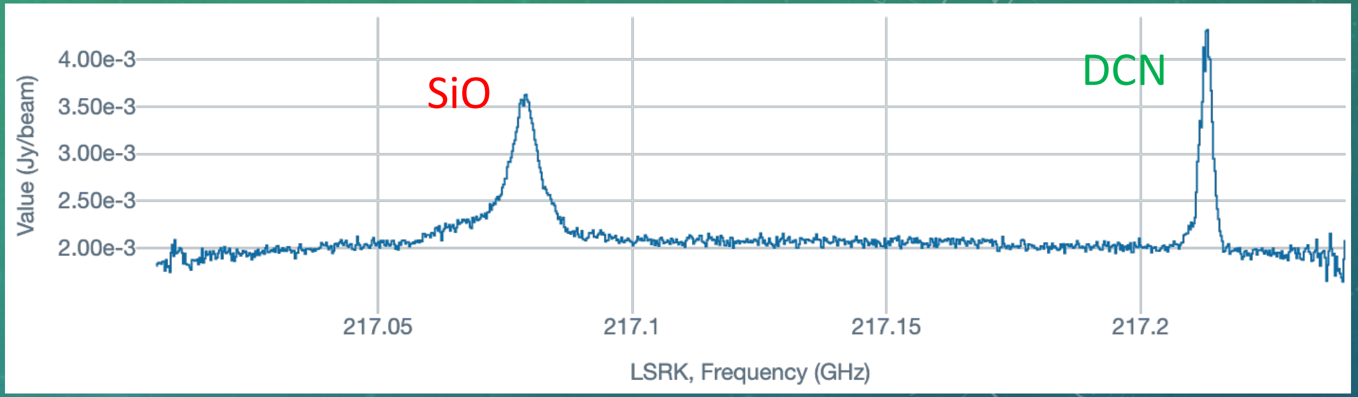


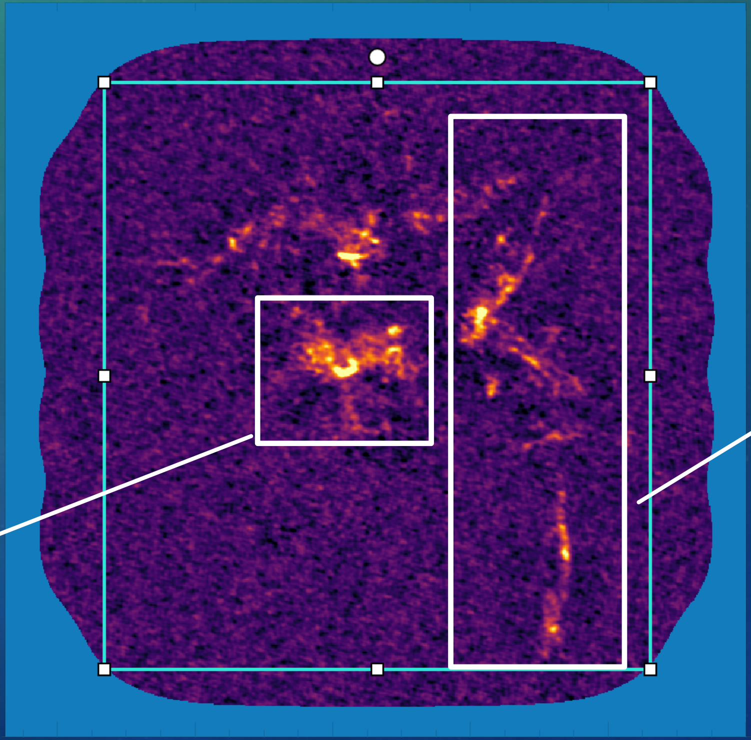
Map ALMA 12m, spw1, B6 (1mm) using CARTA, SiO emission

Plan (2/2):

- Line identification of a maximum of transitions for a maximum number of species in the differents spectral window (spw) (so far ~20 species identified)

- Identification of the different elements (cores, outflows, ...) and structures(clouds, filaments, ...) in this region
- Study and comparison with the outputs of the Paris-Durham shock code





Map ALMA 12m, spw1, B6 (1mm) using CARTA, SiO emission

Filament

Core + cloud

→ Combining chemical + dynamical aspect
→ Define temperature + age

Thank you for your attention !