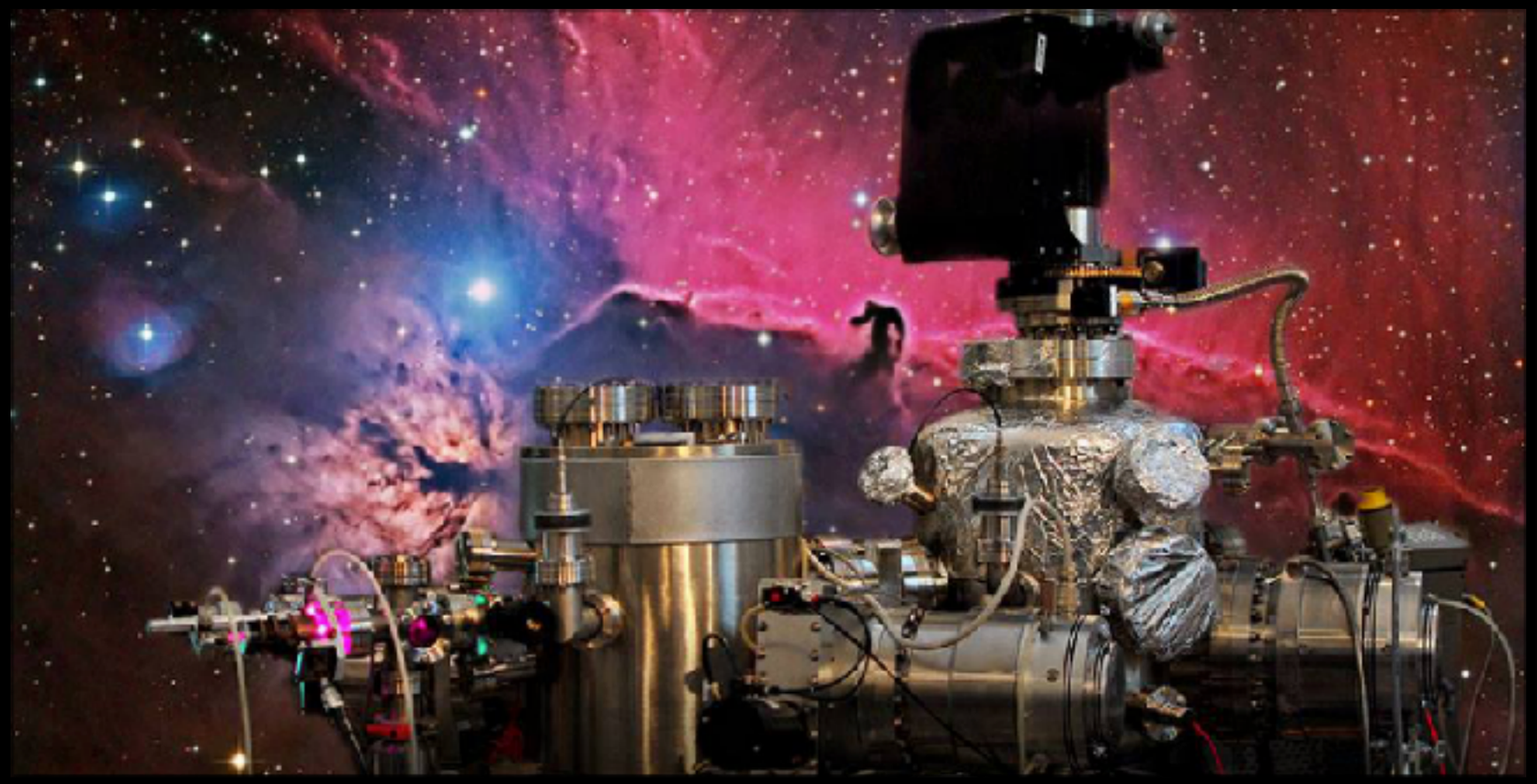
MOLECULES IN THE UNIVERSE



FRANCOIS DULIEU - LERMA

PRÉSENTATION - PARIS - 23/10/2017

TRANSPARENCY/OPACITY

Zoom ***and*** shift in frequency :

Source : Spitzer Space Telescope - NASA Caltech

visible —> FIR

TRANSPARENCY/OPACITY(1)

Zoom ***and*** shift in frequency :

Dark interstellar clouds

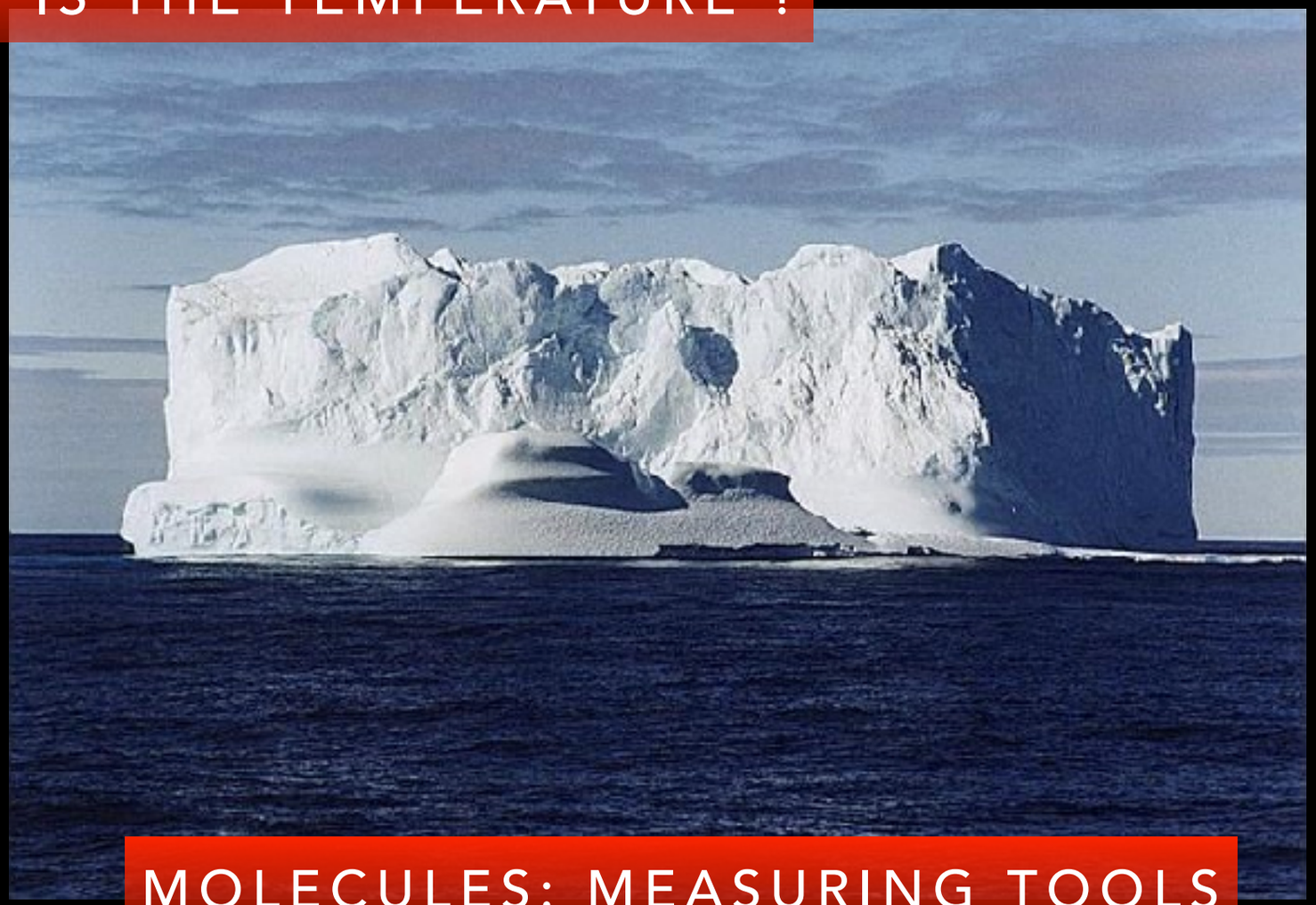
- Dust obscures the line of sight
- Cold (10K), and « dense » ($>10^4/cm^3$)
- But active : star formation regions

Source : Spitzer Space Telescope - NASA Caltech

visible —> FIR

PHASE TRANSITION

WHAT IS THE TEMPERATURE ?

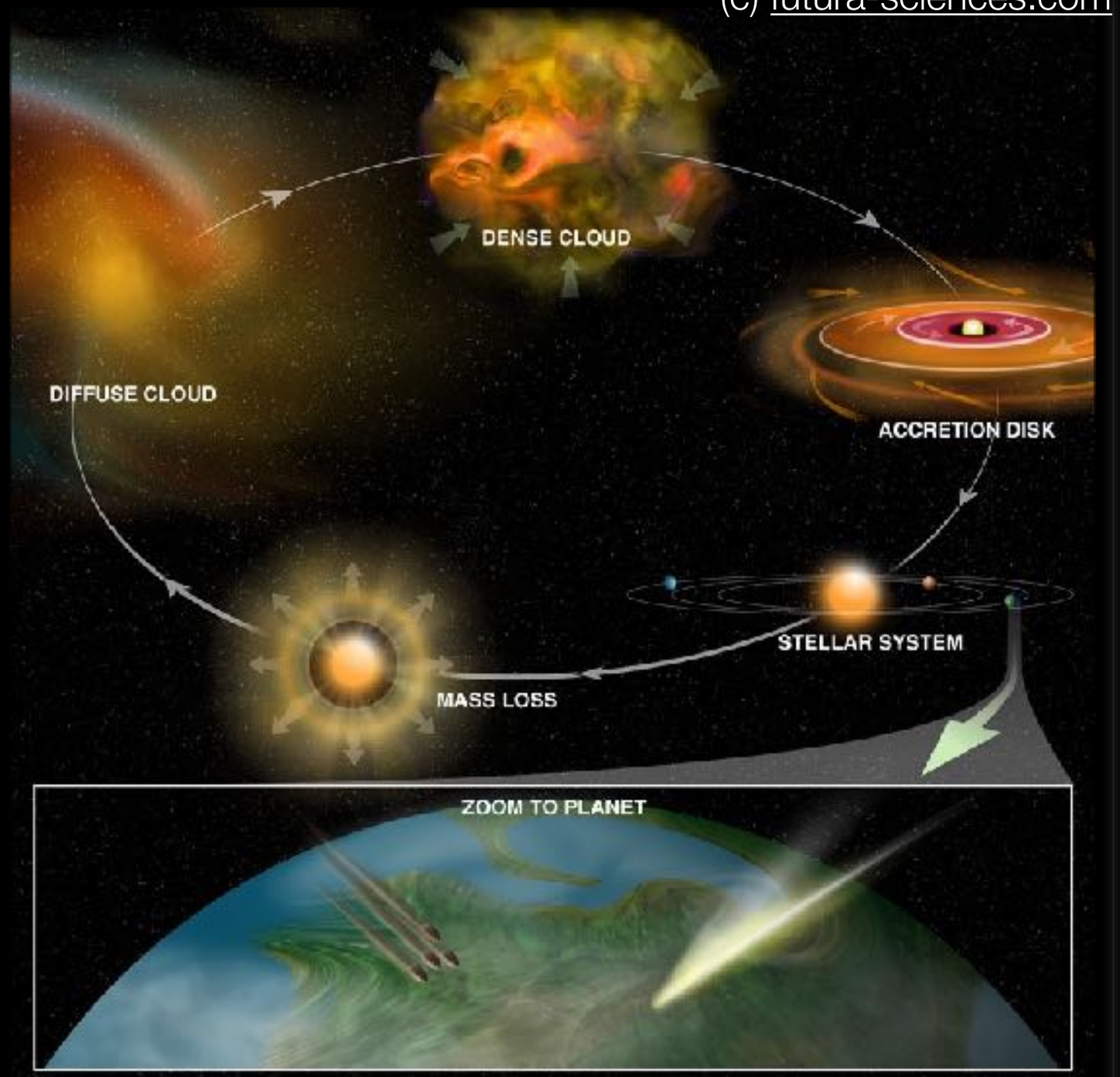


MOLECULES: MEASURING TOOLS

- 3 phases : 2 are visible
- Water is the ground of the definition of the °C
- Molecules are probes (used in thermometers, and barometers)

Different Interstellar media

(c) futura-sciences.com



- Molecules as a tracers of physical conditions

Interstellar media: « what is between stars »

In ***space*** as well as in ***time***

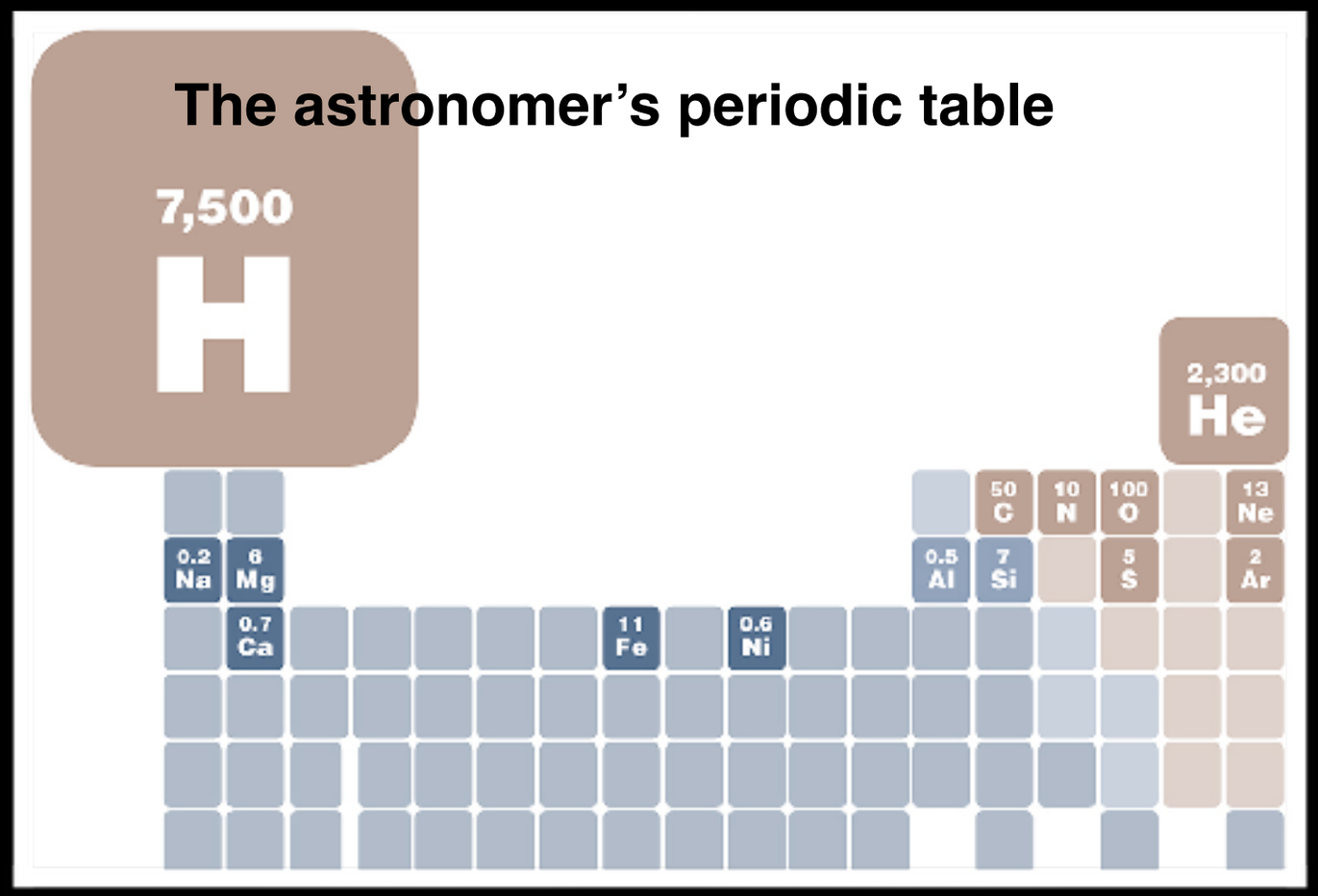
COURSE I : CYCLE OF MATTER

F. Dulieu (Univ. Cergy)

- Nucleosynthesis
- Star formation and destruction
- Molecular astrophysics
- Gas-grain interaction (Practical with real research set-up)
- Rosetta story ?

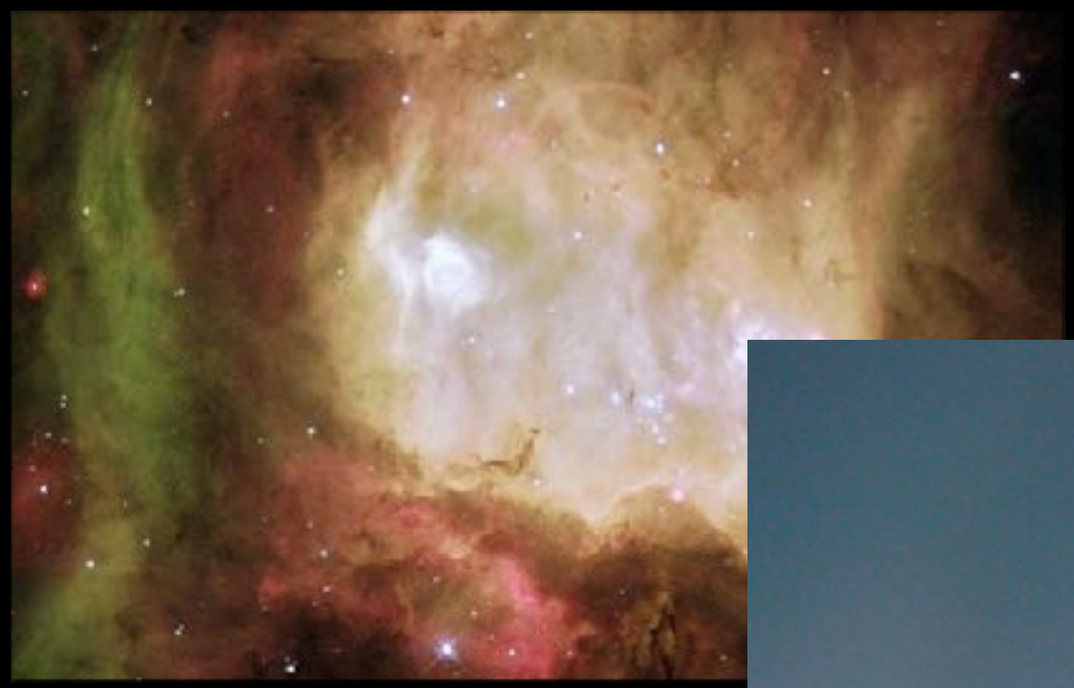
PHASE TRANSITION

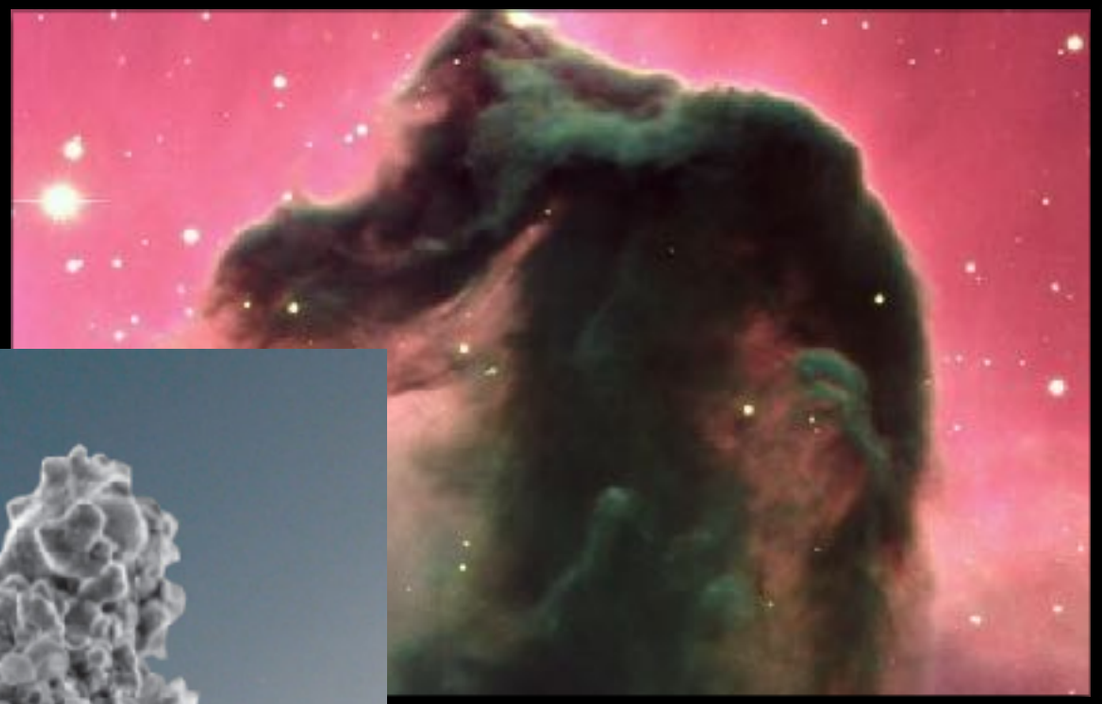
$H \longrightarrow H_2$

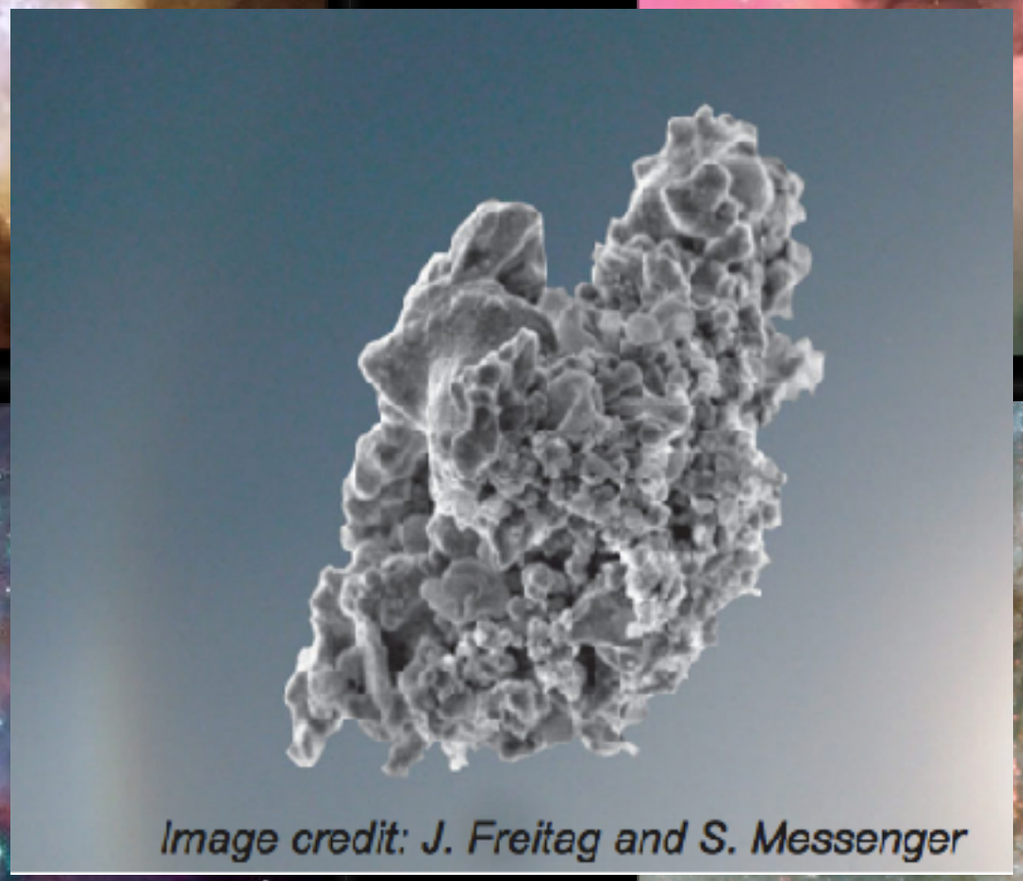


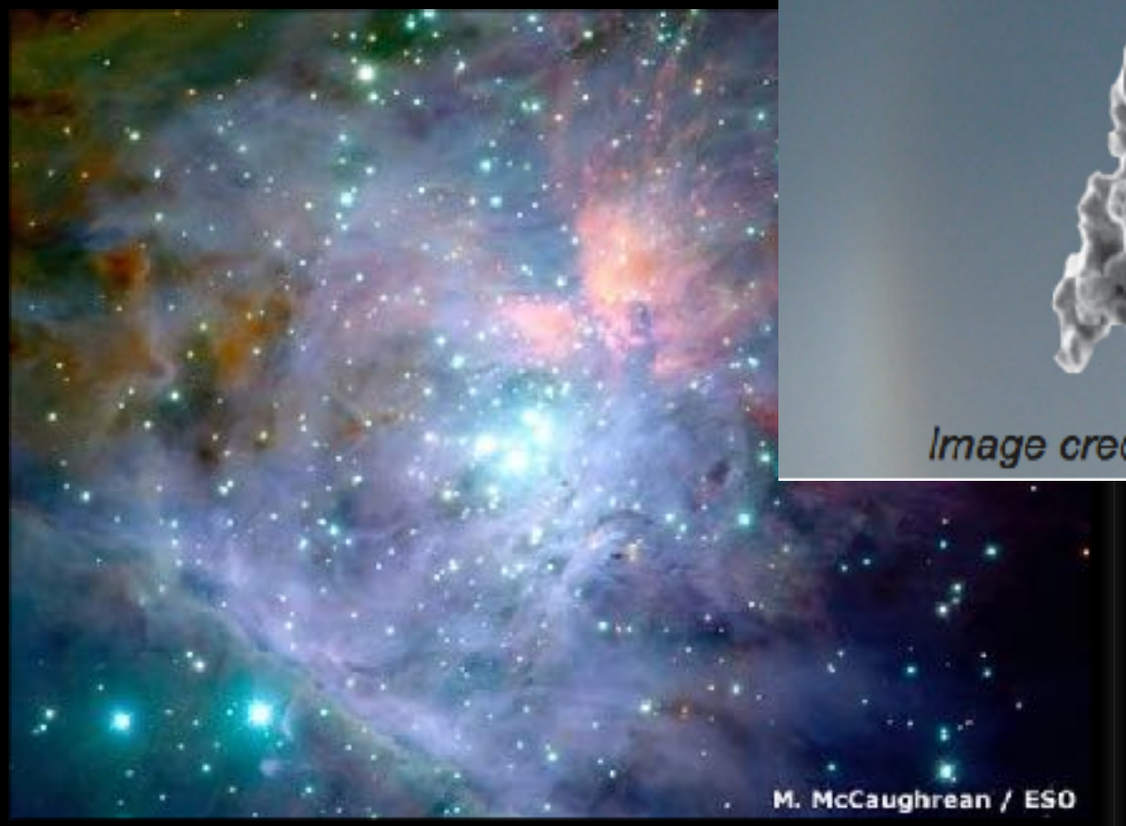
$H \longrightarrow H_2$ transition, is a major change in radiative transfert properties of space in cooling, in shielding…

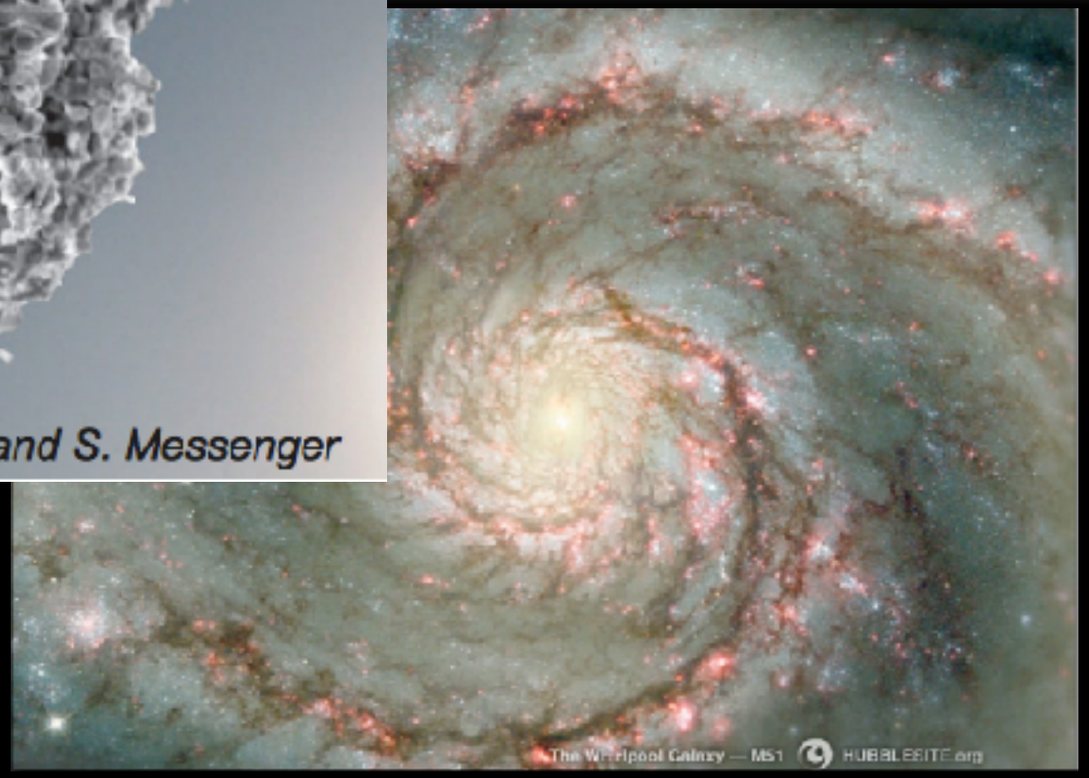
BEAUTY OF NEBULAE IS DUE TO THE DIFFUSION OF LIGHT BY THE SOLID PHASE











AND THE SOLID PHASE IS (MOSTLY) DUST GRAINS…

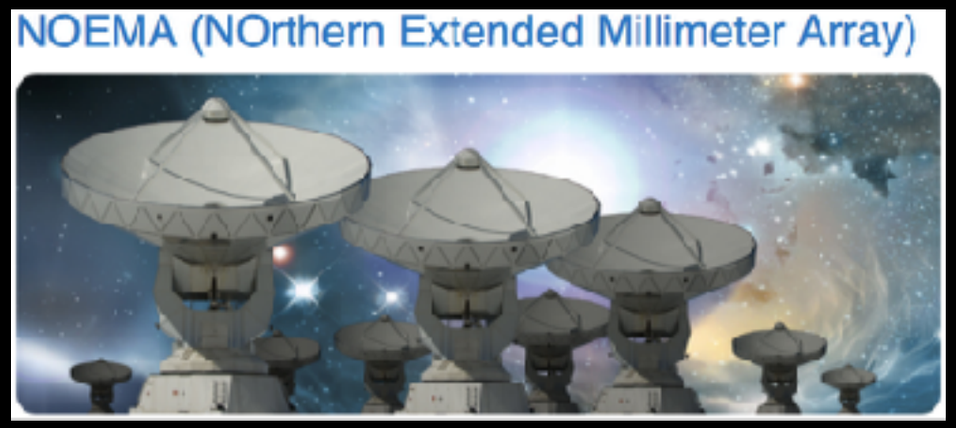
UNIVERSITÉ de Cergy-Pontoise

l'Observatoire de Paris

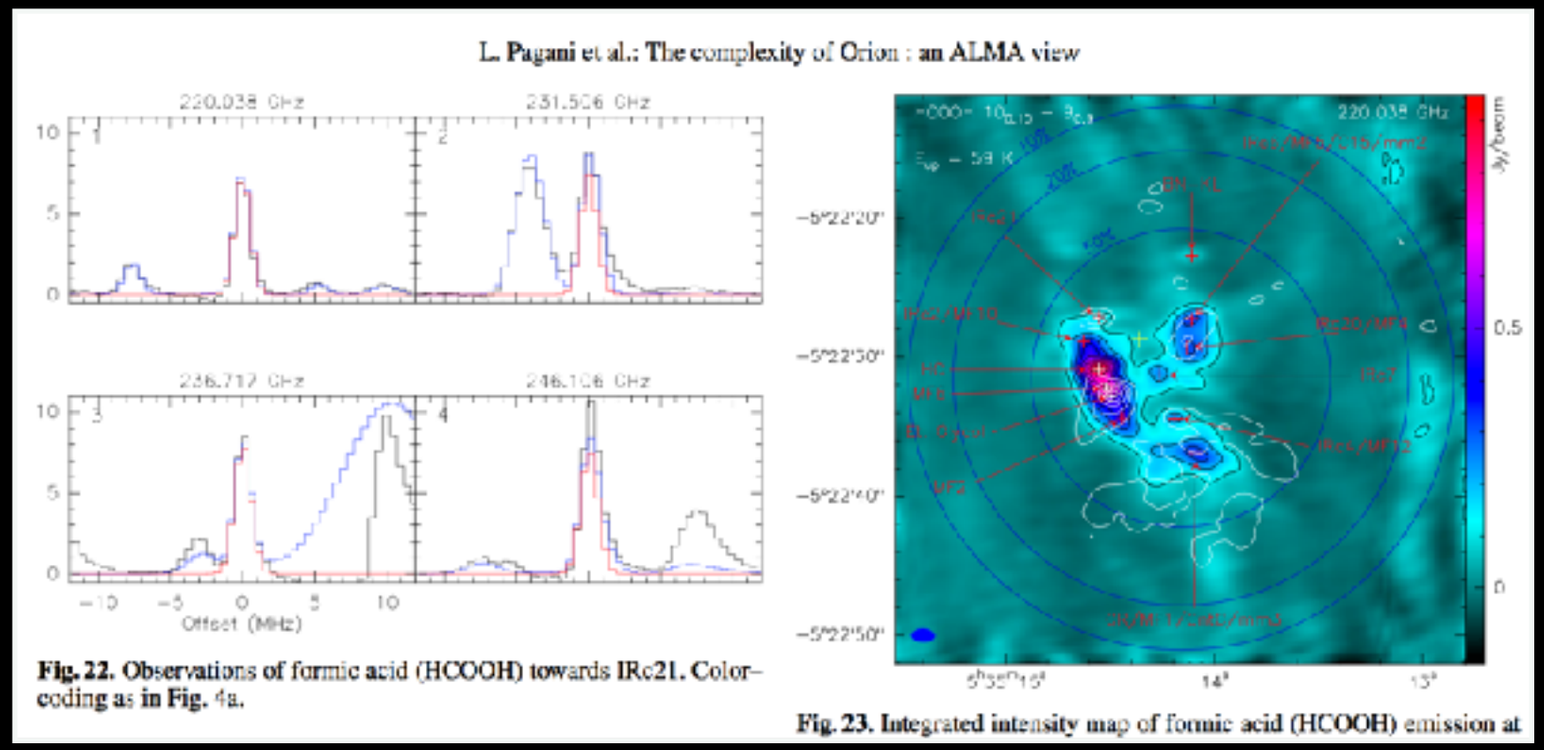
FRANCOIS DULIEU - LERMA

COURSE II : RADIO-ASTRONOMY AND GALAXIES

P. Salomé (Observatoire Paris)

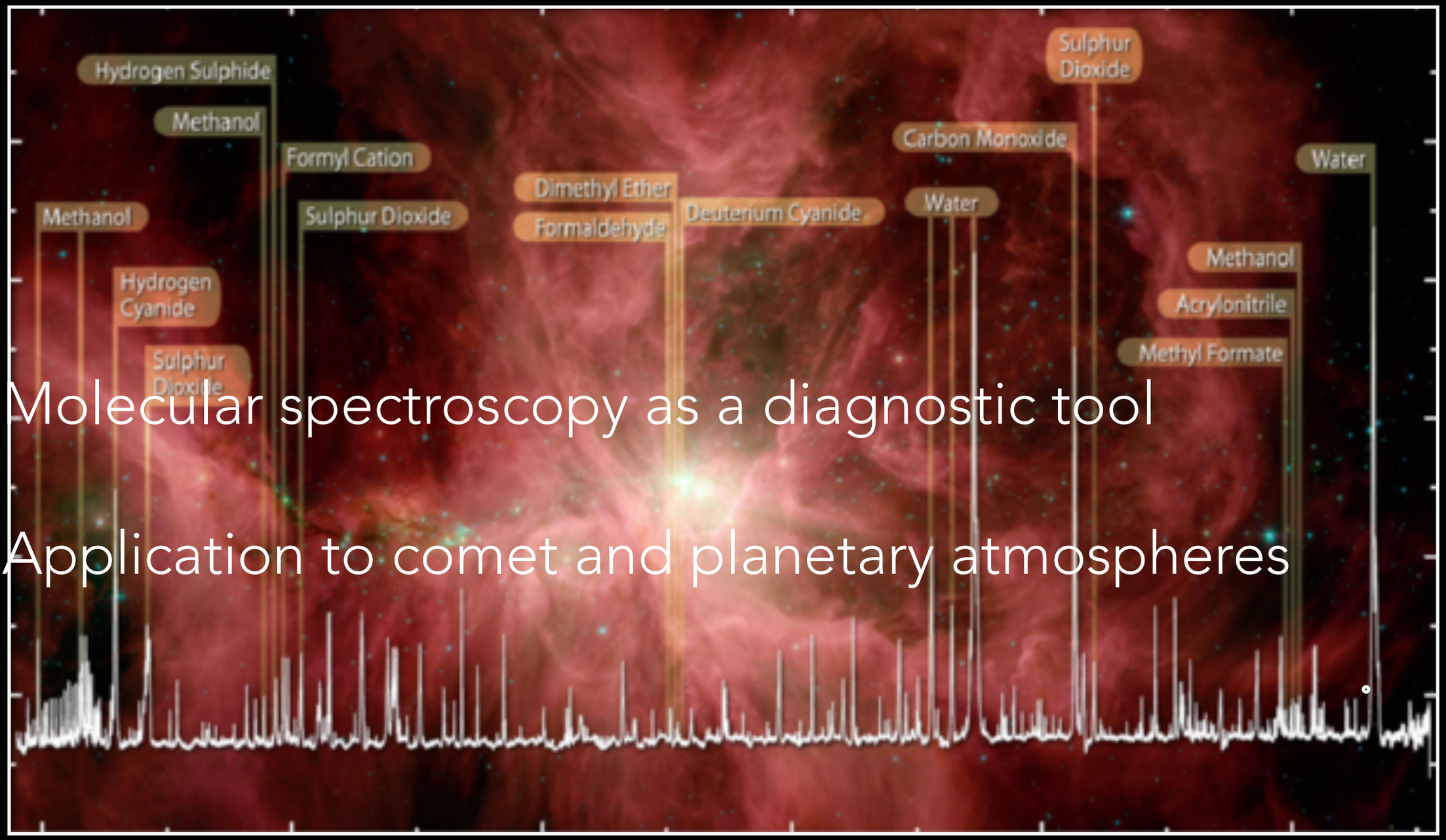


- Introduction to radio-astronomy
- Antennas and technical aspects (practical)
- Molecules in galaxies
- Space missions ?



COURSE III : MOLECULAR SIGNATURES IN DIFFERENT MEDIA

A. Joly (UPEC)



- Molecular spectroscopy as a diagnostic tool
- Application to comet and planetary atmospheres

PRACTICAL DETAILS

- When: Tuesday afternoon
- Where : Tour 32-33 Jussieu (LERMA)
- Exam: Oral prestation of one research article