

ISM science with Euclid?



Pierre-Alain Duc



The diffuse sky background

- *Diffuse dust clouds in our Milky Way scatter light in the optical regime.*
- *Very extended, highly structured emission.*
- *A range of color. They may be taken for stellar streams.*
- *Some filaments have width less than 5 arcsec.*

*Composite g+r+i CFHT MegaCam deep image
(obtained as part of the MATLAS LP).
Field of view: 1 square degree*



The diffuse sky background

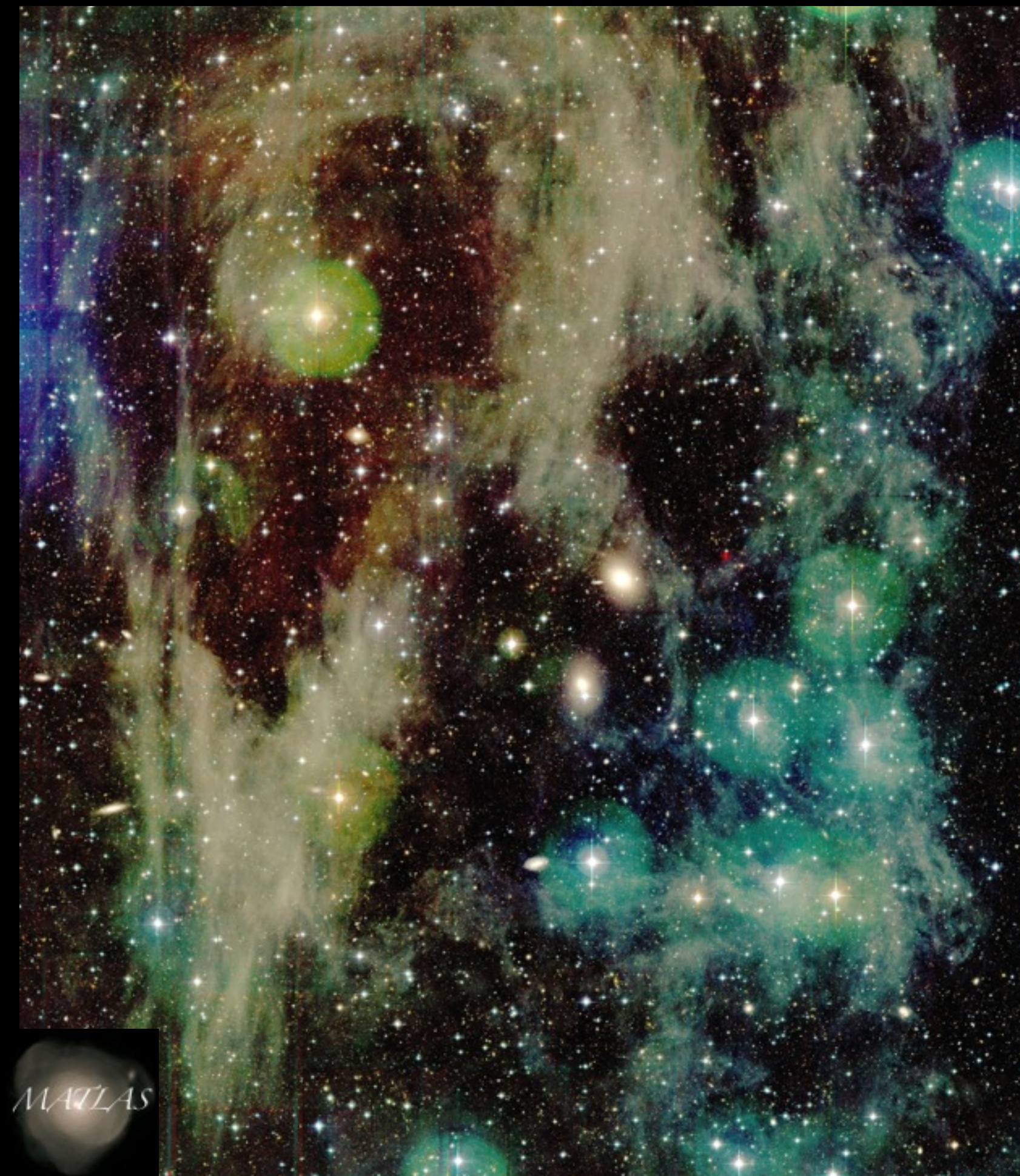
- *This ISM component of the sky is not yet taken into account in Euclid background estimation*
- *ISM considered so far as being uniform*
- *A concern for shape measurements that requires a good knowledge of the background?*

*Composite g+r+i CFHT MegaCam deep image
(obtained as part of the MATLAS LP).
Field of view: 1 square degree*

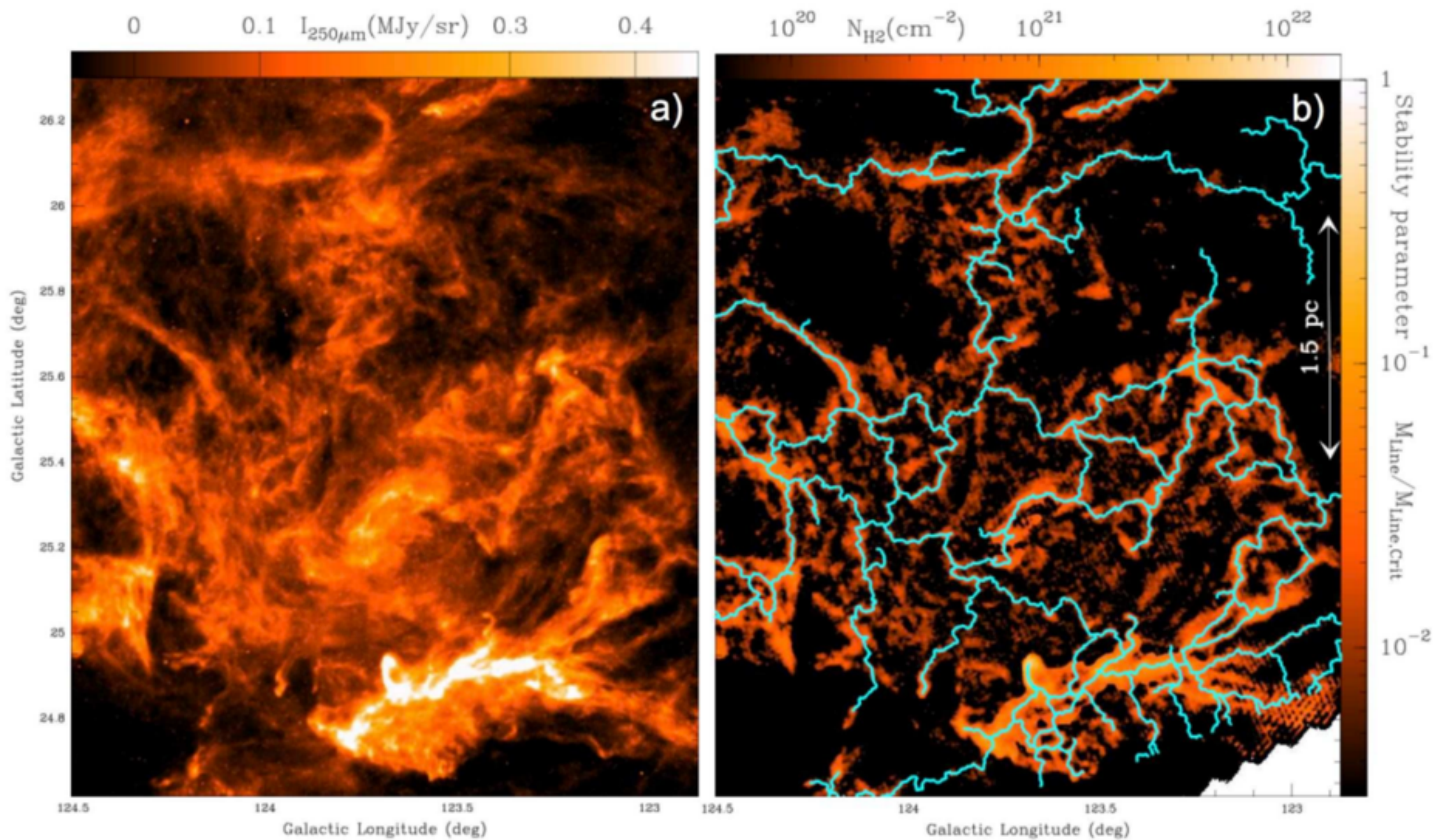


Will Euclid detect this component?

- **Yes:** the sensitivity in Space is high: low background
- **Yes:** the instrument is optimized to prevent internal light reflections that could hide this LSB component
- **Yes:** cirrus emission seen everywhere including at high Galactic latitude (cirrus are nearby clouds!)
- **Yes:** they show up in 5 arcmin exposures with MegaCam on CFHT
- **???:** the limiting surface brightness of Euclid/VIS is not yet known. Large band is an asset.
- **No:** the pipeline may erase this component if proper background subtraction is not made



ISM science with Euclid



André et al., 2015

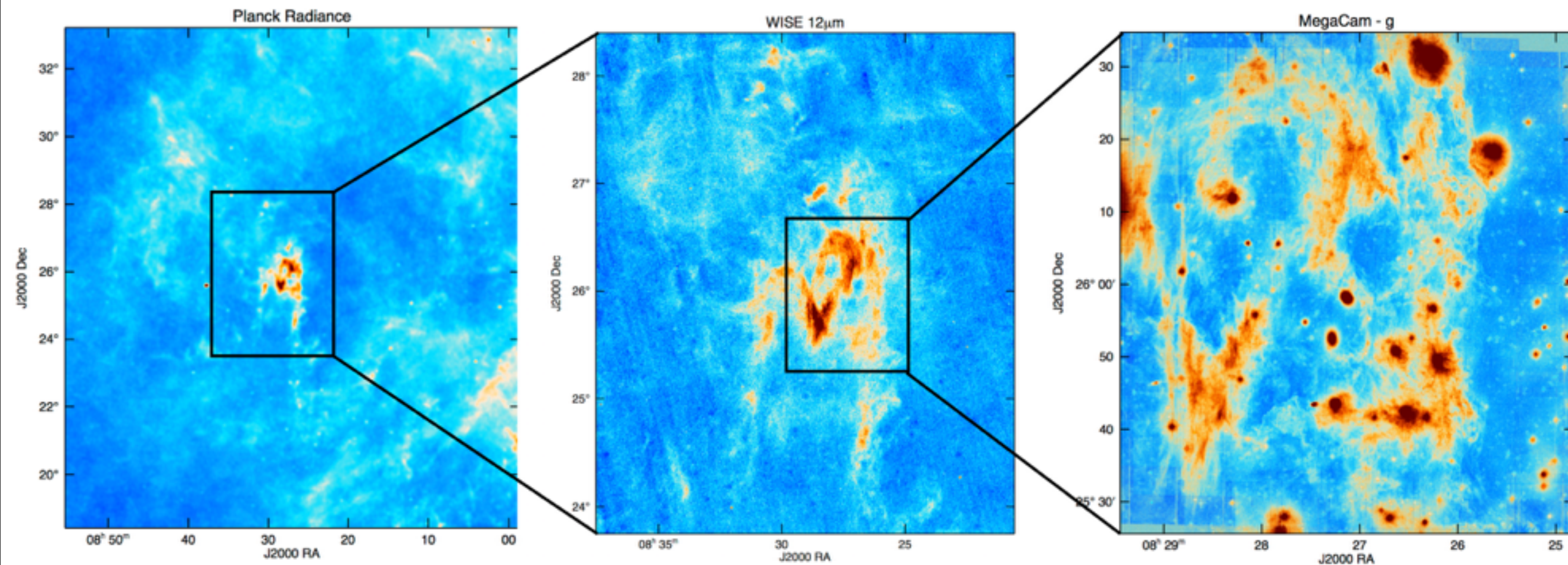
The filamentary structure of the ISM was the highlight of the Herschel mission

ISM science with Euclid

Planck - 5 arcmin

WISE - 15 arcsec

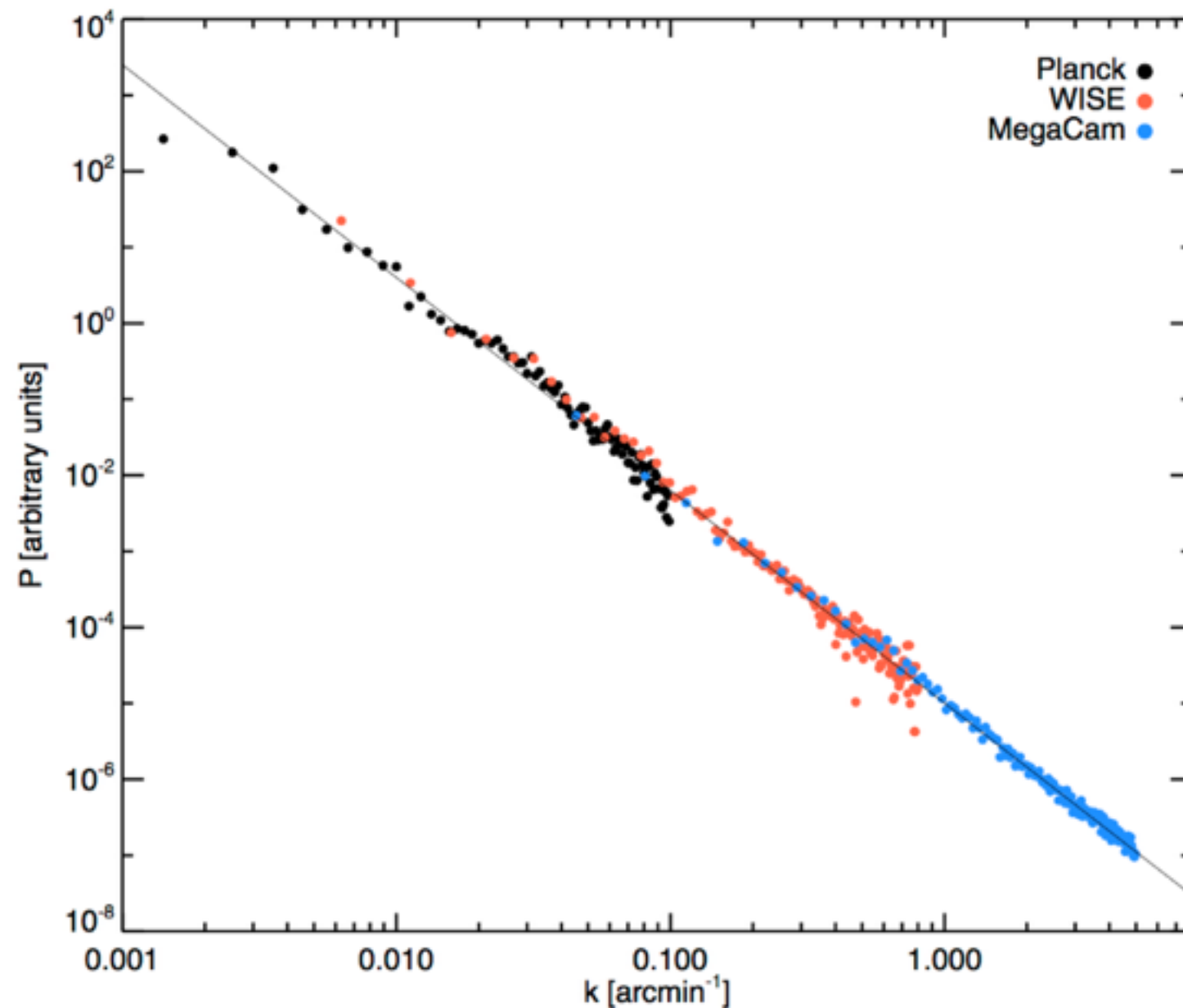
MegaCam - 0.6 arcsec



Miville-Deschenes & Duc., 2015

The resolution increased by a factor $\times 500$ in the optical. For cirrus located at 100 pc from the Sun, spatial scales smaller than 0.01 pc can be probed

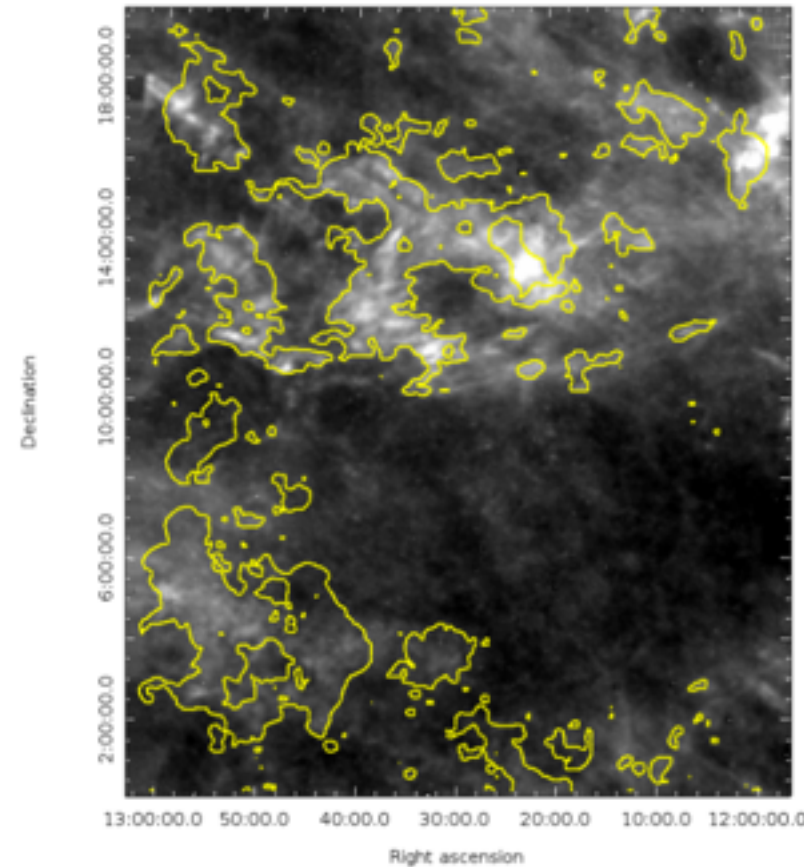
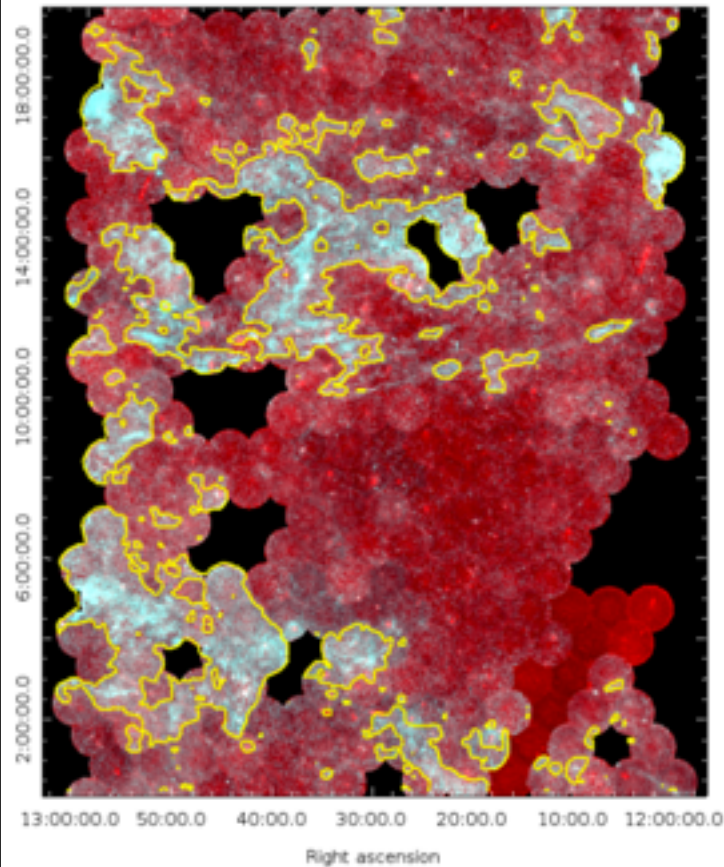
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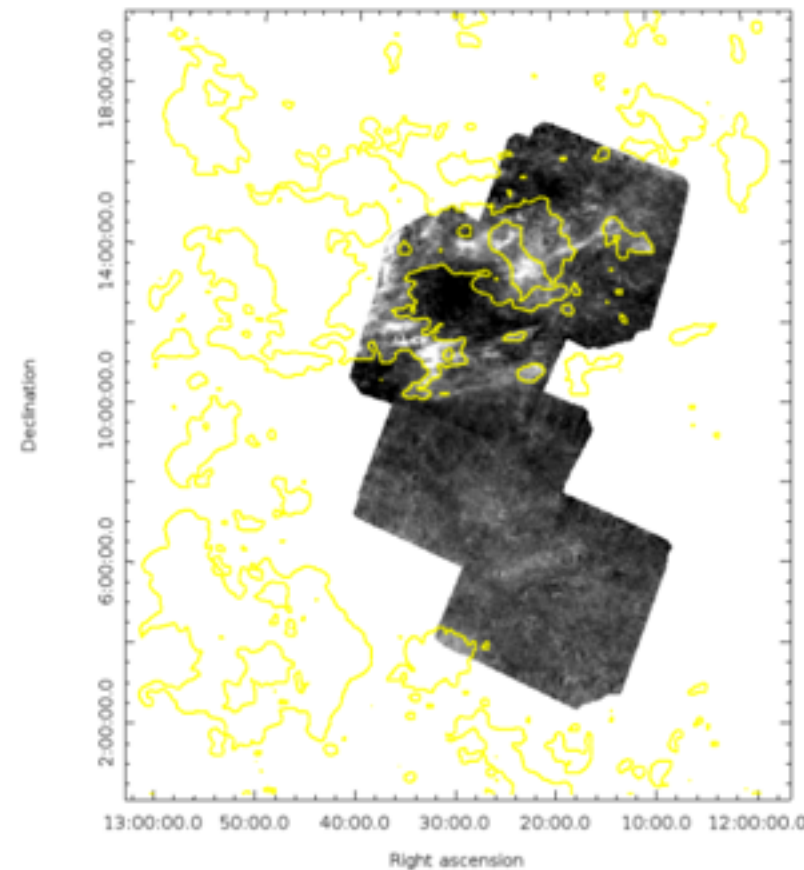
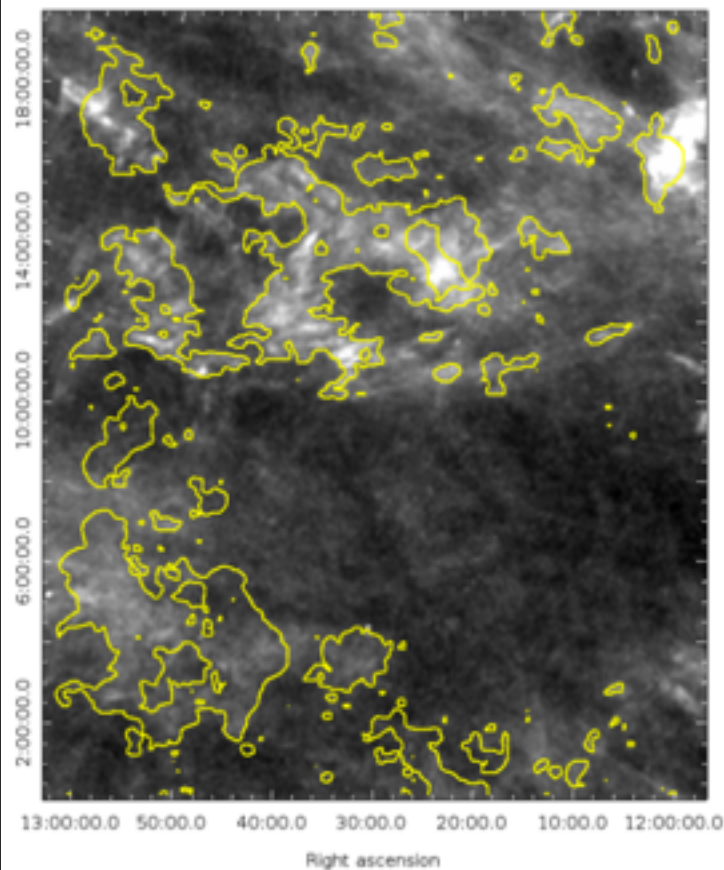
$$P \sim k^{-2.8}$$

- A uniform slope for the power spectrum, giving information on the turbulence cascade of the ISM

ISM science with Euclid



- Asset of Euclid: large coverage of the sky.
- Allows to probe a large range of ISM density
- A high spatial resolution, allowing us to probe even smaller scales than from the ground



Cirrus emission towards Virgo
as probed by GALEX,
Boissier et al 2015



- *Include realistic ISM in background estimates*
- *Pay attention to background subtraction not to erase potential useful information*