

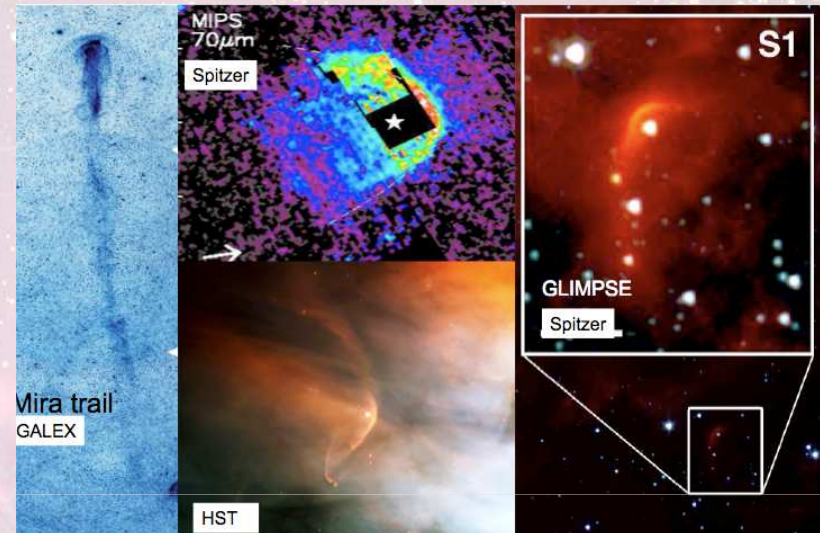


3D tomography of local interstellar gas and dust

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The local interstellar medium

- Local medium : here roughly $d < 300$ pc
- Several roles of the ISM in astrophysics
 - *Tool for studying the evolution of the ISM*
 - *Conditions of photons and particules transport in 3D: radiation field , cosmic rays*
 - *Foreground : needs to be removed for studying specific objects*
 - *The ambient medium which governs limit conditions for a specific object*
 - *The context environning a specific object*
 - *etc...*



Means of study

- Absorption lines of the gas in spectra of nearby stars
- Extinction inferred from photometric measurements



Interstellar absorptions database

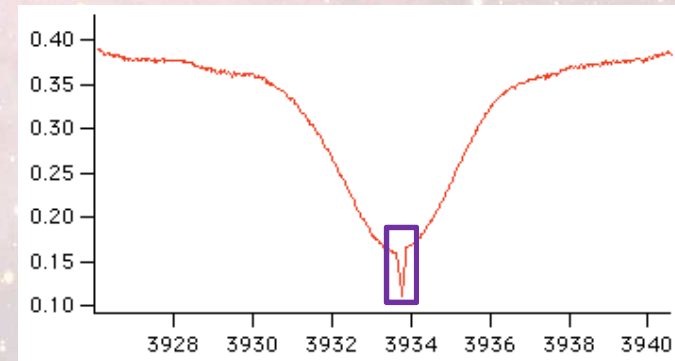
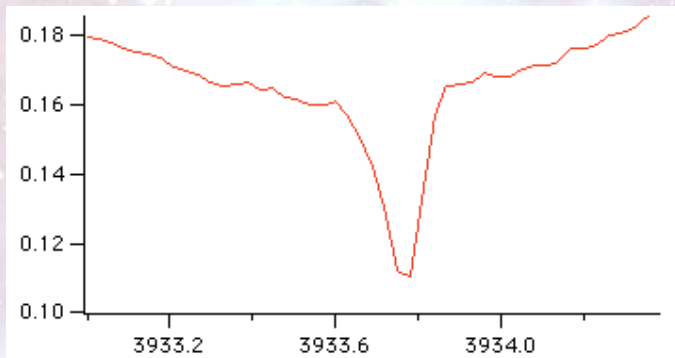
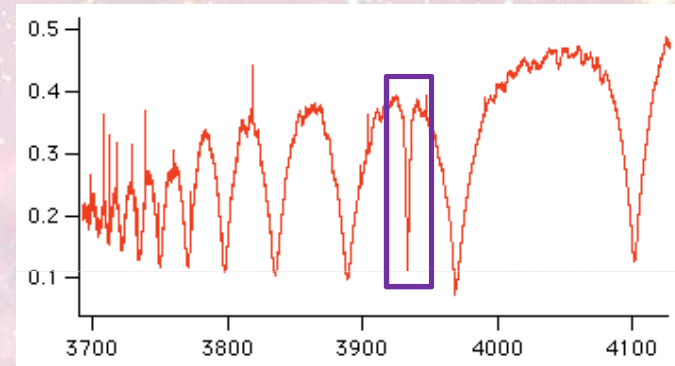
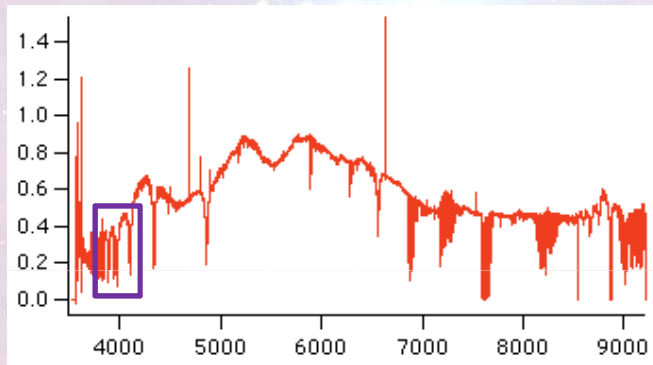
- Allows to distinguish between foreground absorption and local lines
- Allows to locate objects from their absorption lines



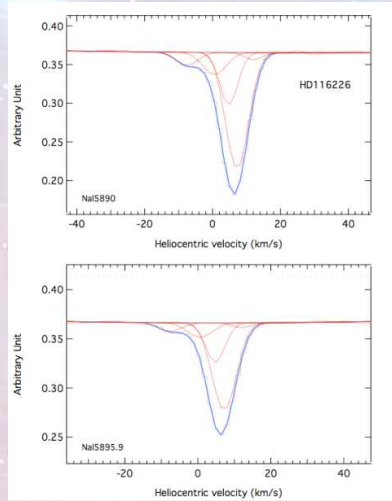
3D mapping of the LISM

Example of absorption due to local ISM

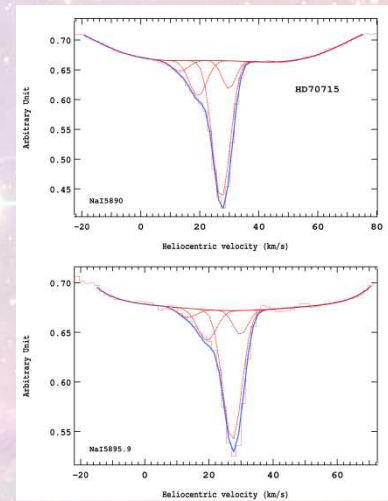
- Spectrum obtained with *Feros* spectrograph (La Silla)
 - *Very high resolving power*



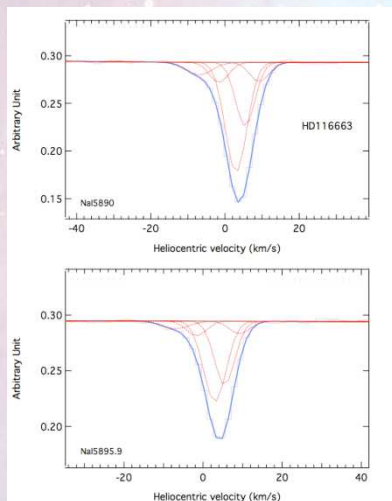
Doublet of NaI



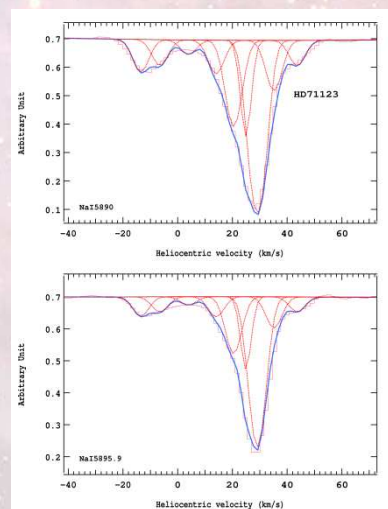
HD116226
 $d = 550$ pc
 $l = 308^\circ$ $b = +14^\circ$
 column = $76 \cdot 10^{10}$ cm⁻²



HD70715
 $d = 300$ pc
 $l = 260^\circ$ $b = -3^\circ$
 column = $44 \cdot 10^{10}$ cm⁻²

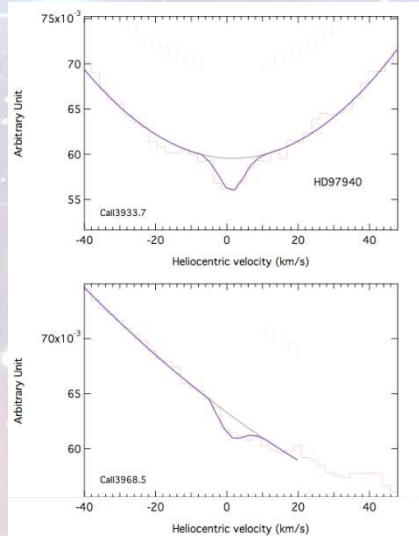


HD116663
 $d = 1020$ pc
 $l = 309^\circ$ $b = +15^\circ$
 column = $137 \cdot 10^{10}$ cm⁻²

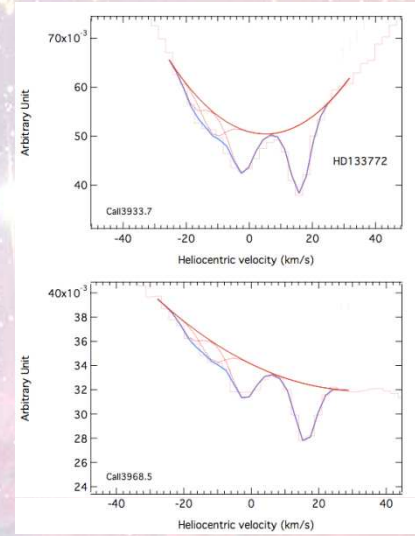


HD71123
 $d = 610$ pc
 $l = 260^\circ$ $b = -3^\circ$
 column = $327 \cdot 10^{10}$ cm⁻²

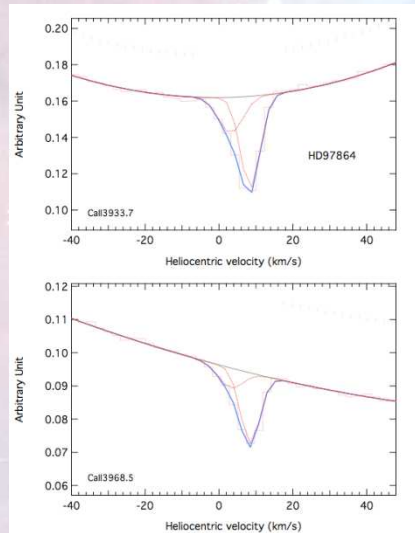
Doublet du CaII



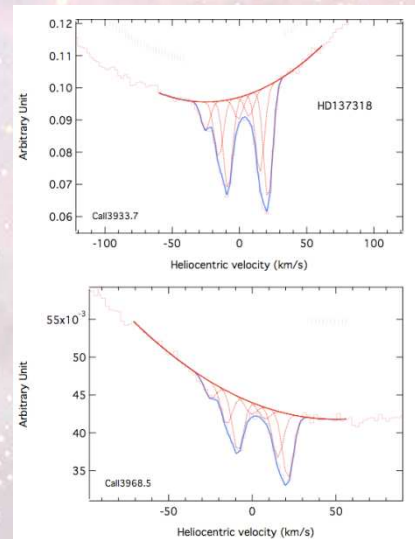
HD97940
 $d = 85 \text{ pc}$
 $l = 275^\circ \quad b = +35^\circ$
 $\text{column} = 8.10^{10} \text{ cm}^{-2}$



HD133772
 $d = 170 \text{ pc}$
 $l = 347^\circ \quad b = +38^\circ$
 $\text{column} = 80.10^{10} \text{ cm}^{-2}$

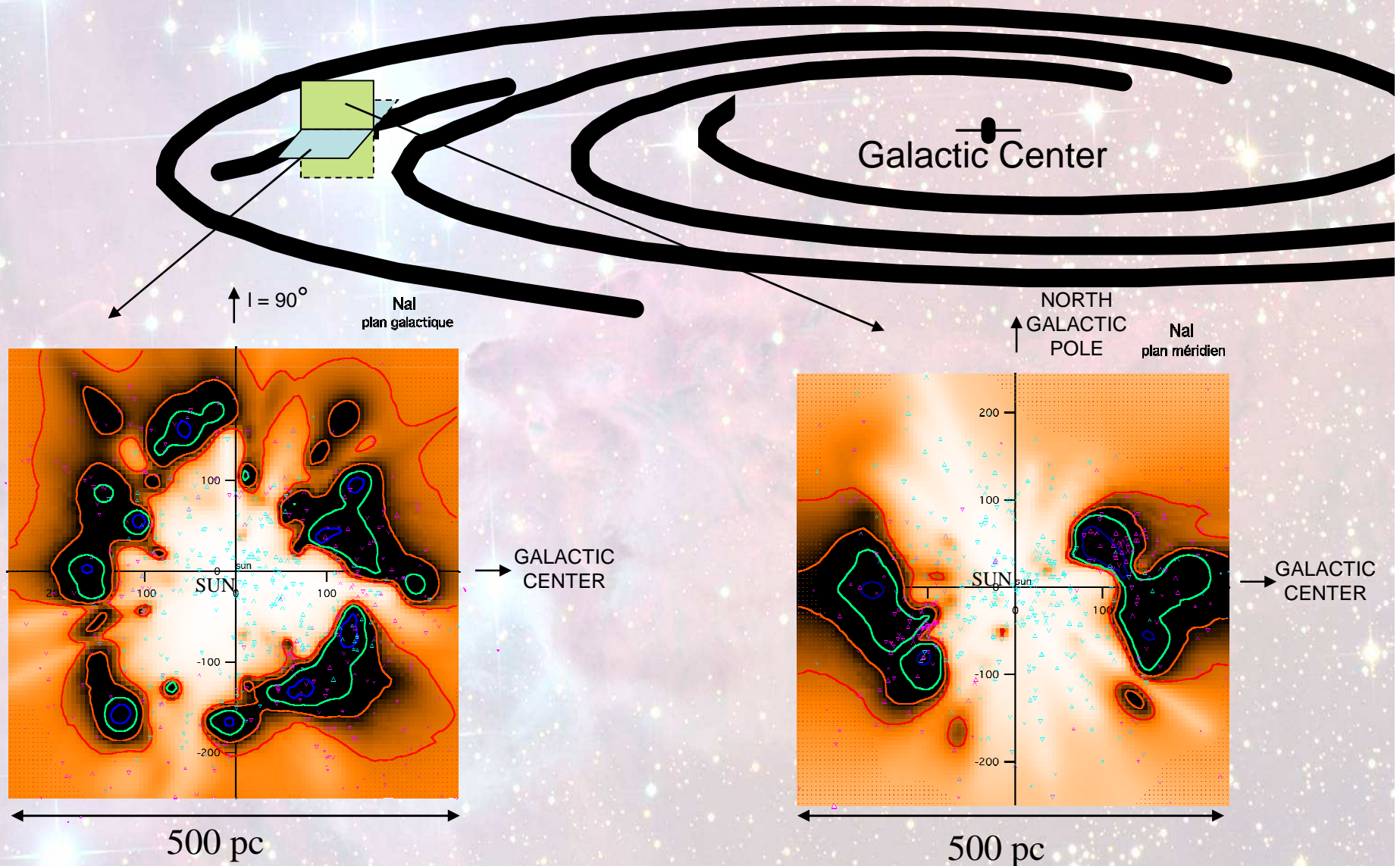


HD97864
 $d = 92 \text{ pc}$
 $l = 274^\circ \quad b = +38^\circ$
 $\text{column} = 89.10^{10} \text{ cm}^{-2}$



HD137318
 $d = 300 \text{ pc}$
 $l = 347^\circ \quad b = +31^\circ$
 $\text{column} = 260.10^{10} \text{ cm}^{-2}$

The Local Bubble



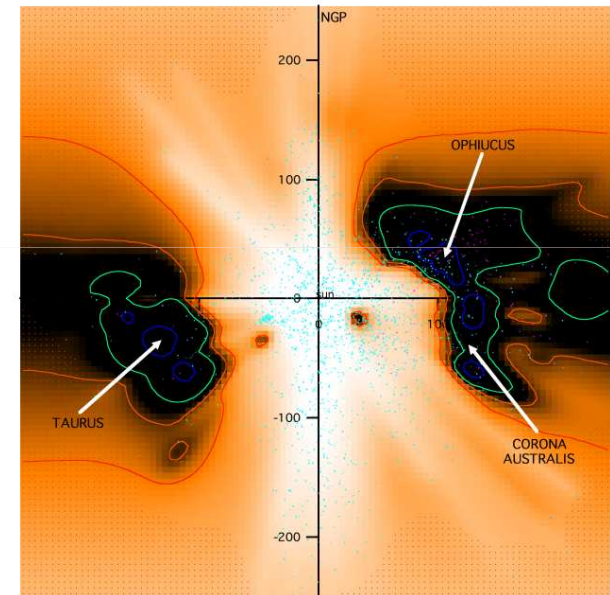
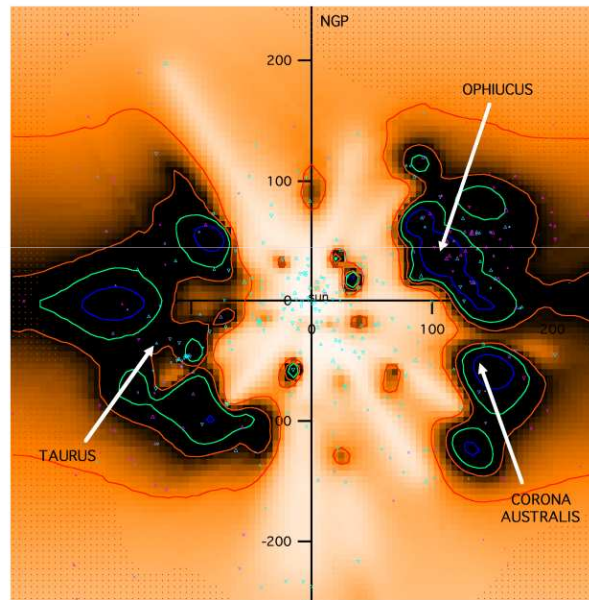
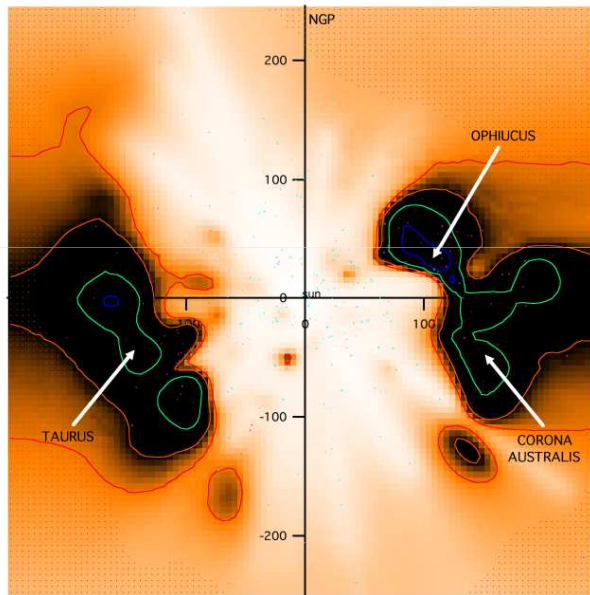
Comparison NaI / CaII / extinction

CASE OF MERIDIAN PLANE

NaI

CaII

extinction



DENSE-NEUTRAL GAS

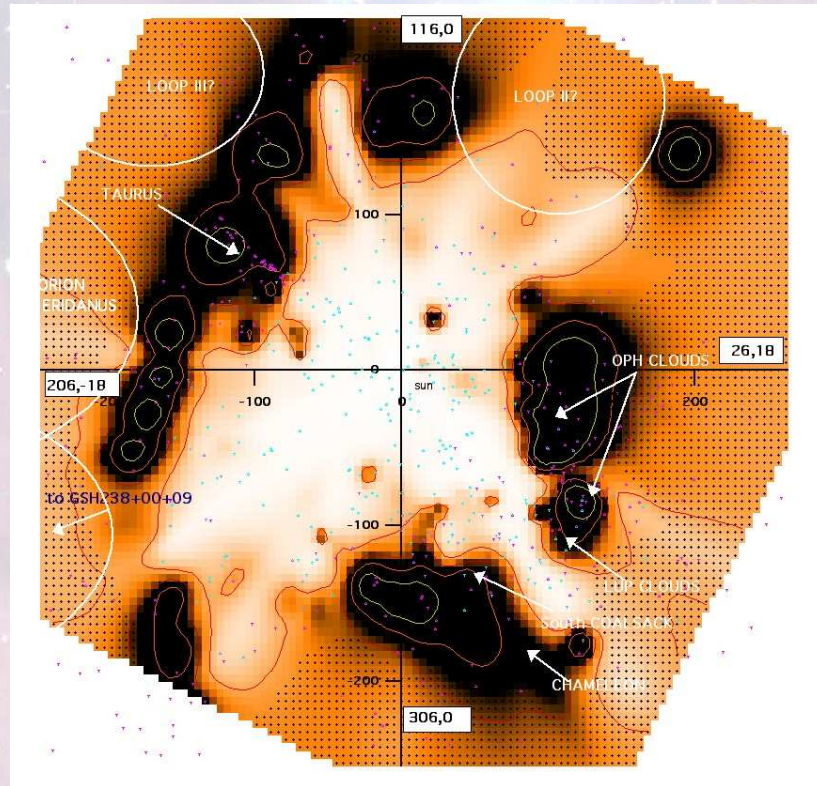
DENSE
NEUTRAL + IONIZED
GAS

DUST

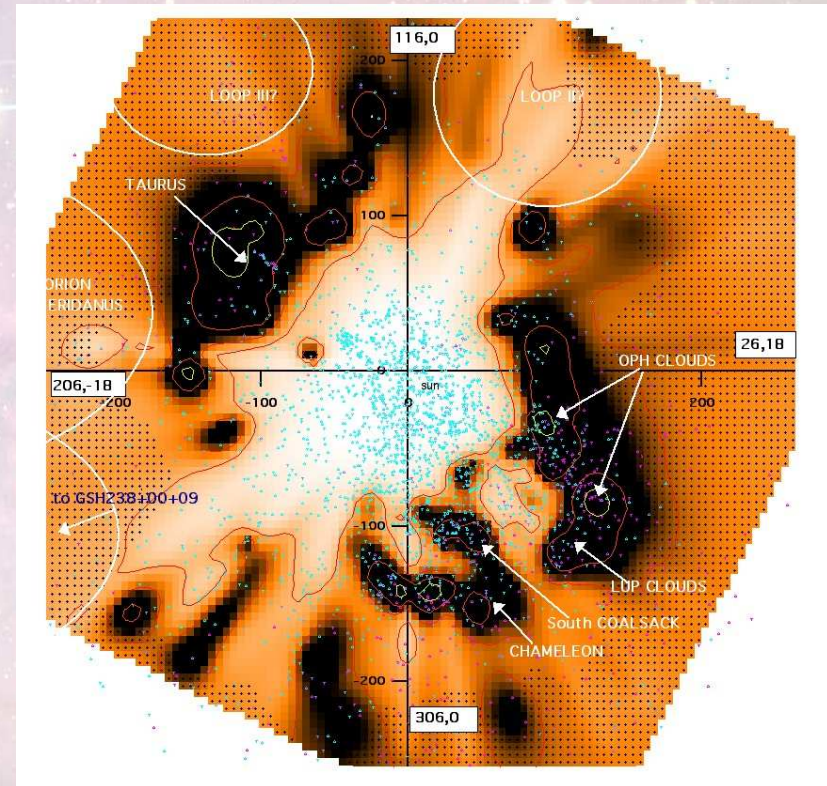
Welsh et al., 2010

Vergely et al., 2010

Gould Belt



NaI

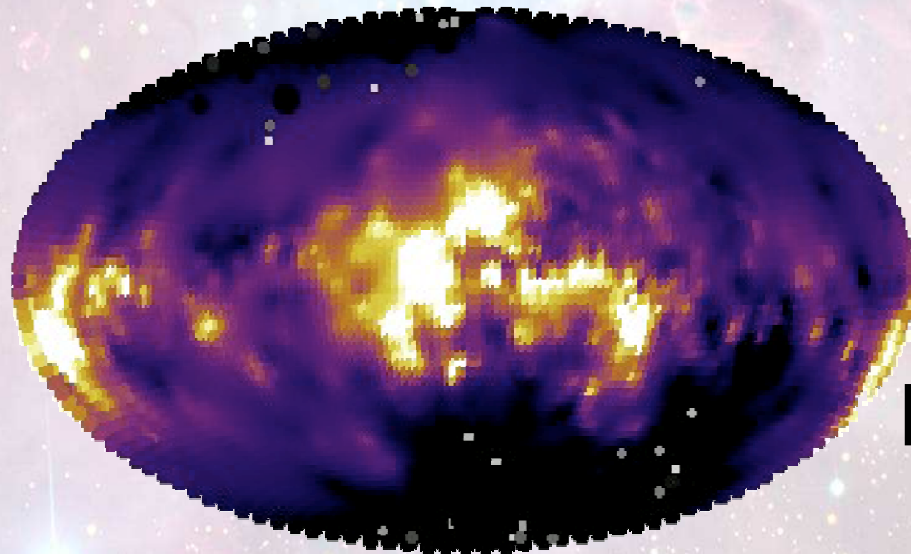
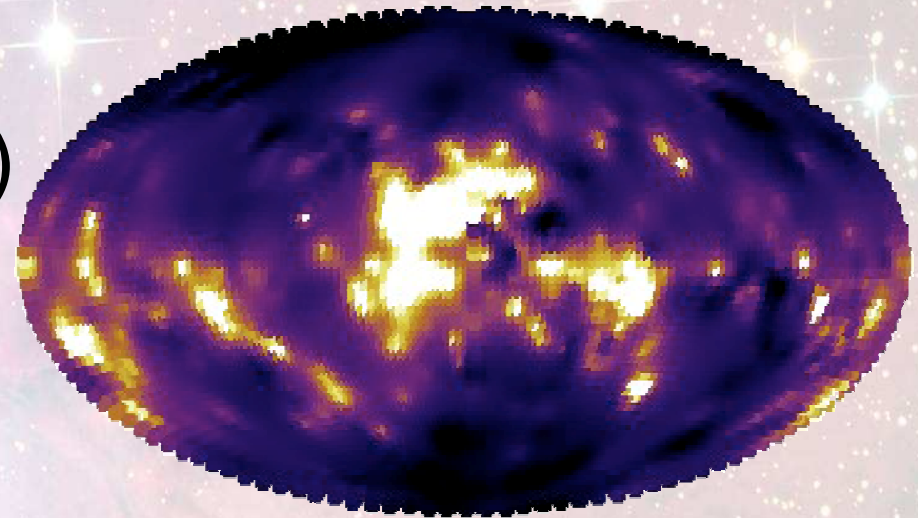


extinction

GAS and DUST CLOSER than 200 pc

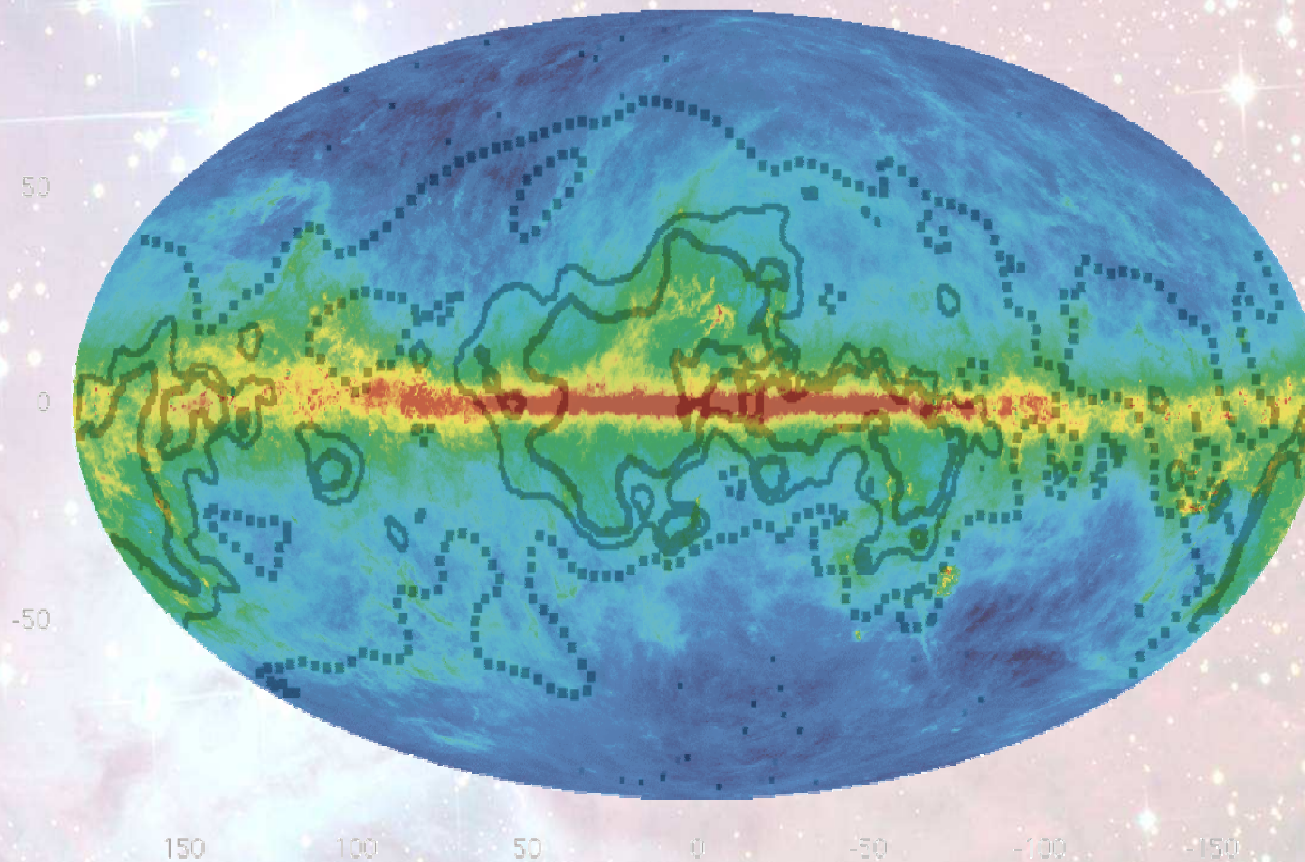
- Integration in the 3D cube of inverted densities and opacities

Gas (NaI)



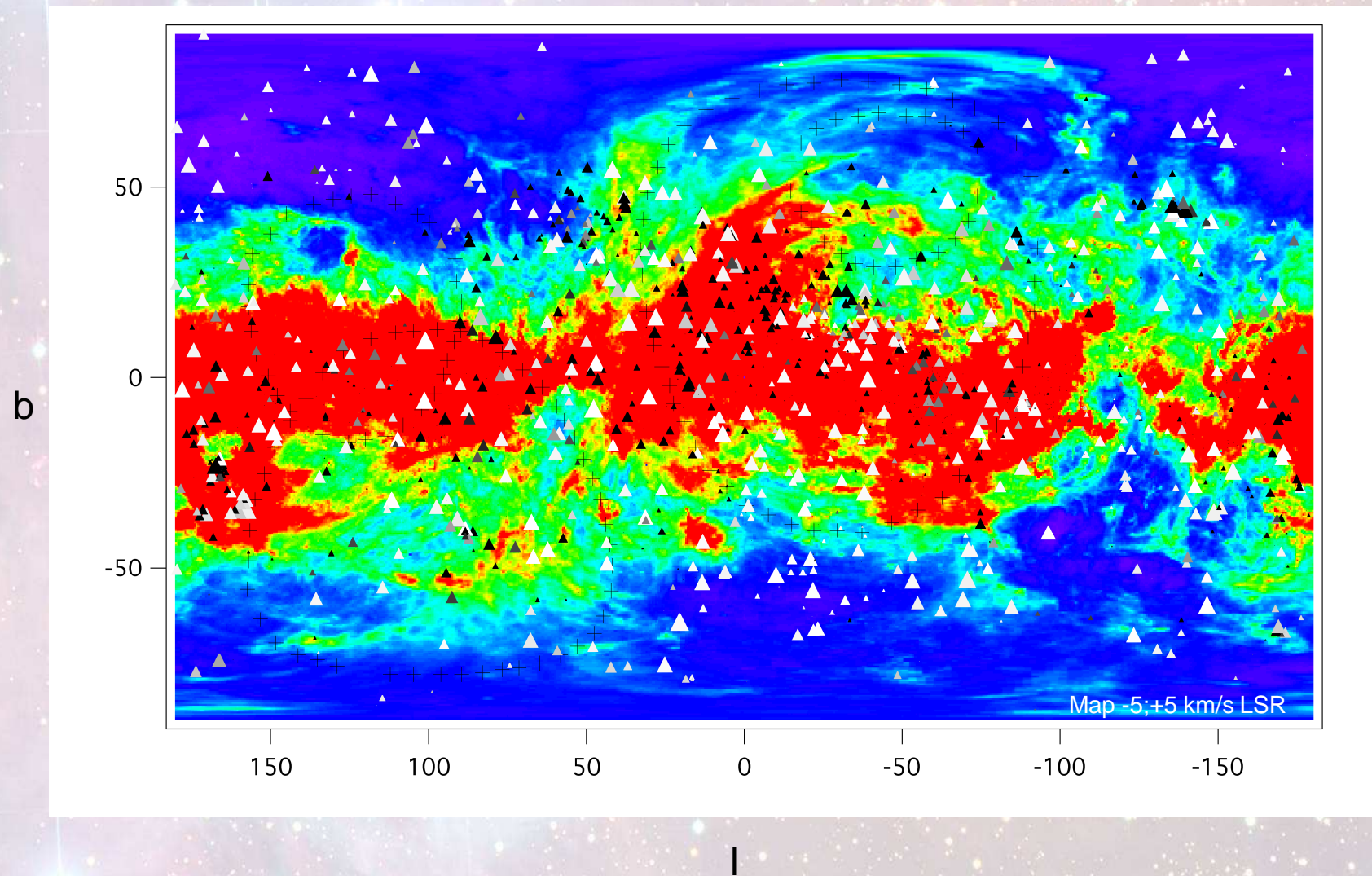
Dust

Local dust vs Total dust

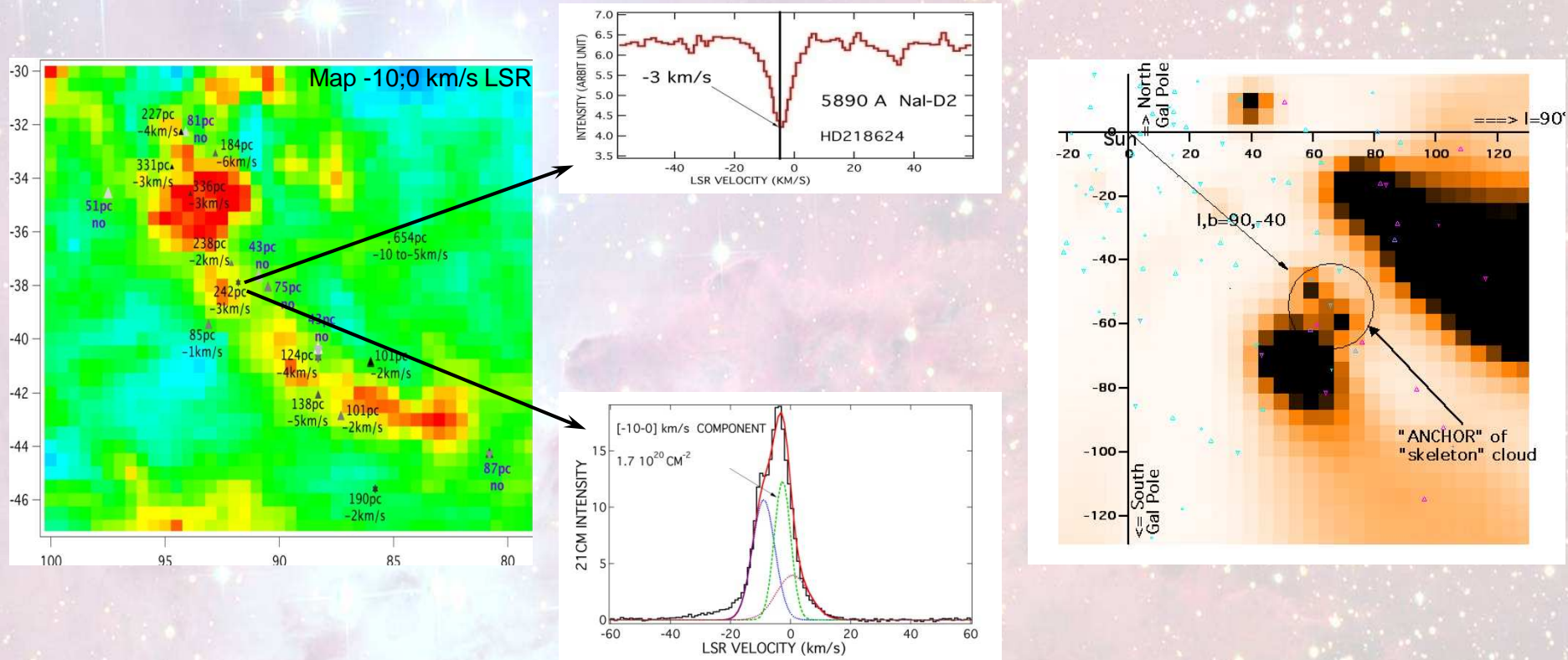


Finkbeiner et al., 1999

HI data



Determination of the distance of a structure

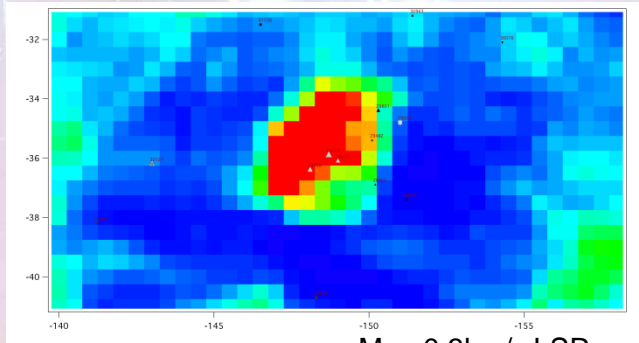


- Identification of the region: MBM53, MBM54, MBM55
- Research of dense clouds in HI maps and in data cubes

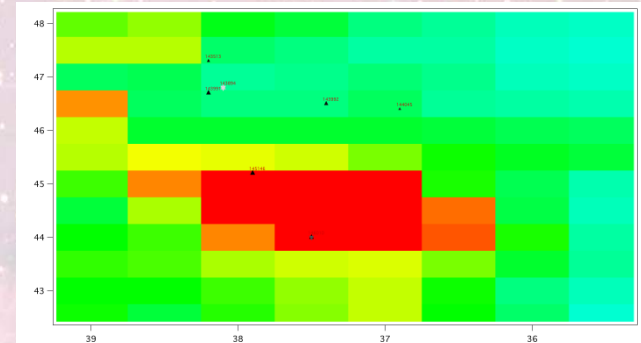
Magnani et al., 1985

Welty et al., 1989

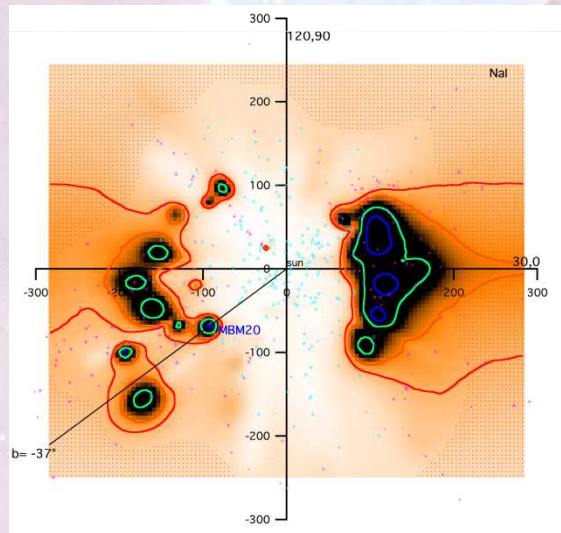
Other high-latitude molecular clouds



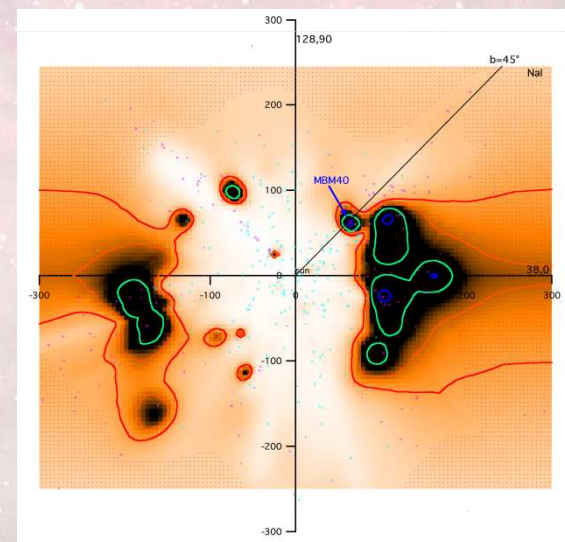
Map 0.3km/s LSR



Map 3.5km/s LSR



MBM20



MBM40

Perspectives

- Increase of the database
- Generalization of the comparison HI / 3D data
 - *better 3D construction*
- Preparation of future reddenings and spectroscopic data for GAIA

Thank you for your attention!