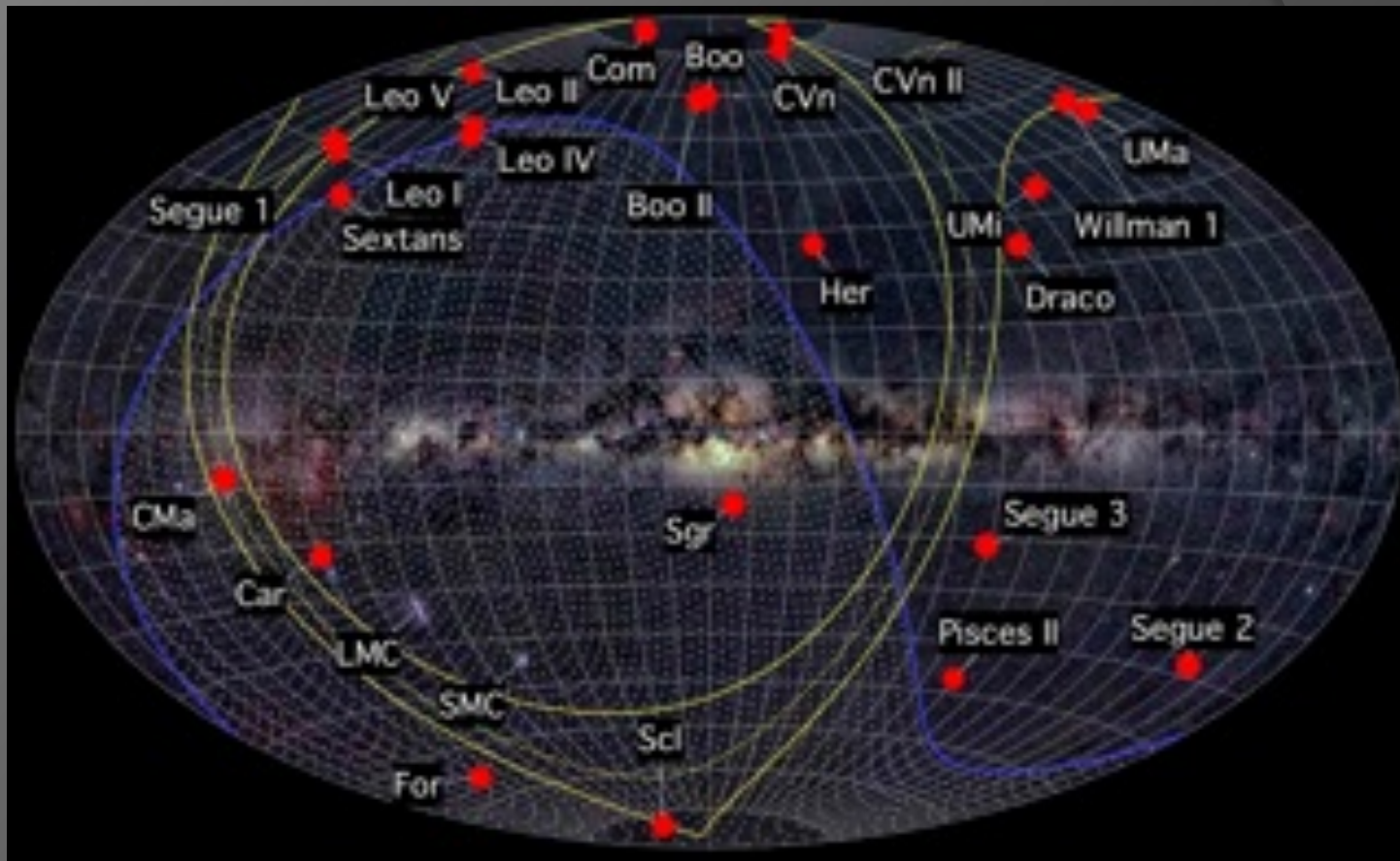


# SATELLITES and STREAMS in the OUTER GALACTIC DISK ?



Giovanni Carraro, ESO-Chile

## **SETTING the SCENE**

**The Galactic disk is in place since about 10 Gyr (Carraro '00);**

**Its dynamical evolution has been pretty quiet ( Hammer et al. '07, Ruchti et al '15);**

**The outer disk is known since the 70ies to have a significant warp and lower scale fluctuations (Alfaro et al. '91; Moitinho et al. '06);**

**The outer disk possesses a significant flare (Momany et al. '06, Feast et al. '15);**

**The spiral structure in the outer disk is well known since the 70s (Vogt & Moffat '75, Vazquez et al. '08).**

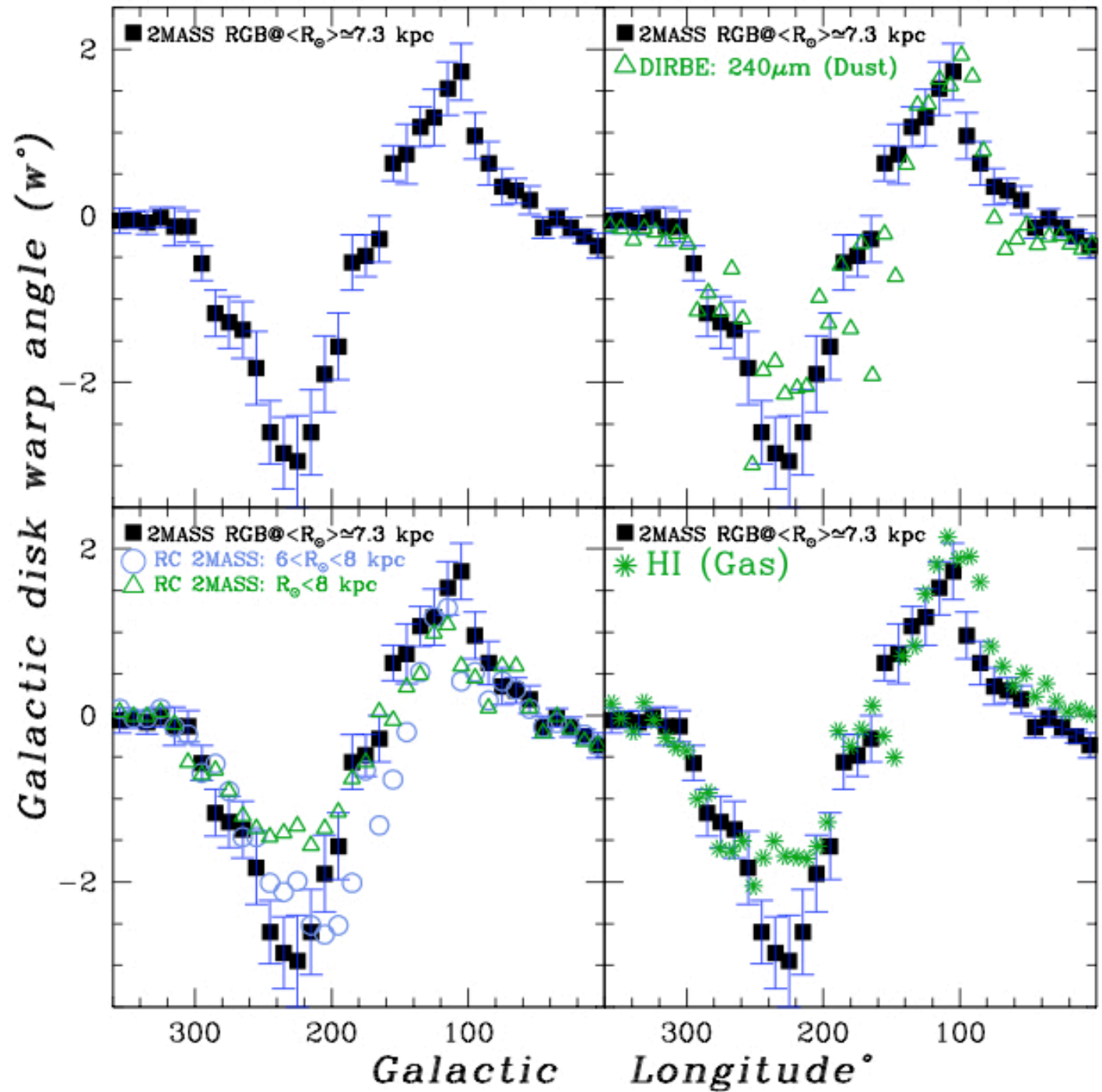
## **ACCRETION in the OUTER DISK**

**Canis Major over-density (Martin et al. '04)**

**Monoceros ring (Newberg et al. '02)**

**Triangulum-Andromeda over-density (Rocha-Pinto et al. '04)**

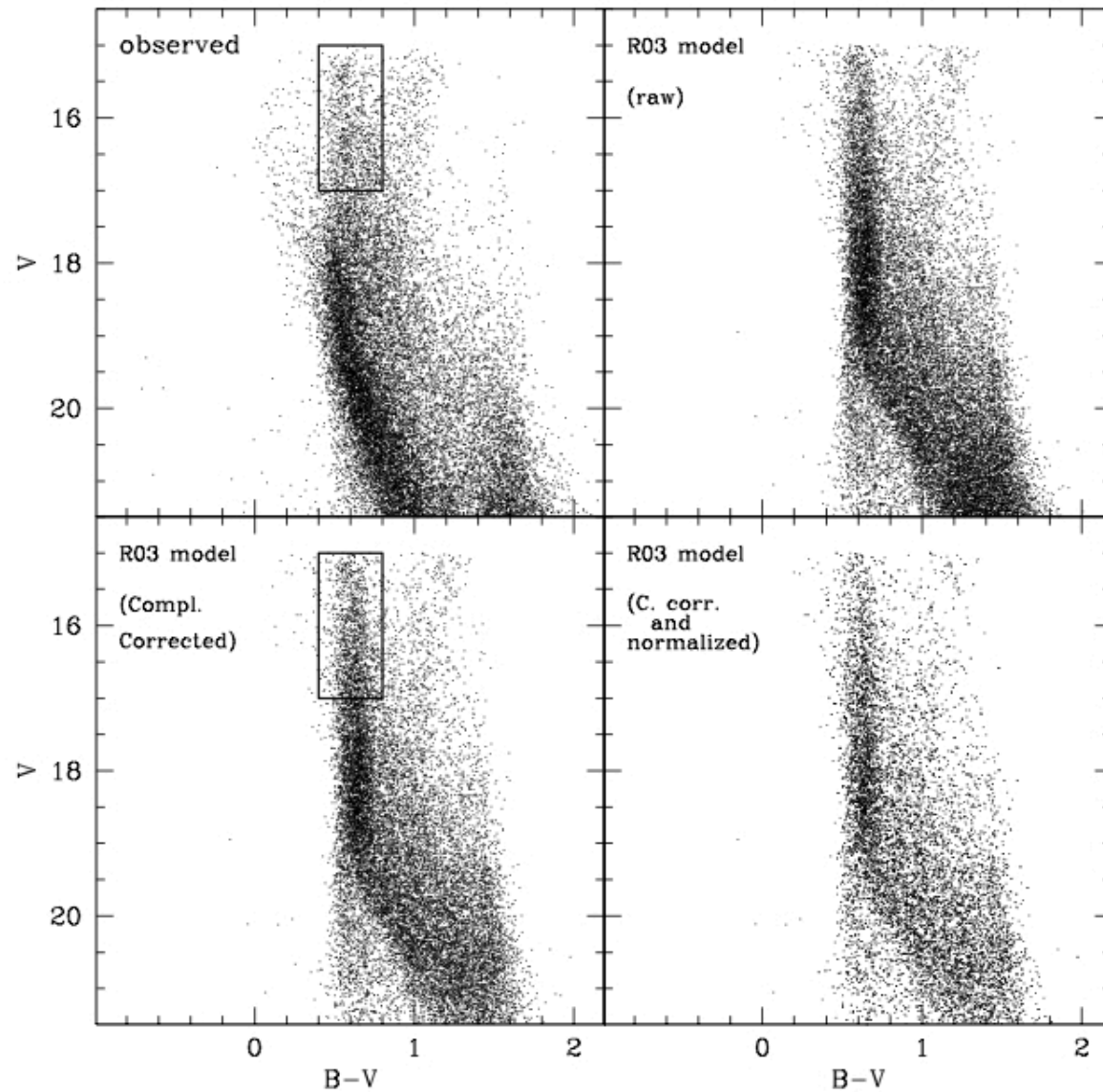
Momany+ 2006  
Moitinho+ 2006  
Carney+ 1984  
May+ 1991



WARP!

# CANIS MAJOR OVERDENSITY

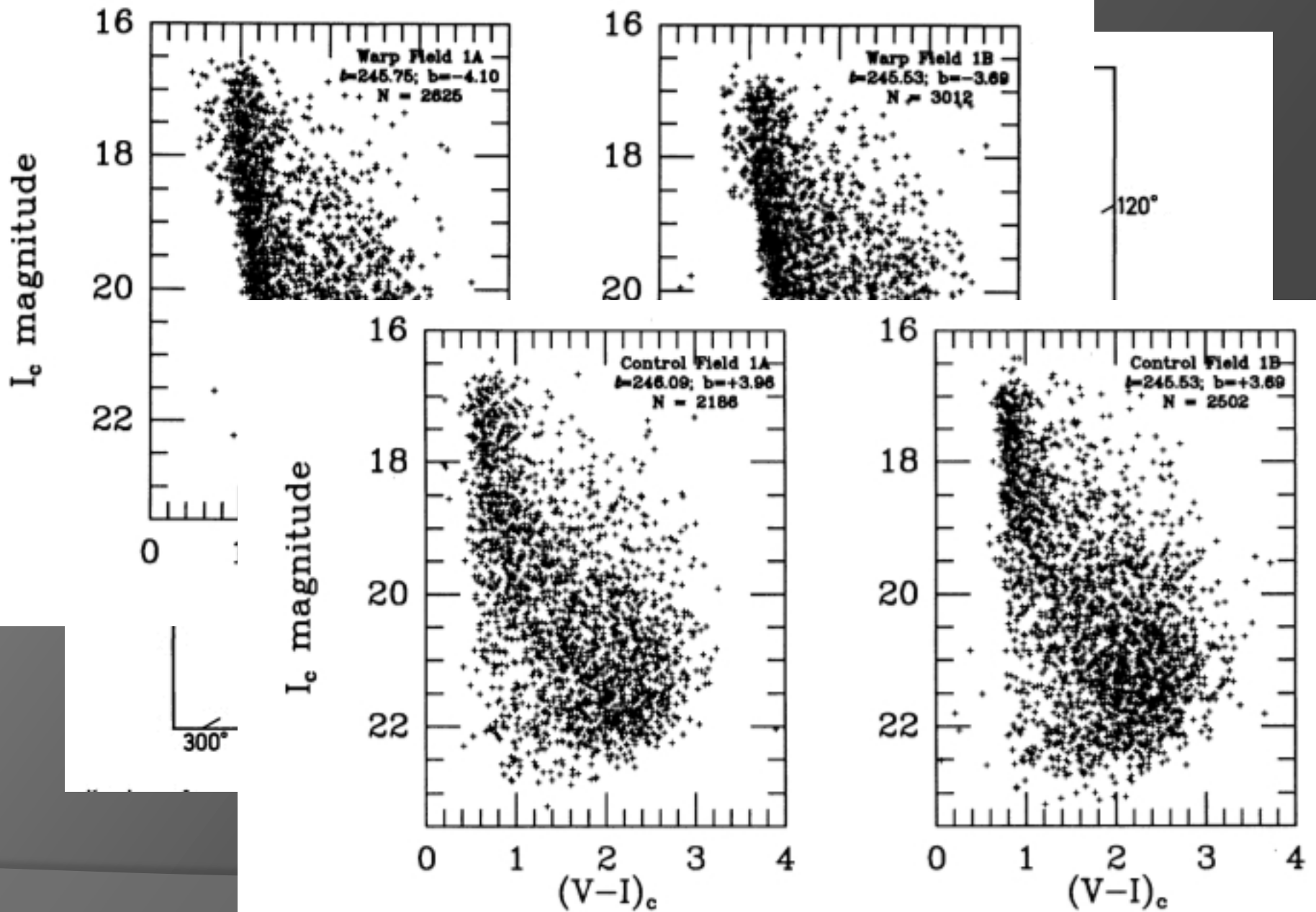
**$l = 244$**   
 **$b = -8$**



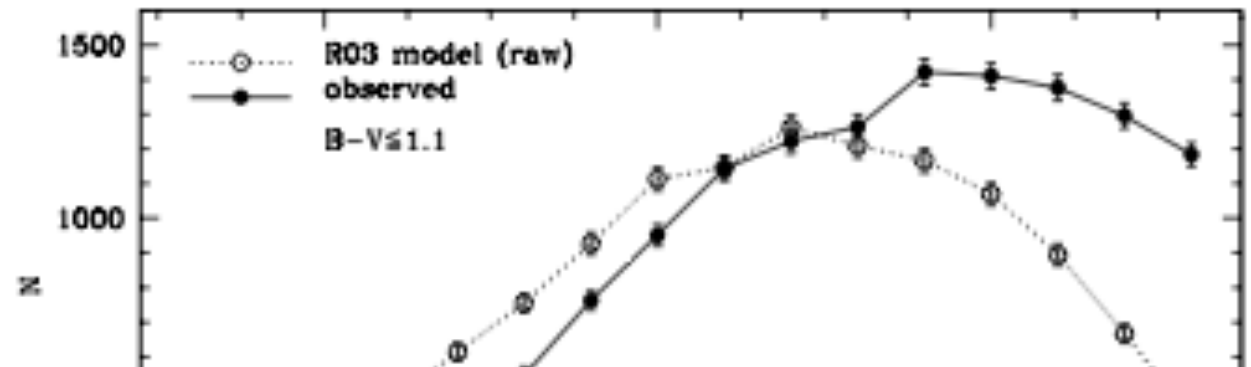
**Figure 3.** Comparison with the observed CMD of F-XMM (upper left-hand panel) and the synthetic CMD from the Galactic model by R03. Upper right-hand panel: raw synthetic CMD. Lower left-hand panel: synthetic CMD corrected for incompleteness. Lower right-hand panel: synthetic CMD corrected for incompleteness and normalized to have the same number of stars as the observed CMD in the selection box plotted in CMDs on the left-hand panels.



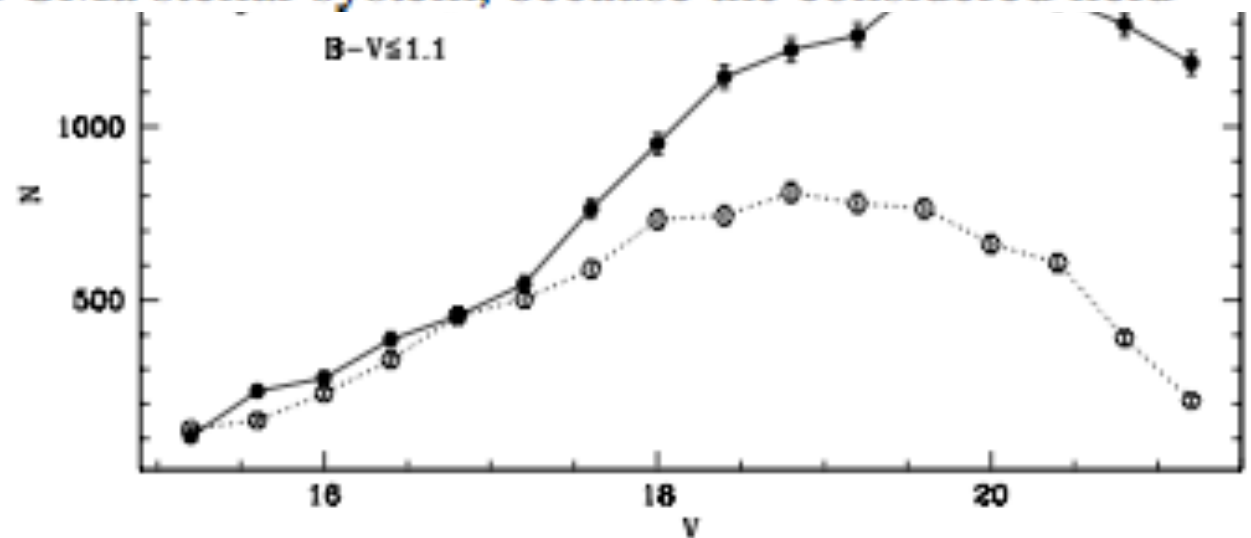
# CANIS MAJOR OVER-DENSITY



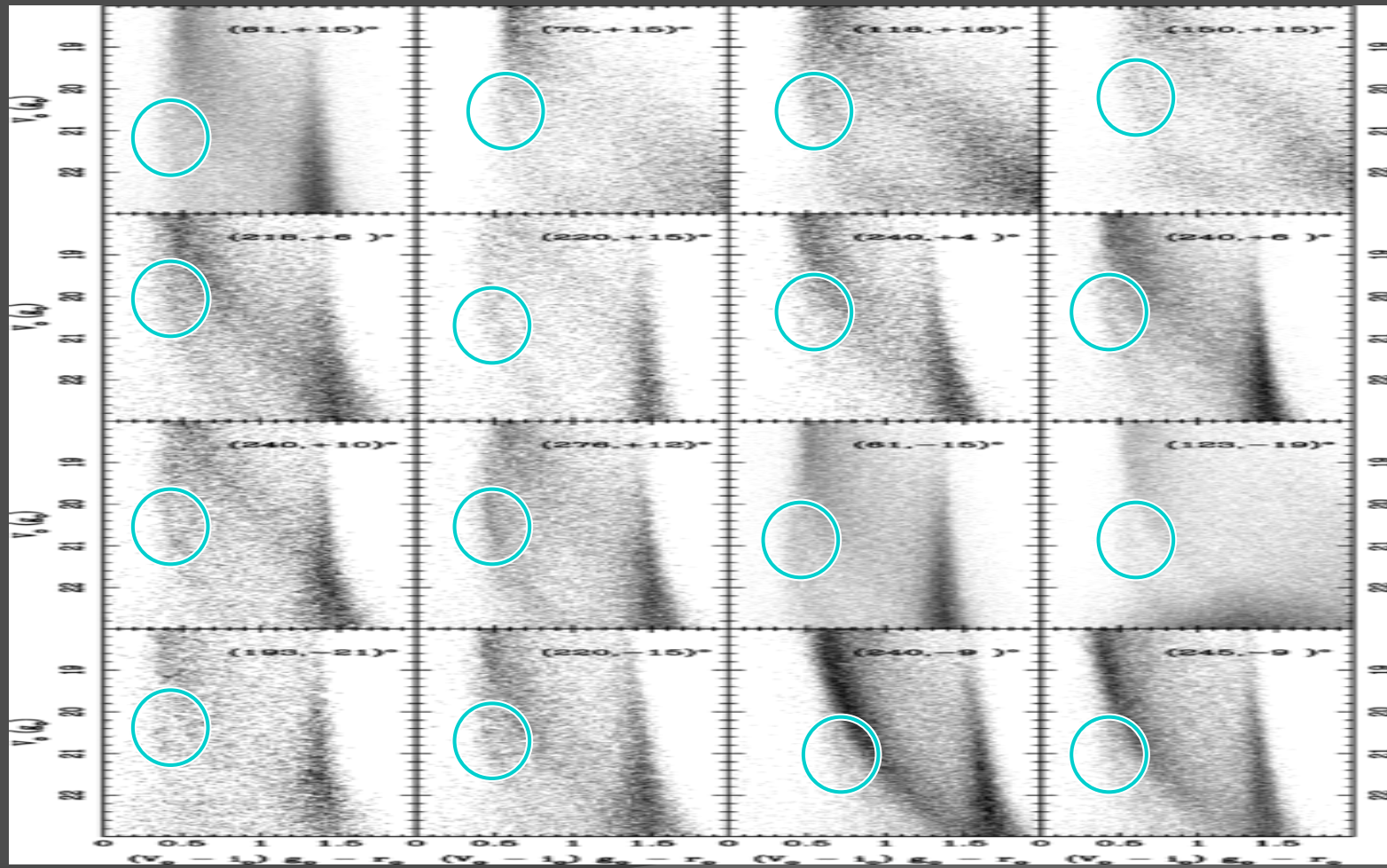
## CANIS MAJOR OVERDENSITY



From the above comparisons we conclude that in the *F-XMM* there is indeed a conspicuous stellar population that is not comprised in the R03 Galactic model. We identify this population with the newly discovered CMa stellar system, because the considered field



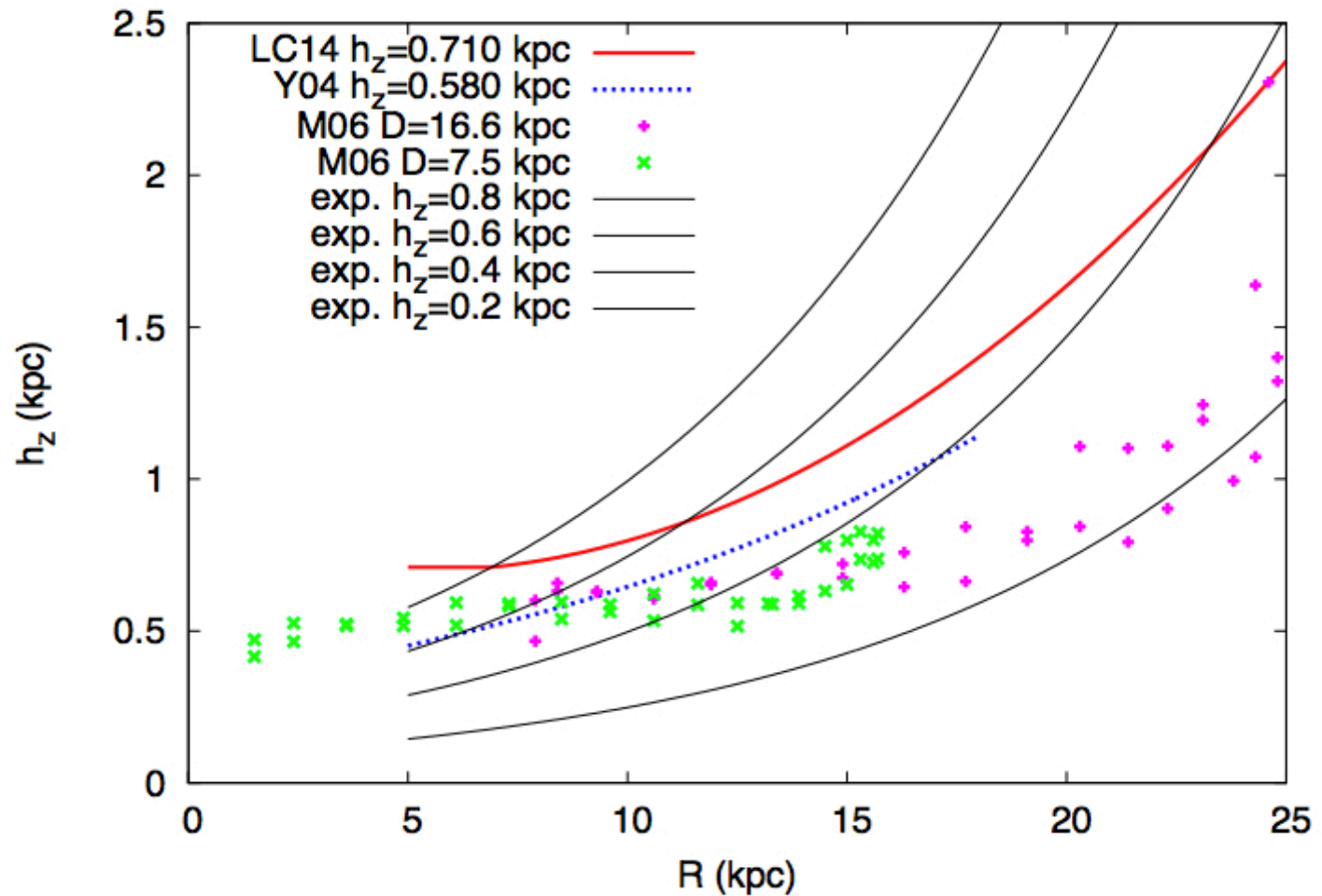
# MONOCEROS RING



Conn et al. (2008)



Kalberla+ 2014; Carraro+2010, 2015; Anderson+ 2014;  
Lopez-Corredoira and Molgo 2014; Feast+2014; May+ 1991;  
Momany+2006; Chakrabarti+ 2015



FLARE !

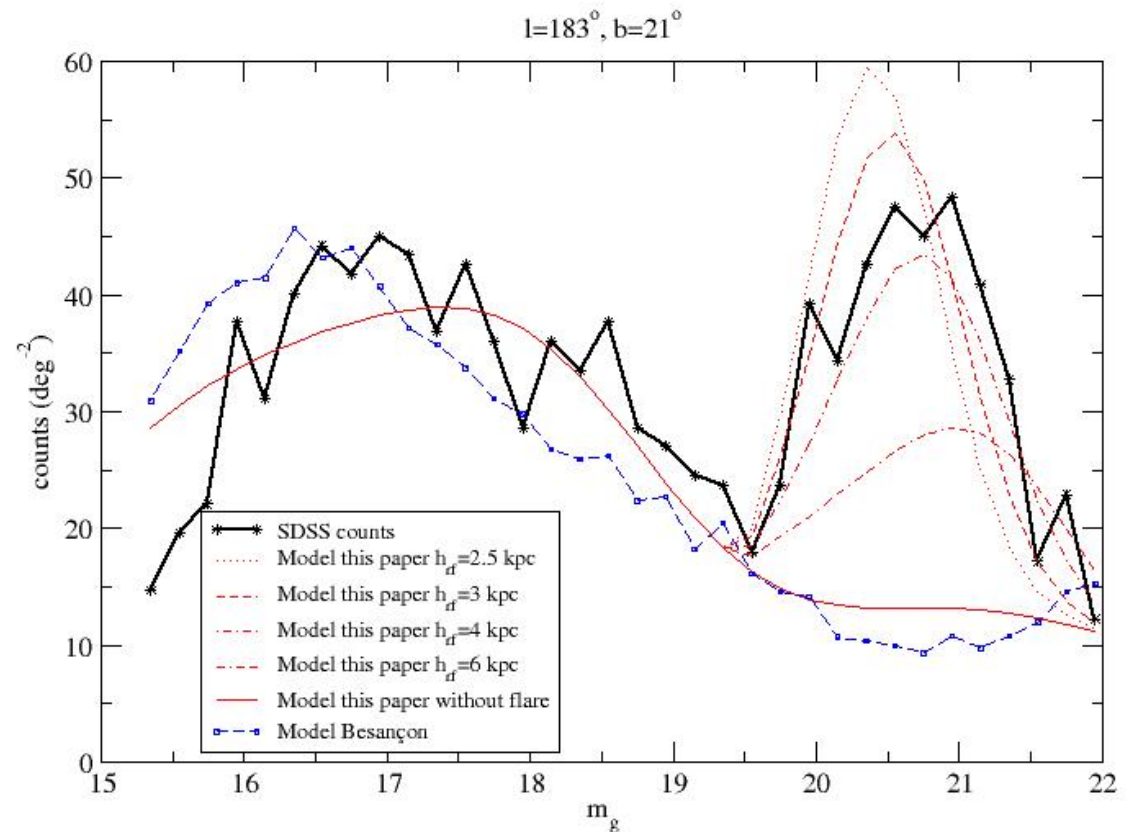
# MONOCEROS RING

A thin+thick disc with each component:

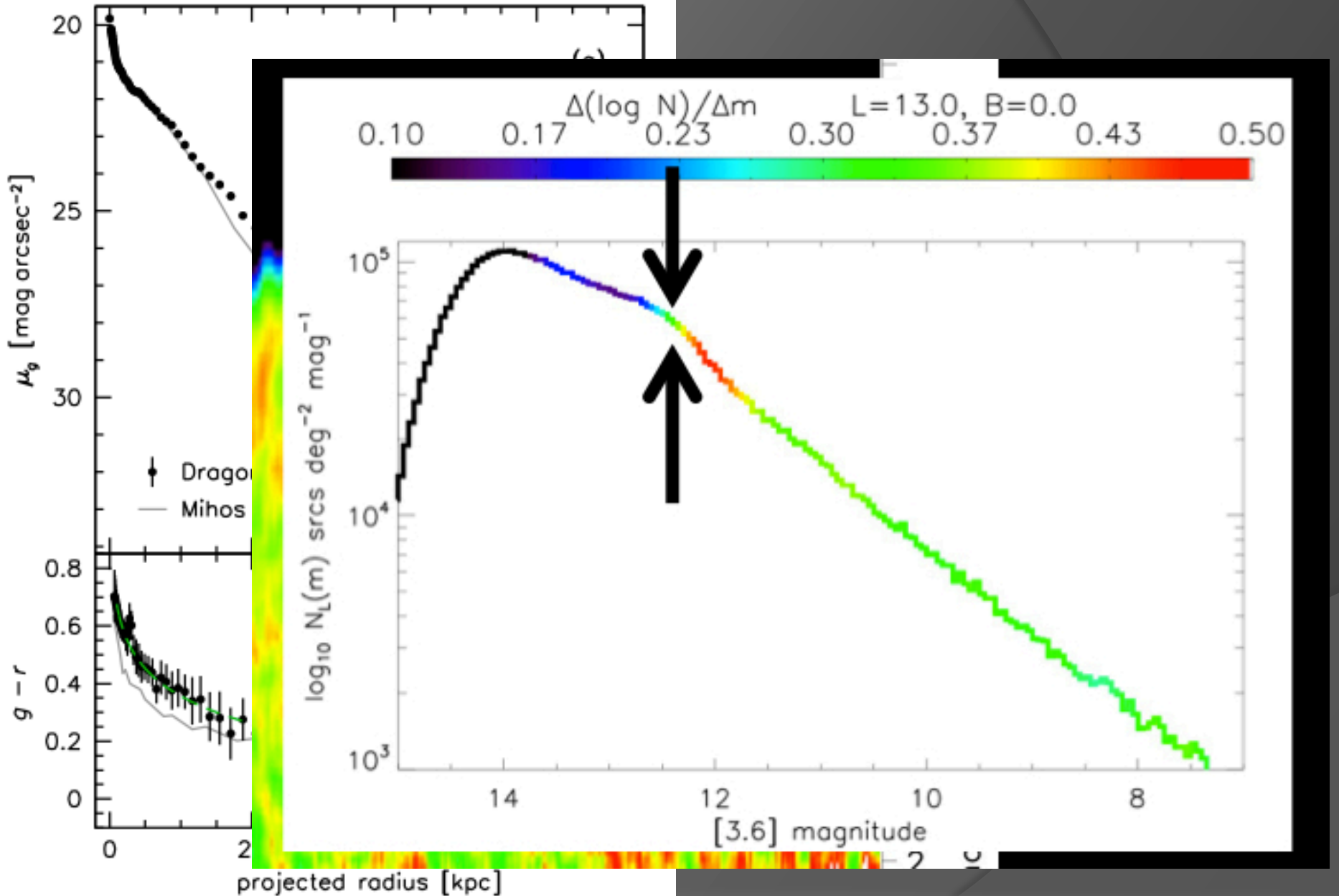
$$\rho(R,z) = \rho_{\text{sun}} \frac{h_{z,\text{sun}}}{h_z(R)} e^{(-R+R_{\text{sun}})/hR} e^{-|z|/h_z(R)}$$

flared at  $R > 16$  kpc:

$$h_z(R) = h_z(R_{\text{sun}}) e^{(R-16 \text{ kpc})/h_{\text{rf}}}$$



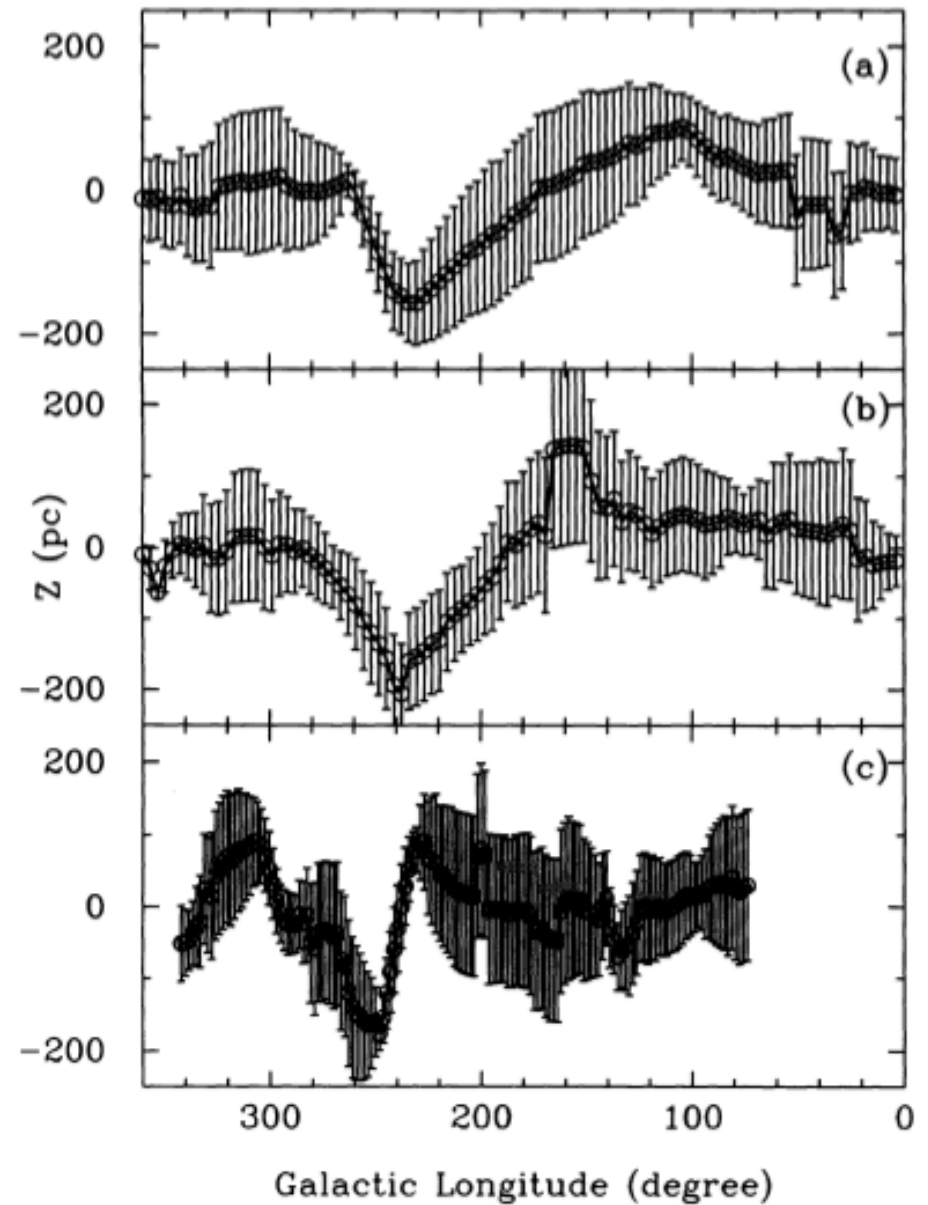
# DISK EXTENT and CORRUGATIONS / OSCILLATIONS



# DISK EXTENT and CORRUGATIONS / OSCILLATIONS

Alfaro+ 1991, 1992

Vazquez+2008,2010



## SIMPLE CONCLUSION:

Let's be careful.....

.....consult previous  
literature

....and MIND the disk !!

