

銀河磁場

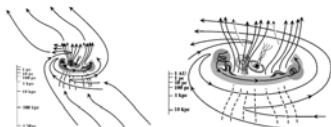
祖父江義明 

鹿児島大学理学部
2008.11.1-2, SKA研究会@国立天文台

1. 磁場の測定
2. 銀河系、銀河
銀河ハロー
銀河中心
3. ジェット、ループ
4. これからの課題
磁場起源と意味

1. 磁場の測定

Cosmological Origin of GC V-field



Synchrotron Intensity & Polarization

1. Equipartition $\Rightarrow$ B strength
 2. Pol. Deg. $\Rightarrow$ Ordered B frac.
 3. Faraday RM $\Rightarrow$ B//
 4. Correction of RM $\Rightarrow$ B $\perp$
- $\Rightarrow$ 3D B vector

Cf: Zeeman effect, Optical Polarization

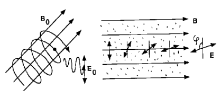
Galactic plane	1 kpc	1 μ G
Galactic Center	10 pc	1 mG
Circum Nucleus	1 pc	1 mG
Nucleus	0.1 pc	10 mG
Circum BH	1 AU	0.1 G
Cosmic Jet	1-100 kpc	1 μ -1mG
Sun	10 ⁶ km	1G
Pulsar	10 km	10 ¹² G

Faraday Rotation
RM

$$\phi = \phi_0 + \phi_F,$$

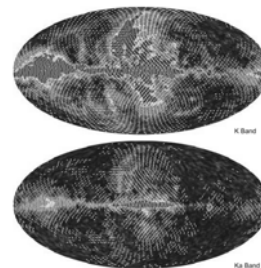
$$\phi_F = RM\lambda^2 \text{ [rad]},$$

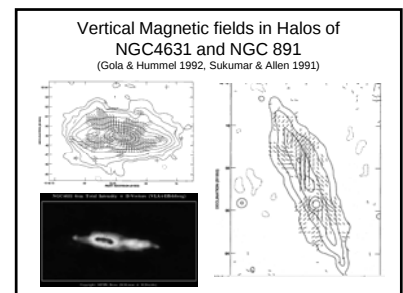
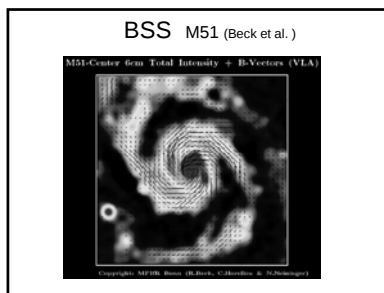
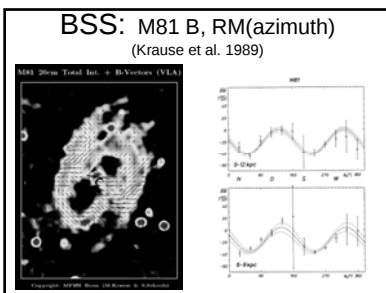
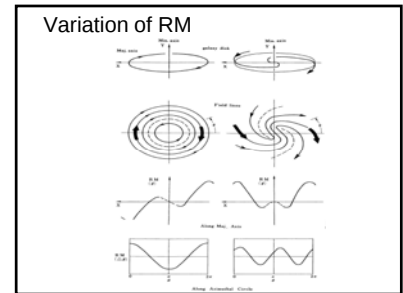
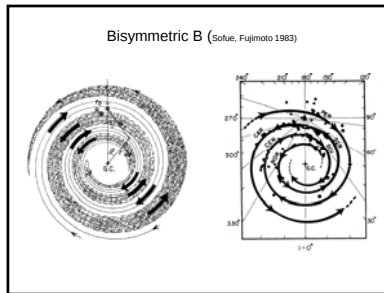
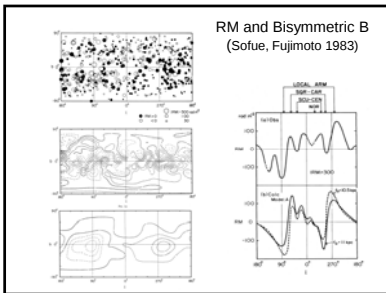
$$RM = 0.81 \int n_e B_{\parallel} dl,$$



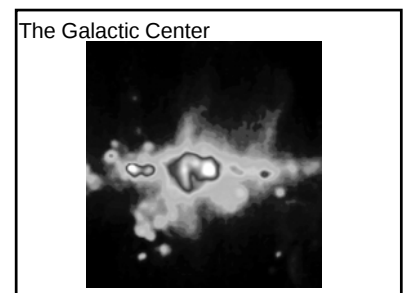
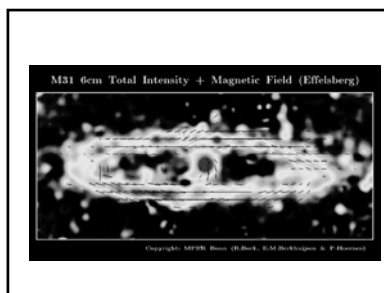
2. 銀河系 銀河の磁場

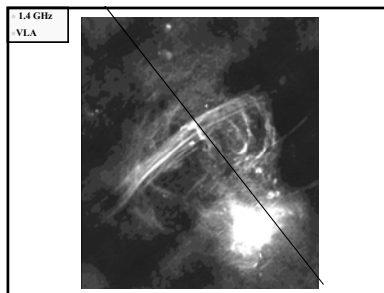
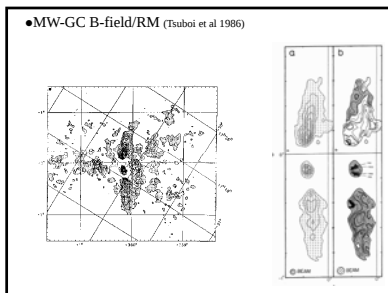
WMAP
22, 23
GHz
Pol. Int.





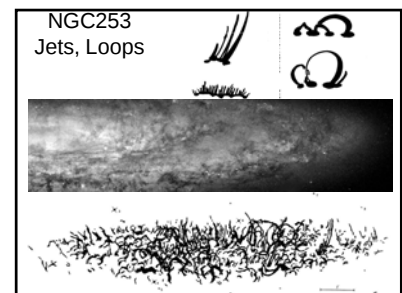
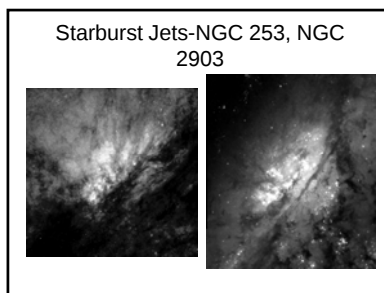
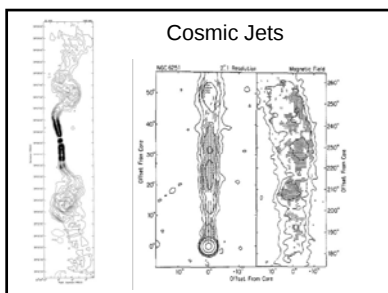
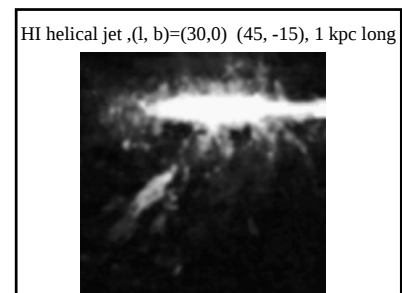
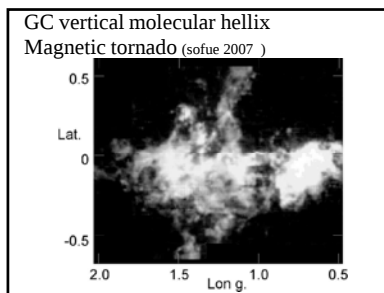
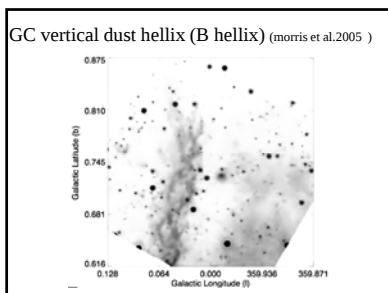
5. 銀河中心の 垂直磁場



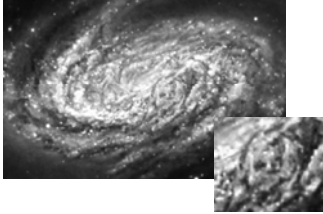


3. Jets, Loops

MHD morphologyの妙



Loop: N2903

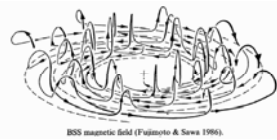
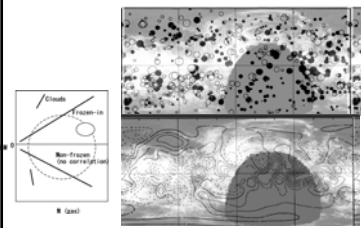


4. 磁場起源 ダイナモ vs 宇宙磁場

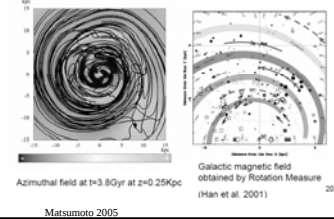
1. “Frozen-in or not”
Problem

2. Local B reversal
(Random / Turbulent B)

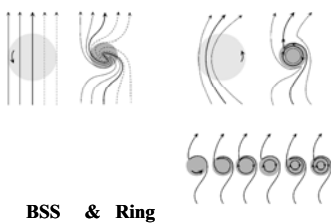
RM / HI, H2, HII, Dust



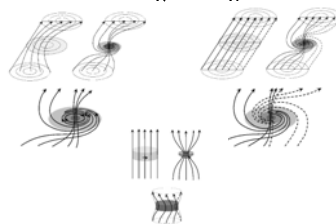
Tangled spiral (MHD simulation) vs
Ordered spiral (observation)



Cosmological Origin



Unified Magview of
Cosmological Origin



すべての天体に
回転と磁場(南北)。
宇宙に南北は?

