銀河磁場

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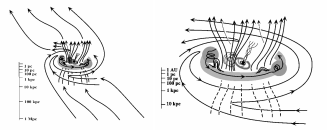
1. 磁場の測定

Cosmological Origin of GC V-field



Synchrotron Intensity & Polarization

1. **Equipartition => B strength**
2. **Pol. Deg. =>Ordered B frac.**
3. **Faraday RM =>B//**
4. **Correction of RM => B⊥**

=> 3D B vector

C.f. Zeeman effect, Optical Polarization

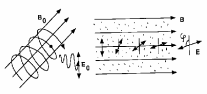
Galactic plane	**1 kpc**	**1 μG**
Galactic Center	**10 pc**	**1 mG**
Circum Nucleus	**1 pc**	**1 mG**
Nucleus	**0.1 pc**	**10 mG**
Circum BH	**1 AU**	**0.1 G**
Cosmic Jet	**1-100 kpc**	**1 μ~1mG**
Sun	**10^6 km**	**1G**
Pulsar	**10 km**	**10^{12} G**

Faraday Rotation
RM

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

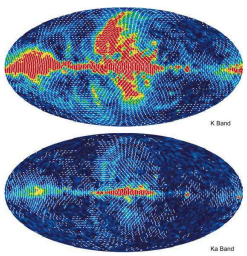
$$\phi_F = RM\lambda^2 \text{ [rad]},$$

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

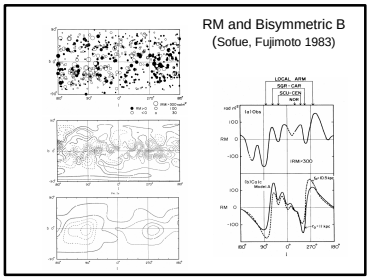


2. 銀河系 銀河の磁場

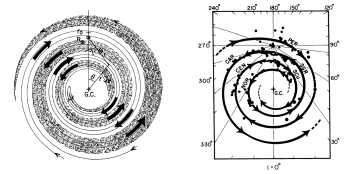
WMAP
22, 23
GHz
Pol. Int.



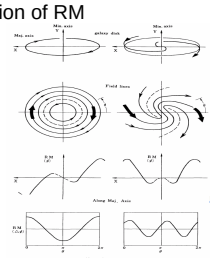
RM and Bisymmetric B
(Sofue, Fujimoto 1983)



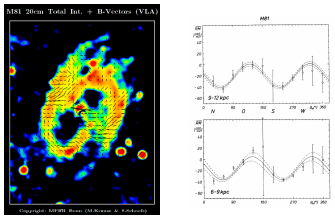
Bisymmetric B (Sofue, Fujimoto 1983)



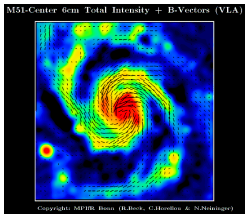
Variation of RM



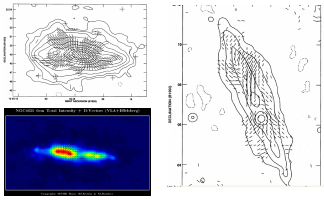
BSS: M81 B, RM(azimuth)
(Krause et al. 1989)



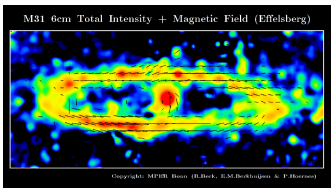
BSS M51 (Beck et al.)



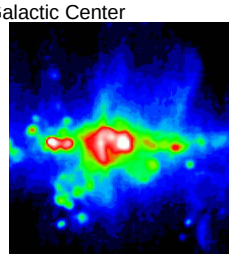
Vertical Magnetic fields in Halos of
NGC4631 and NGC 891
(Gola & Hummel 1992, Sukumar & Allen 1991)



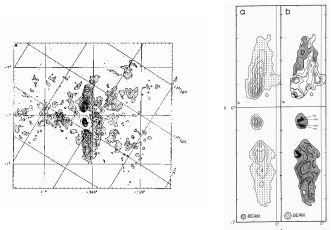
5. 銀河中心の垂直磁場

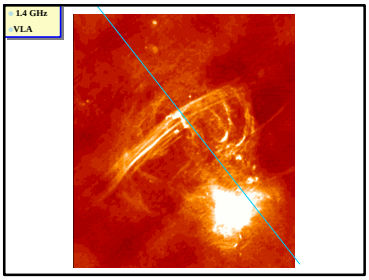


The Galactic Center



MW-GC B-field/RM (Tsuboi et al 1986)

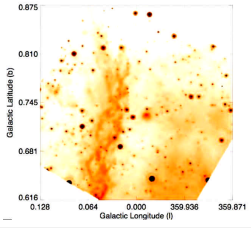




3. Jets, Loops

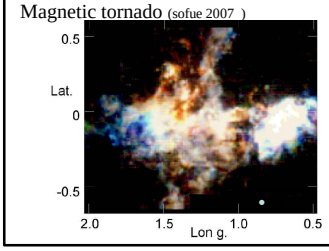
MHD morphologyの妙

GC vertical dust hellix (B hellix) (morris et al.2005)

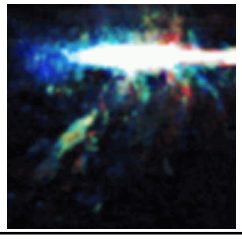


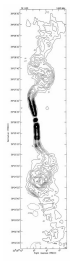
GC vertical molecular hellix

Magnetic tornado (sofue 2007)

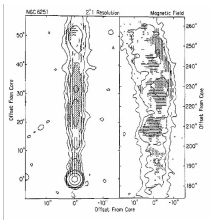


HI helical jet ,(l, b)=(30,0) (45, -15), 1 kpc long

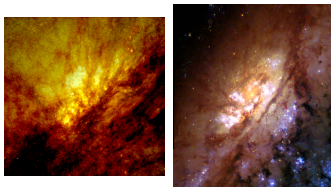




Cosmic Jets

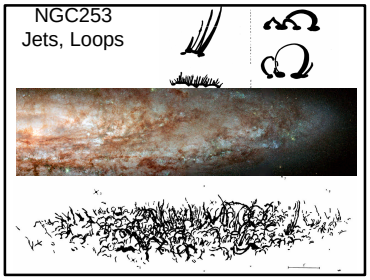


Starburst Jets-NGC 253, NGC 2903



NGC253

Jets, Loops



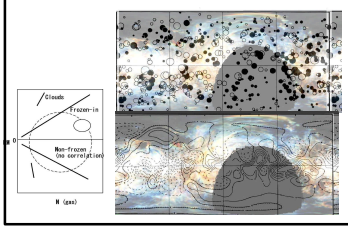
Loop: N2903

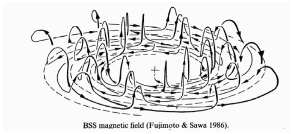
4. 磁場起源 ダイナモ VS 宇宙磁場

1. “Frozen-in or not” Problem

2. Local B reversal (Random / Turbulent B)

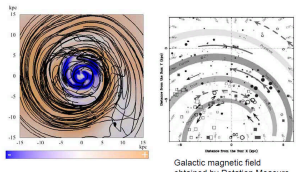
RM / HI, H2, HII, Dust





BSS magnetic field (Fujimoto & Sawa 1986).

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



Azimuthal field at t=3.8Gyr at z=0.25Kpc

Galactic magnetic field obtained by Rotation Measure (Han et al. 2001)

Matsumoto 2005

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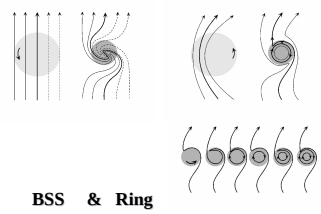
Cosmological Origin



BSS & Ring

Unified Magview of Cosmological Origin