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Discussion

Galaxy clusters:

- Radio halos of clusters are dominated by turbulent magnetic fields
- Basically understood (?)
- But what about relics? Just simple shock fronts?

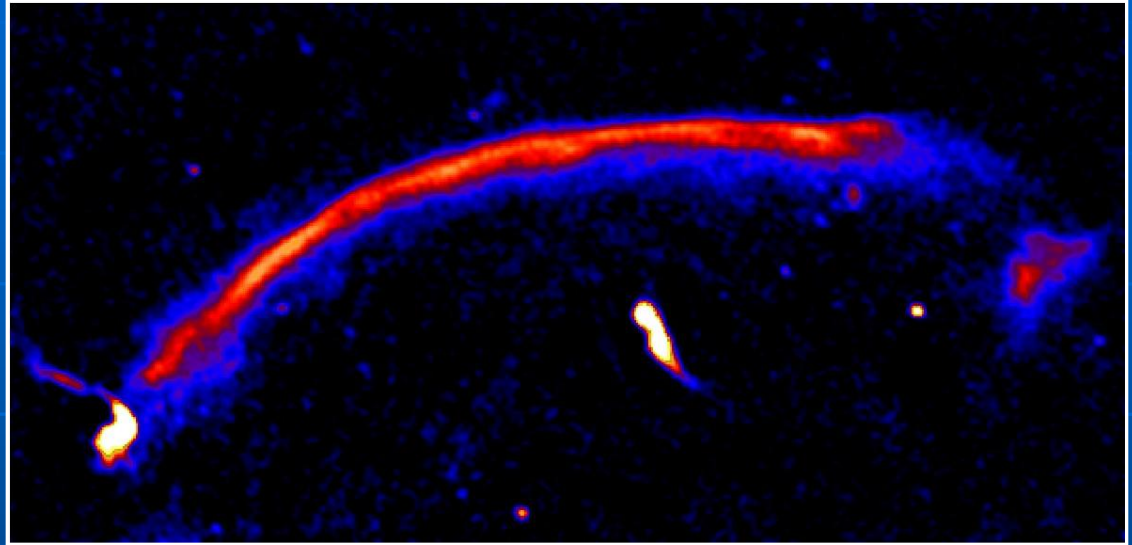
Cluster relic: The largest polarized feature known

CIZA J2242

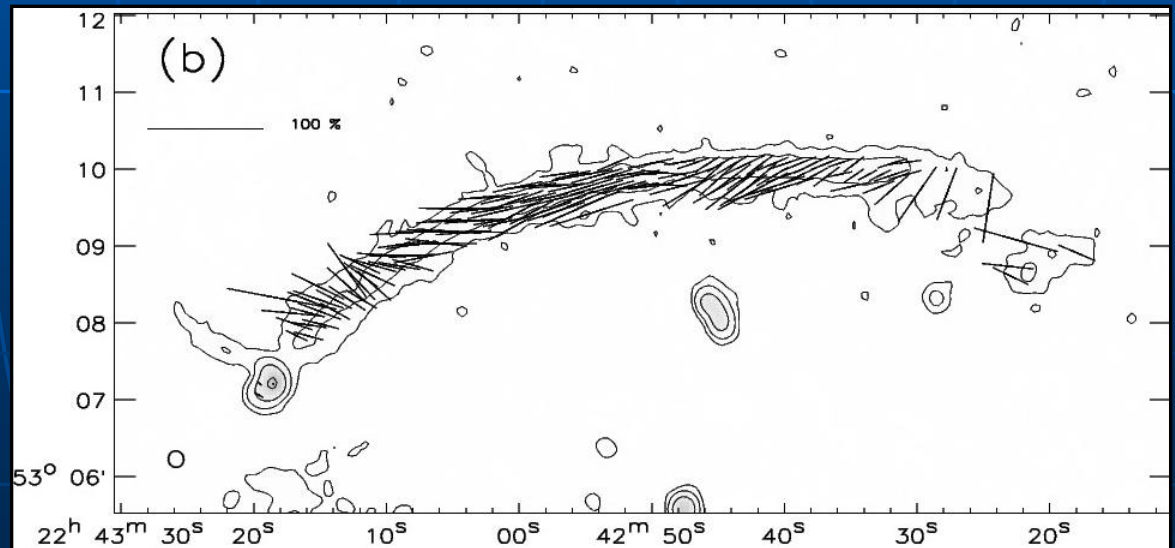
GMRT 49cm

VLA 6cm

Van Weeren et al. 2010



- Distance: ≈ 600 Mpc
- Length: ≈ 2 Mpc
- Pol: $\approx 50\%$
- Almost perfectly aligned field!



Discussion

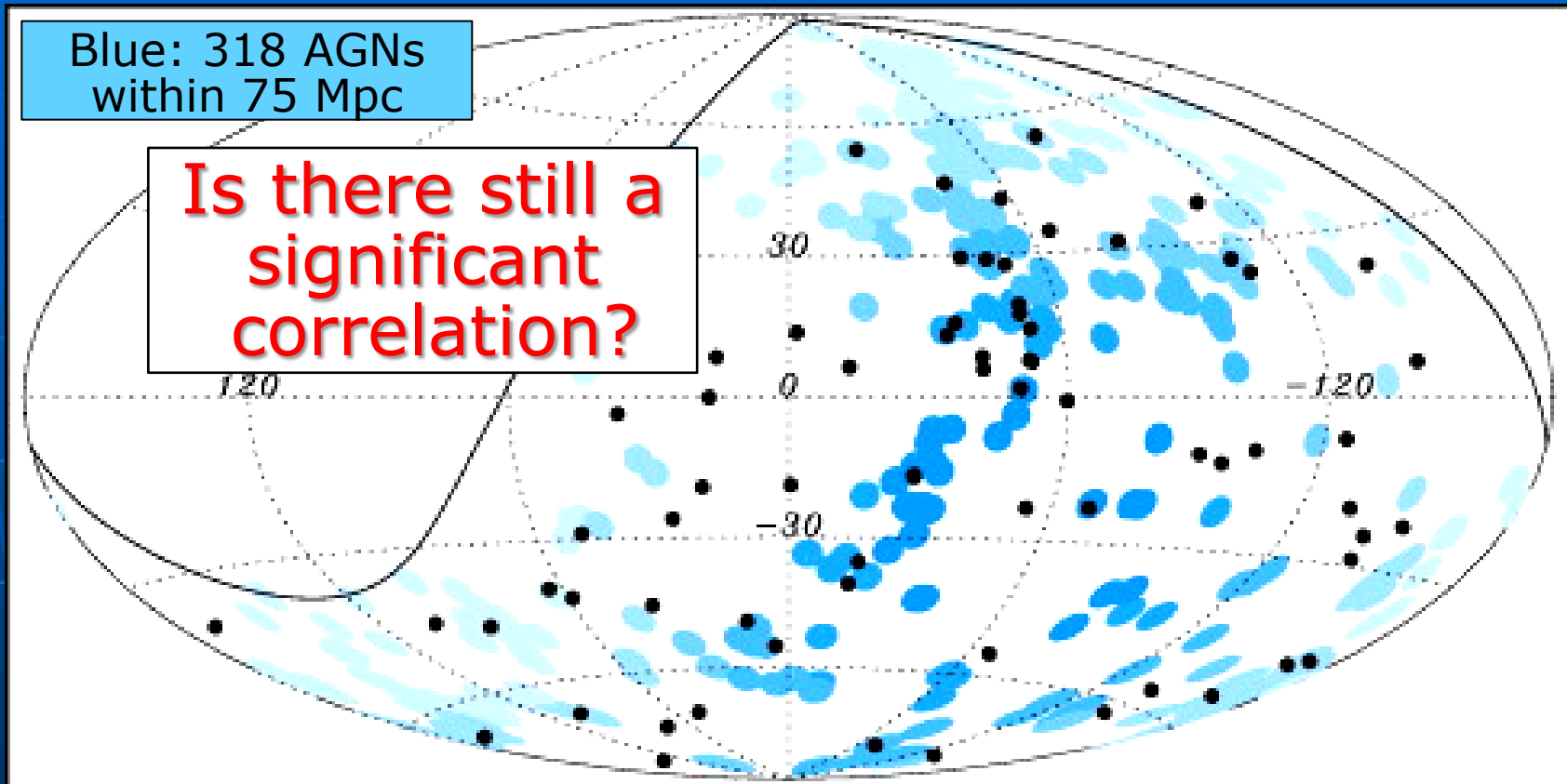
Milky Way I: Some unpleasant results

- Large-scale reversal in the disk
- Odd-symmetry halo field ?
- Strong vertical fields in the center region

Is our Milky Way different?

69 AUGER UHECR events ($> 5.5 \cdot 10^{19}$ eV)

Abreu et al. 2010

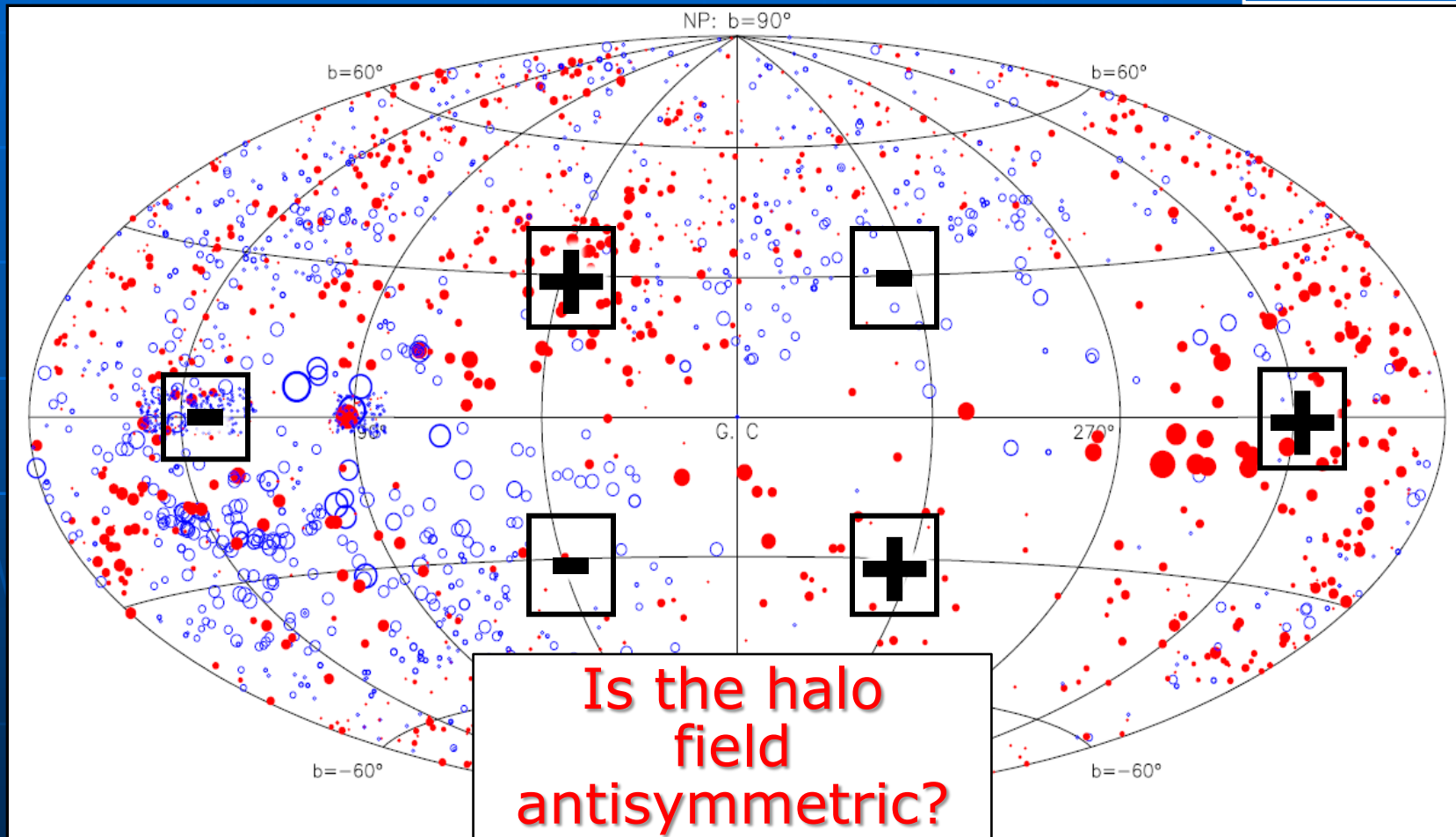


Localizing the UHECR sources requires detailed knowledge about the Milky Way's magnetic field - *but the existing field models are insufficient*

RMs of background sources (B_{\parallel})

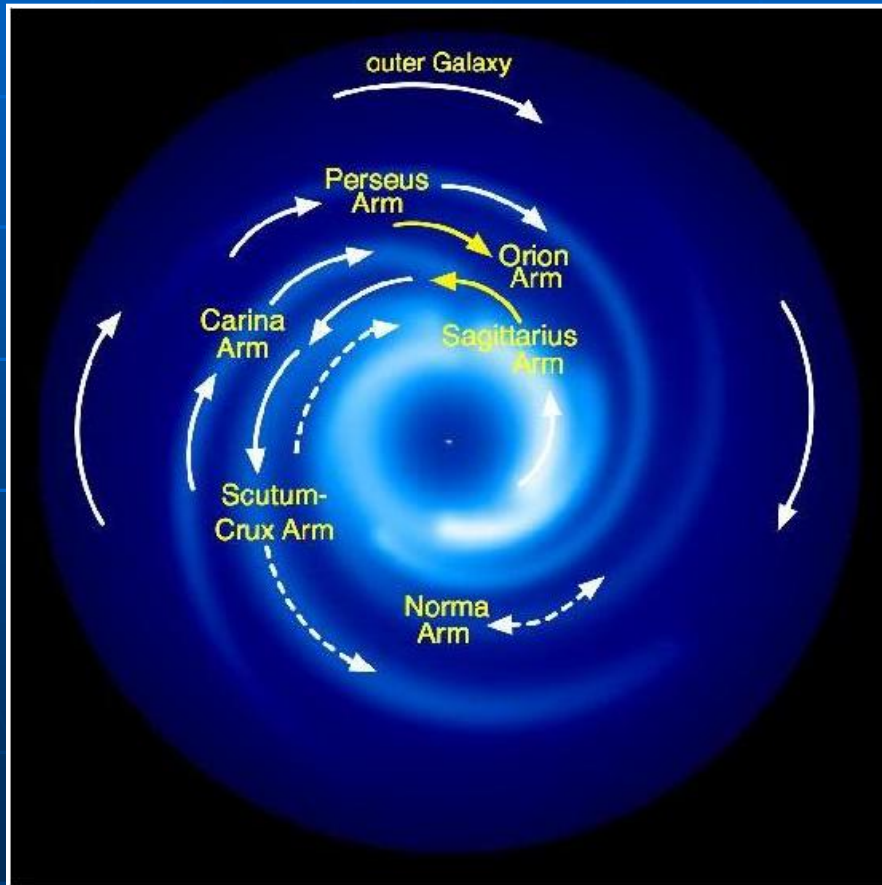
≈ 2000 sources (≈ 0.05 sources per deg^2)

Han et al. 2007



The large-scale Galactic magnetic field from pulsar RM data

(Brown et al. 2007, 2010, Noutsos et al. 2008, Van Eck et al. 2011)



- Local field is clockwise
- Field in Sagittarius arm is counter-clockwise

→ **One reversal**

Claims of more reversals are not statistically safe

NGC 6744
© ESO

Very similar to the
Milky Way !



Discussion

Milky Way II: Obstacles

- RMs from background sources are possibly dominated by local HI structures (Carl Heiles)
- Field modelers should accept that the spiral arms of the Milky Way are not perfectly regular (see NGC 6744)
- The regular fields may not be located in the spiral arms, but in interarm regions
- Models of UHECR propagation in the Milky Way require model of the halo fields, but no realistic model exists – a simple quadrupole or dipole pattern is certainly wrong
→ learn from external galaxies

Discussion

Galaxies I: What did we learn

- Halo fields: (Marita Krause)
Indication of galactic winds
- Intergalactic fields: (Robert Drzazga)
Polarized radio intensity is an ideal tool to study interactions
- Turbulent fields: (Blakesley Burkhart)
Polarized radio intensity is a signature of ISM turbulence

Discussion

Galaxies II: What we need to learn

- No large-scale dynamo without wind (Michal Hanasz, Detlef Elstner)
→ Correlation between strength of regular field and star formation and wind speed?
- Caution: distinguish anisotropic fields (compression or shear) from truly regular ones
- Anisotropic fields: stronger in density-wave galaxies?
- Butterfly diagram of field patterns from MRI model: (Mami Machida)
→ Statistics of even/odd-symmetry field patterns needed
- Same question as on MFU II:
What are the key observations to be done until MFU IV ?