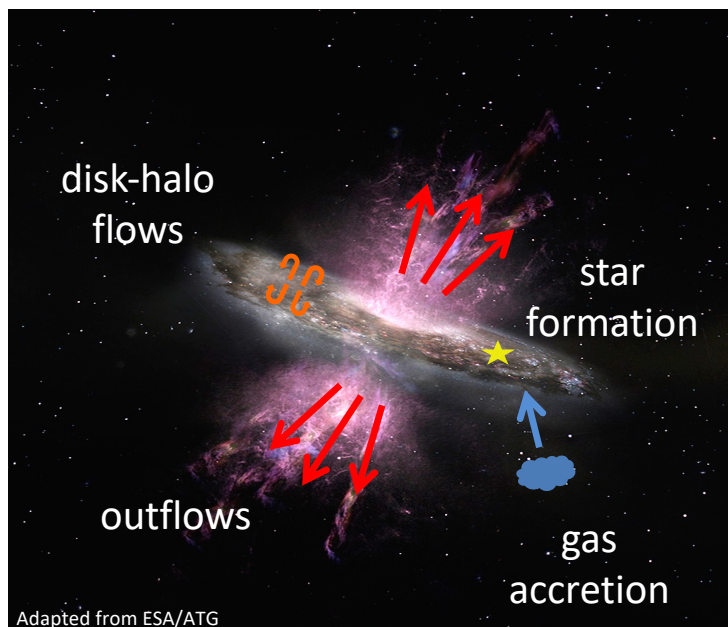# Measuring Magnetic Fields in the Circumgalactic Medium of Intervening Galaxies

Sui Ann Mao (MPIfR, mao@mpifr-bonn.mpg.de), Britt Lundgren (UNC Asheville), Aritra Basu (U Bielefeld)

Max-Planck-Institut
für Radioastronomie

disk-halo flows

star formation

outflows

gas accretion

Adapted from ESA/ATG


background quasar

distant galaxy

©Sui Ann Mao

- Role of magnetic fields in galaxy evolution

- Back-illumination: Faraday rotation (RM) towards polarized bkg quasars encodes density and B field info

$$\text{RM} = 0.812 \int_{source}^{observer} n_e(l) B_{\parallel}(l) dl \ \ \text{rad m}^{-2}$$

- Statistically isolate RM_{galaxy} by comparing RM distributions of target & clean samples

[e.g. Bernet et al. 2008, 2010; Joshi & Chand 2012; Farnes et al. 2014]
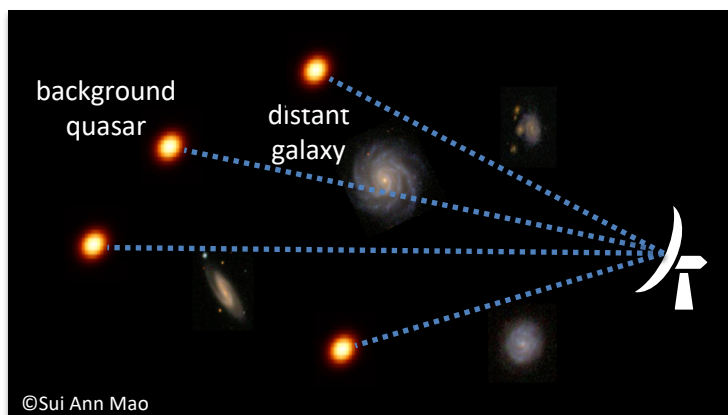
$$f\left(\text{RM}_{obs,\,target}\right) = f\left(\frac{\text{RM}_{quasar}}{(1+z_{quasar})^2} + \frac{\boxed{\text{RM}_{galaxy}}}{(1+z_{galaxy})^2} + \text{RM}_{MilkyWay}\right)$$

$$f\left(\text{RM}_{obs,\,clean}\right) = f\left(\frac{\text{RM}_{quasar}}{(1+z_{quasar})^2} + \text{RM}_{MilkyWay}\right)$$
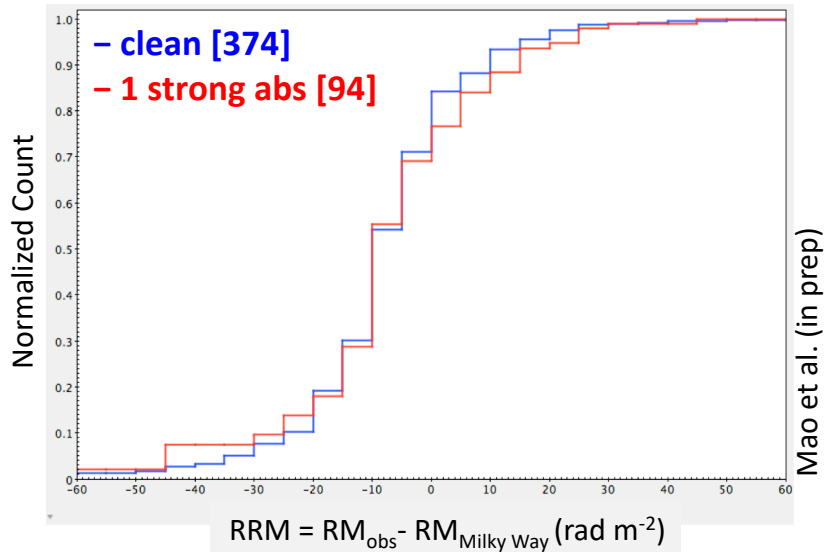
$\boxed{B_{galaxy}}$

[e.g, Basu, Mao et al. 2018]

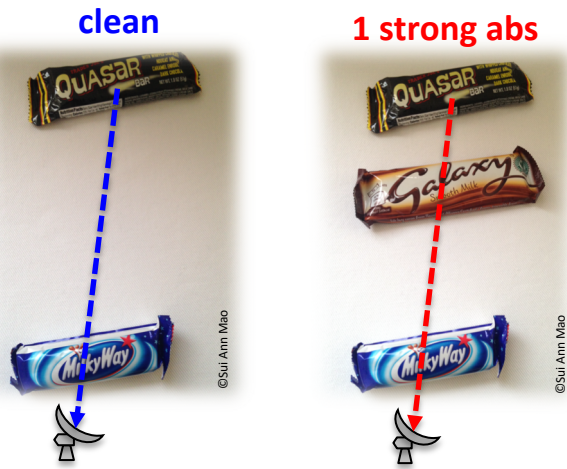# Measuring Magnetic Fields in the Circumgalactic Medium of Intervening Galaxies

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Cumulative Distribution of RRM

– clean [374]
– 1 strong abs [94]

Normalized Count

$RRM = RM_{obs} - RM_{Milky\ Way}$ (rad m^{-2})

Mao et al. (in prep)

- Strong MgII absorption systems with RM
  - SDSS DR7 MgII quasar absorption catalog [York, Lundgren et al. (in prep)]
  - Hammond et al. 2012 RM-z catalog
- K-S test: Clean & strong abs sightlines have RMs drawn from the same distribution (p=0.64)
- Results remain unchanged when RM uncertainties, sample size differences, different z_{quasar} distributions of clean & abs sightlines are taken into account

clean

1 strong abs

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z_{quasar} distribution

– clean
– 1 strong abs
-- >=1 strong abs

Normalized Count

z_{quasar}

Mao et al. (in prep)