

# Some proposed pulsar projects



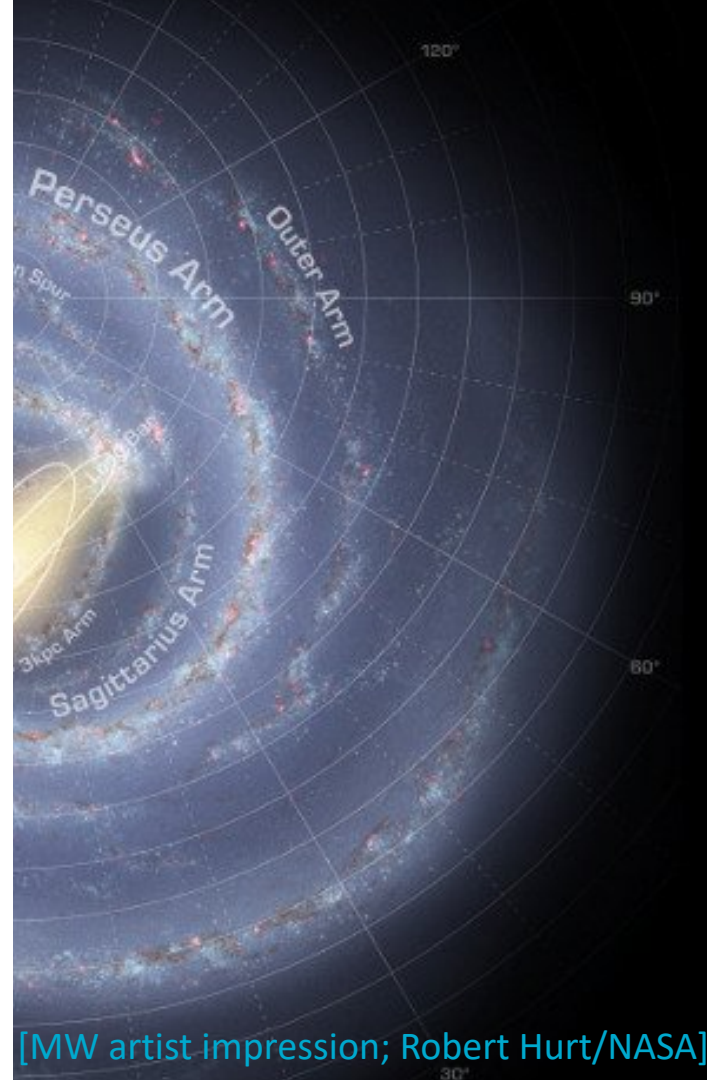
Charlotte Sobey | Wednesday 18 December 2019

Australia's National Science Agency



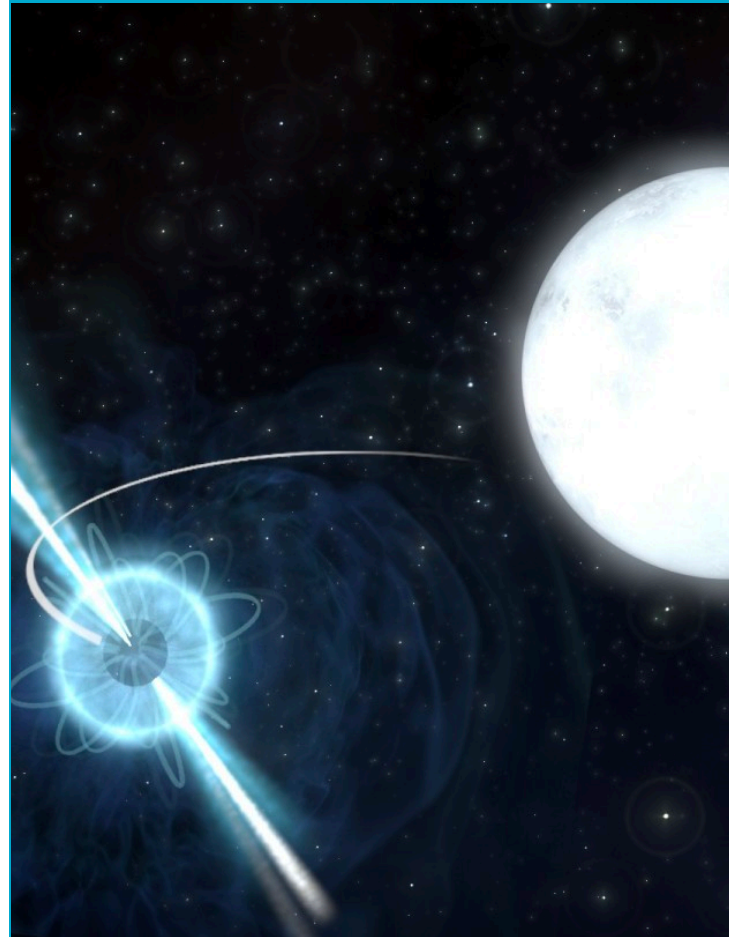
# Outline

- Brief summaries / initial thoughts for science relevant to POSSUM RM catalogue
  1. Search for pulsar candidates
  2. Globular cluster B-fields
  3. Getting involved in all-sky Galactic magnetic field work



# 1. Search for pulsar candidates

- Why?
  - Interesting pulsar systems
  - Additional L-o-S for GMF in 3-D
- How?
  - Known pulsar characteristics from POSSUM used as input (e.g. spectral index, %L, %V, RM,  $\sigma_{\text{RM}}$ )
  - Candidate pulsars from images
    - complementary EMU/VAST projects (steep spectral index, variance, etc.)
  - Follow-up with Parkes UWL pulsar search observations
- Timeline: RACS, pilot, ...



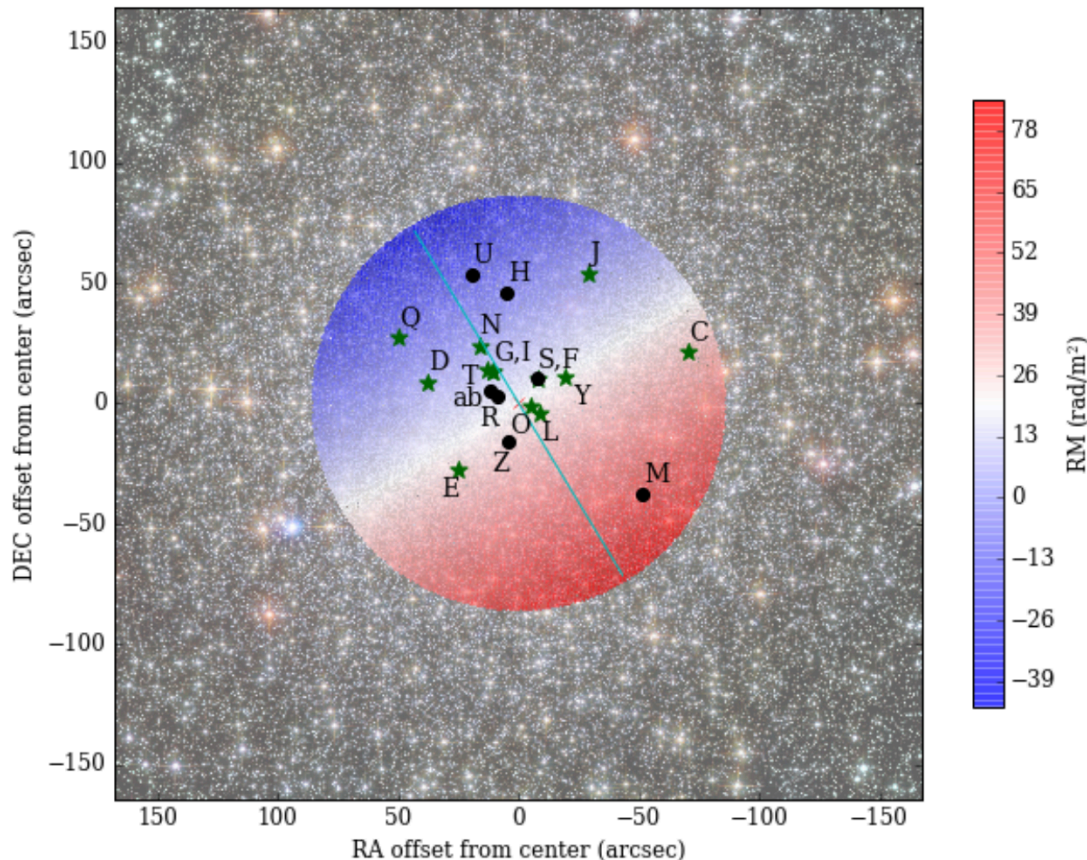




## 2. Globular cluster B-field investigation

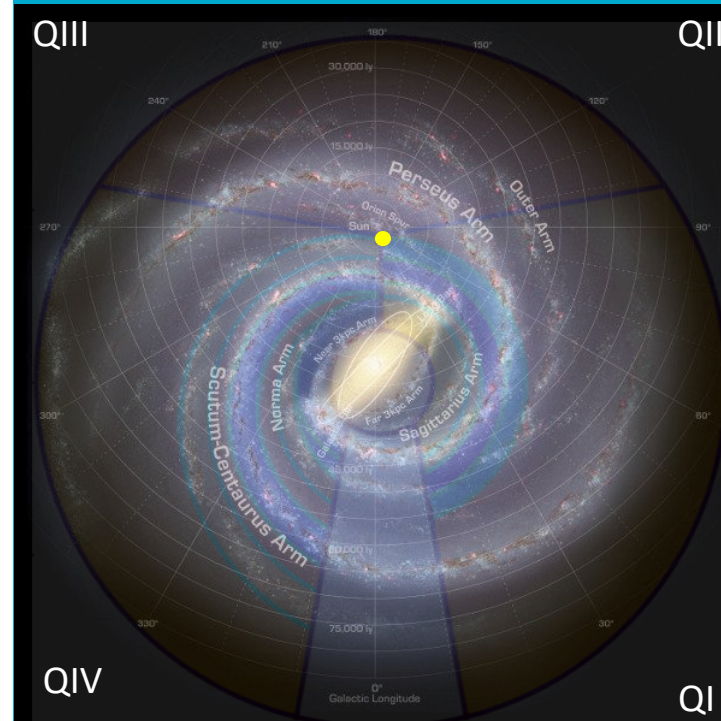
- Why?
  - Additional L-o-S for 3-D GMF
  - Detect/upper-limit for GC B-field
  - Are GC and PSR B-fields related?
  - Also contribute to pulsar search
- How?
  - RMs (and  $\delta$ RM) for pulsars inside GC, plus extragalactic sources as baseline
  - Complementary to MeerTIME globular cluster timing obs
  - $\Delta$ DM provides electron density (Freire+2001; Ransom+2007)

## 2. Globular cluster B-field investigation



### 3. Galactic magnetic field

- Getting involved in existing efforts...
- Adding value with pulsars!



[MW artist impression, disk magnetic field  
Robert Hurt/NASA; van Eck et al. 2011]

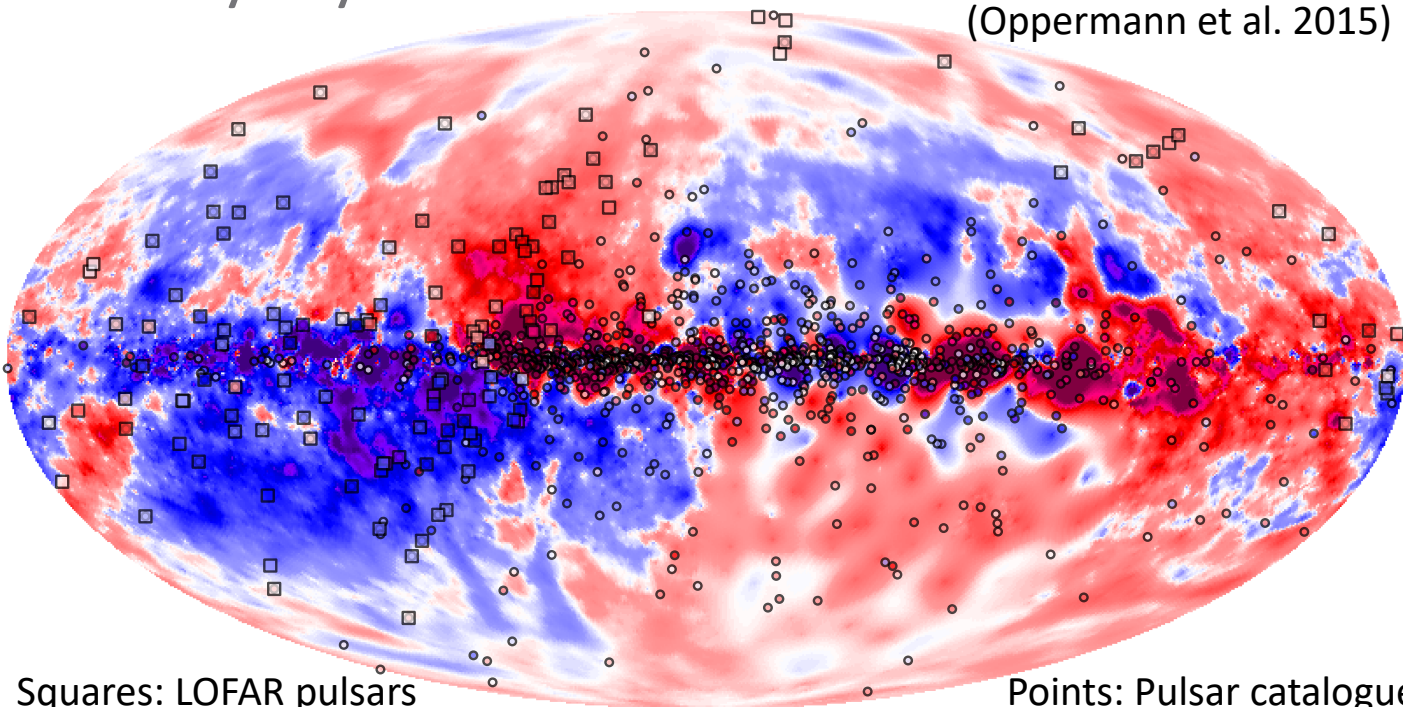




### 3. Galactic magnetic field

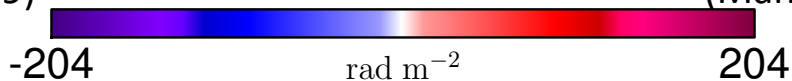
## Faraday sky

Background: Extragalactic  
(Oppermann et al. 2015)



Squares: LOFAR pulsars  
(Sobey et al. 2019)

Points: Pulsar catalogue  
(Manchester et al. 2005)

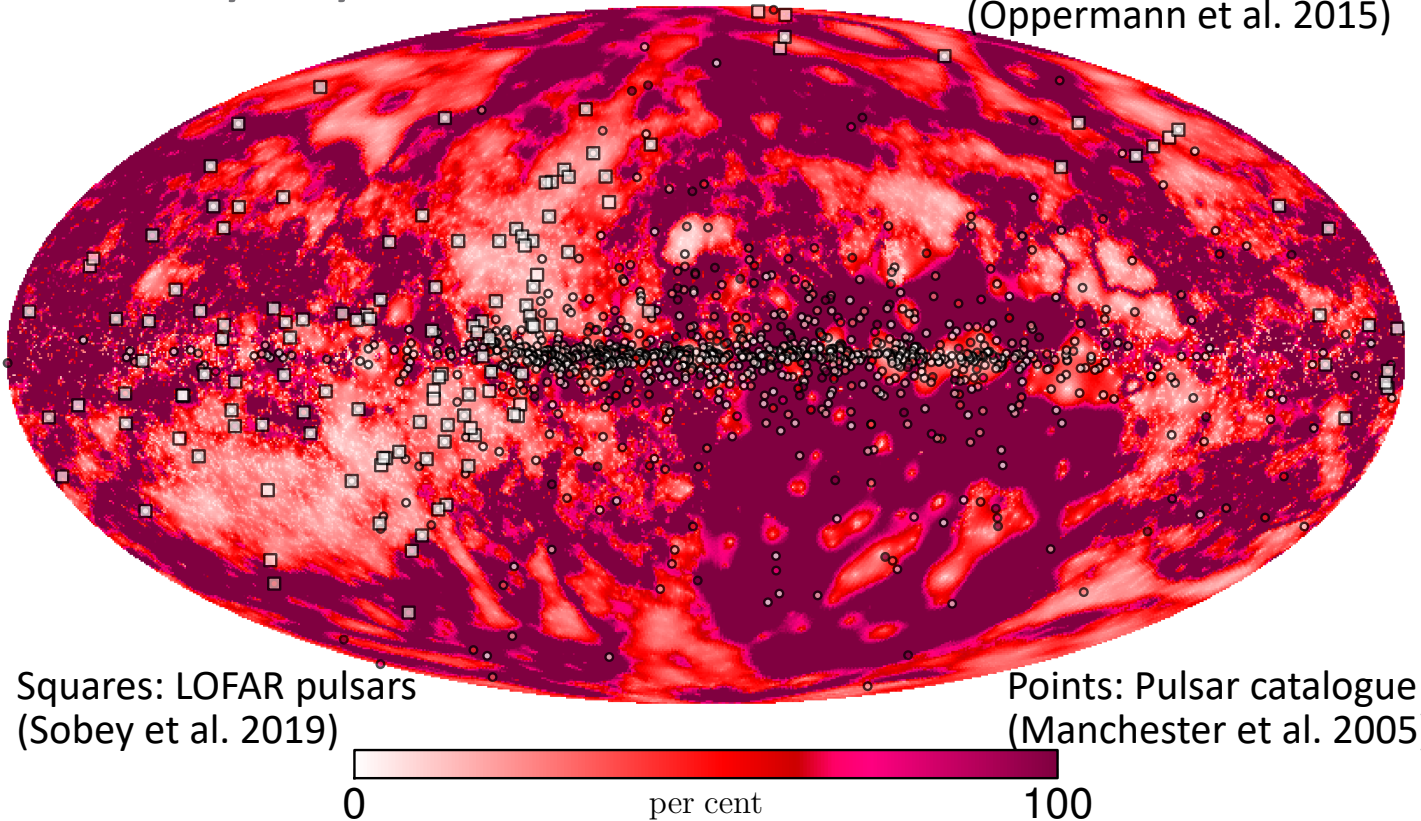




### 3. Galactic magnetic field

## Faraday sky uncertainties

Background: Extragalactic  
(Oppermann et al. 2015)



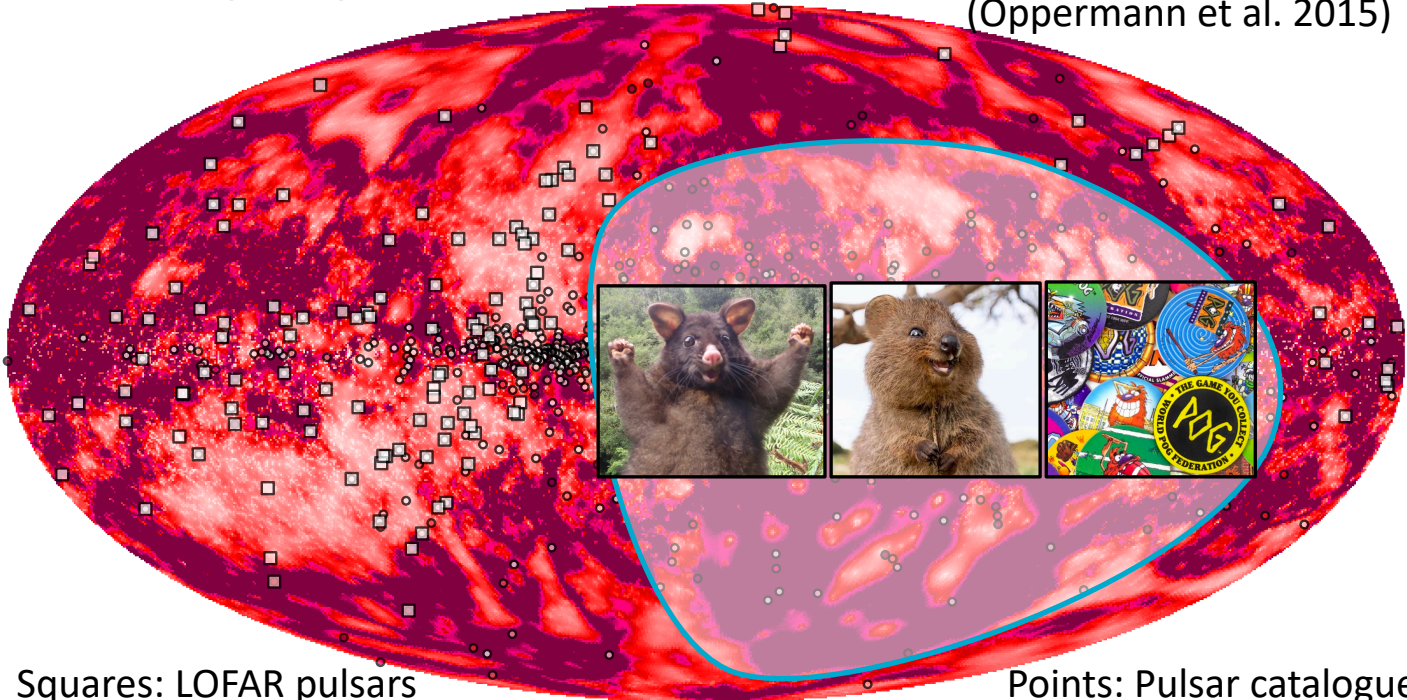




### 3. Galactic magnetic field

## Faraday sky uncertainties

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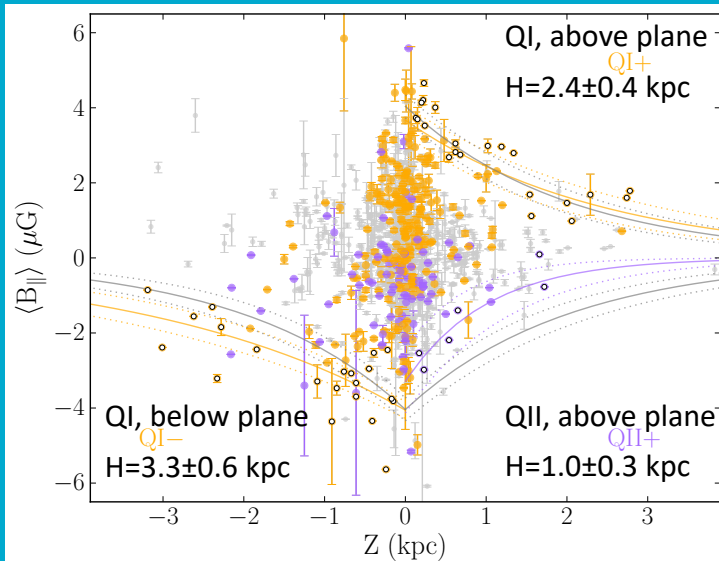
### 3. Galactic magnetic field

Results include:

Magnetic scale height

- Estimated exponential magnetic scale height
  - Pulsar DM, RM &  $\sim$ distance
- Fit using 'outermost' points in  $\langle B \rangle$  vs  $Z$  distance plot
- Average =  $2.0 \pm 0.3$  kpc

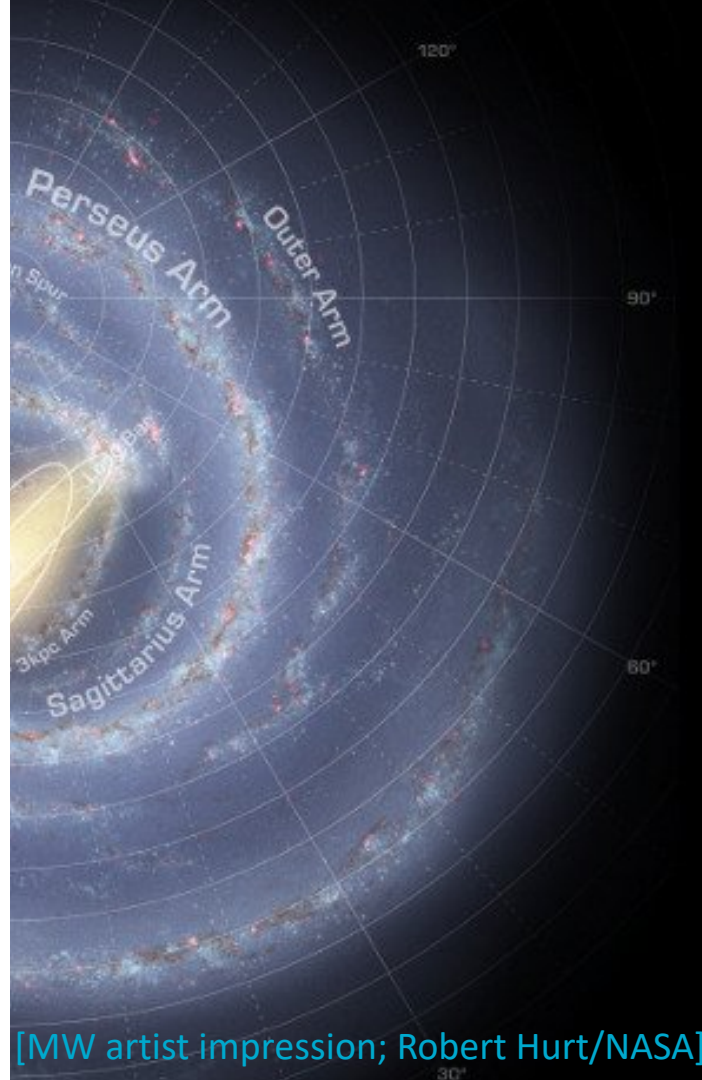
Average magnetic field vs distance from Galactic plane for pulsars with pulsar catalogue and LOFAR RM & DM measurements



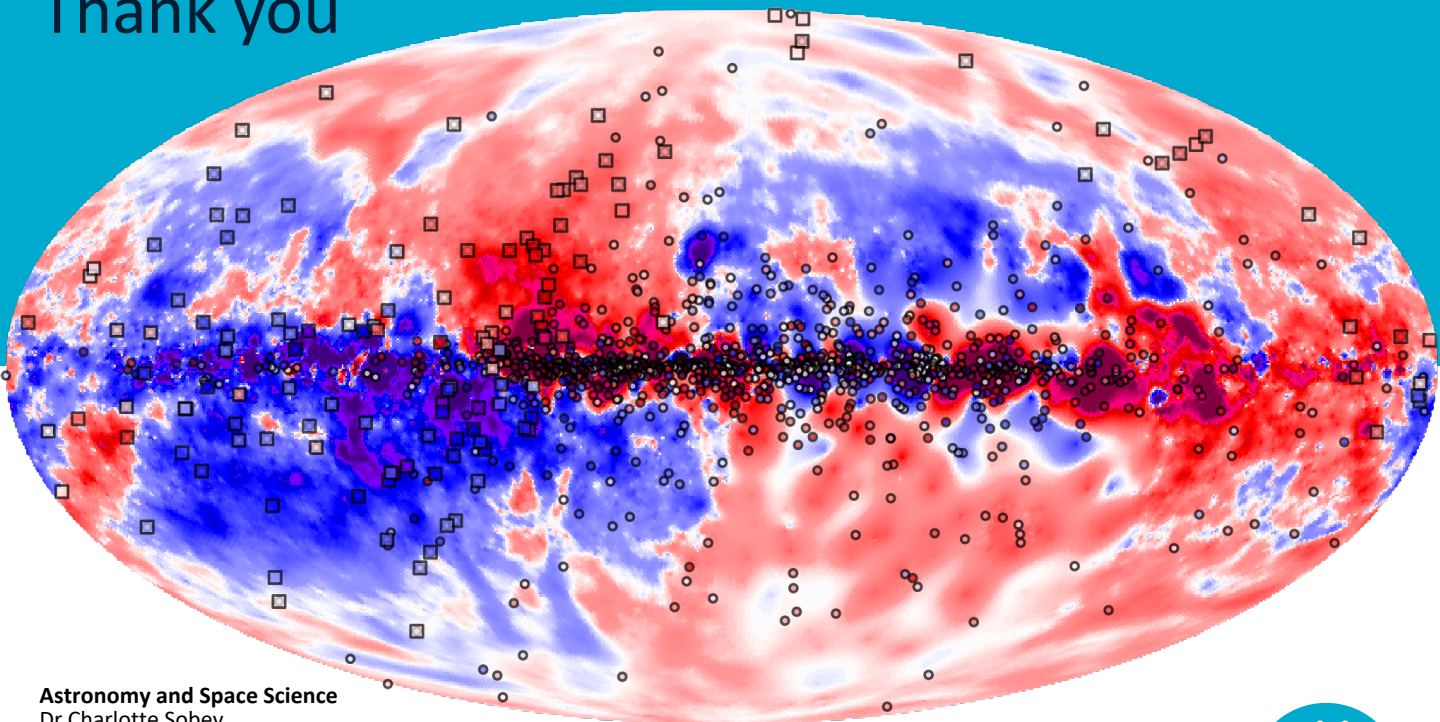
[Sobey et al. 2019]

# Summary

- Science relevant to POSSUM RM catalogue includes:
  1. Search for pulsar candidates
  2. Globular cluster B-fields
  3. Getting involved in all-sky Galactic magnetic field work
- Please contact me with thoughts/comments/questions



# Thank you



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