

# Pulsar population overview

Dunc Lorimer (WVU)

November 2, 2006

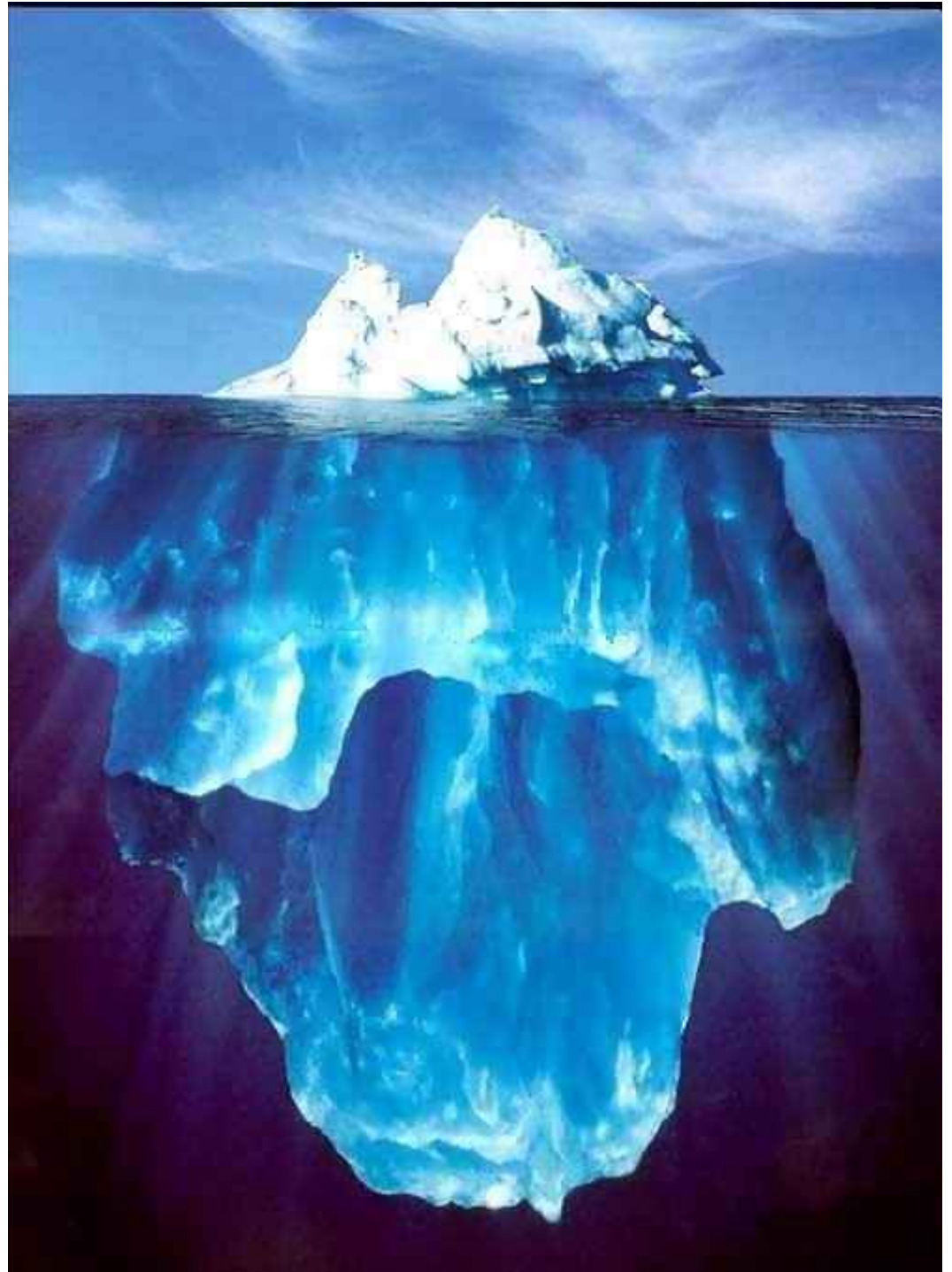
The observed sample

Spin frequencies  $> 10$  Hz

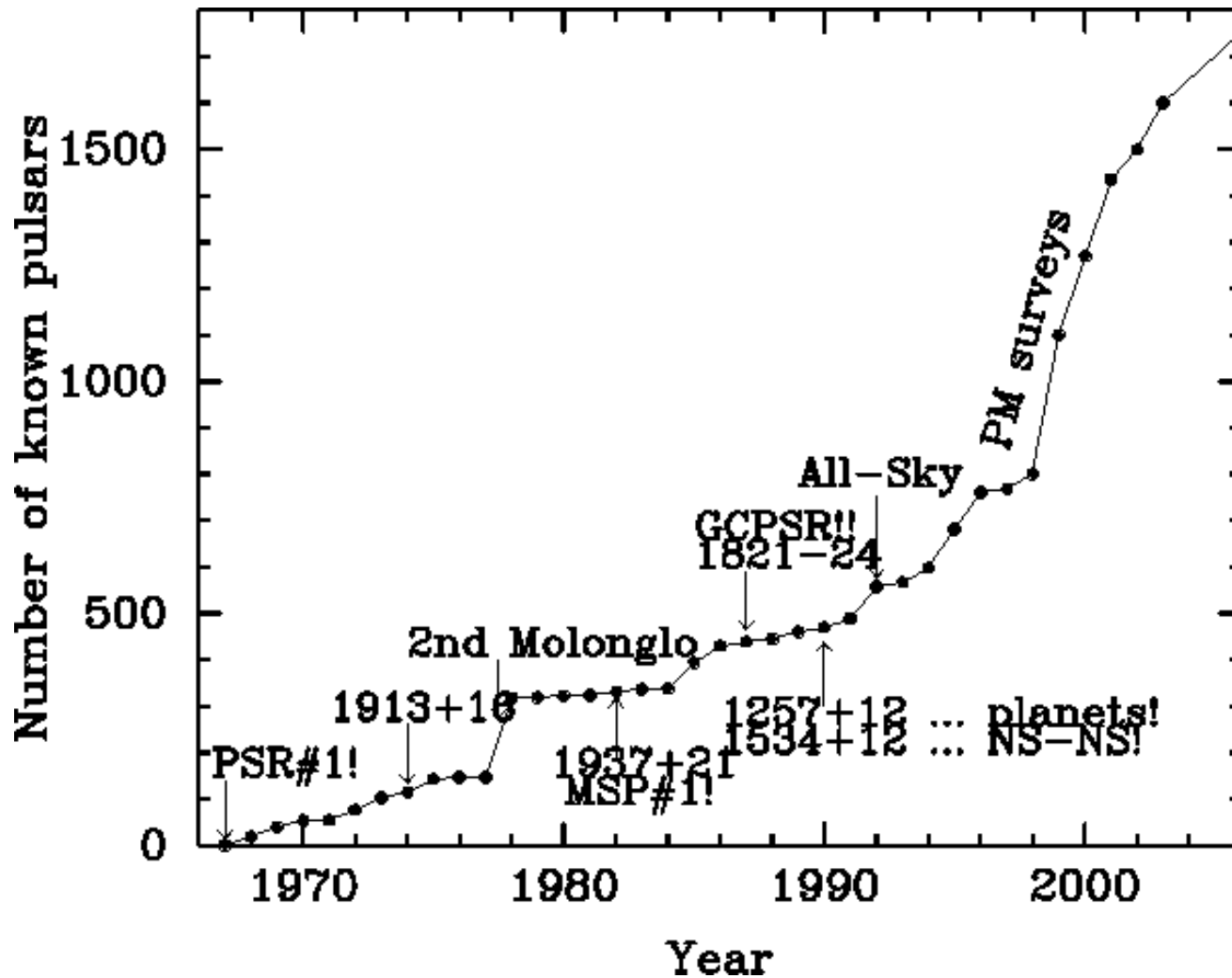
- normal pulsars
- recycled objects

Current/future searches

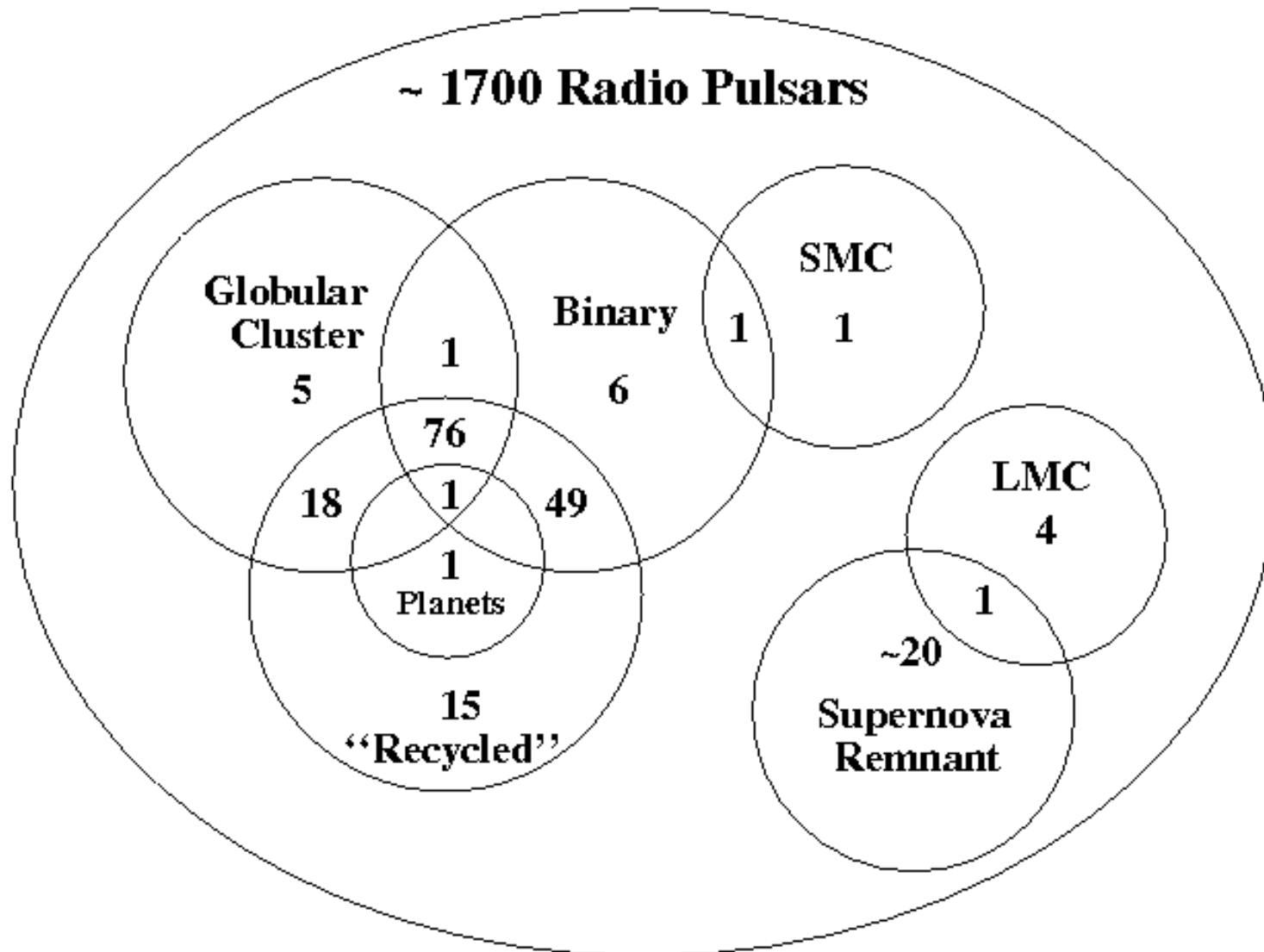
- Arecibo
- GBT
- SKA



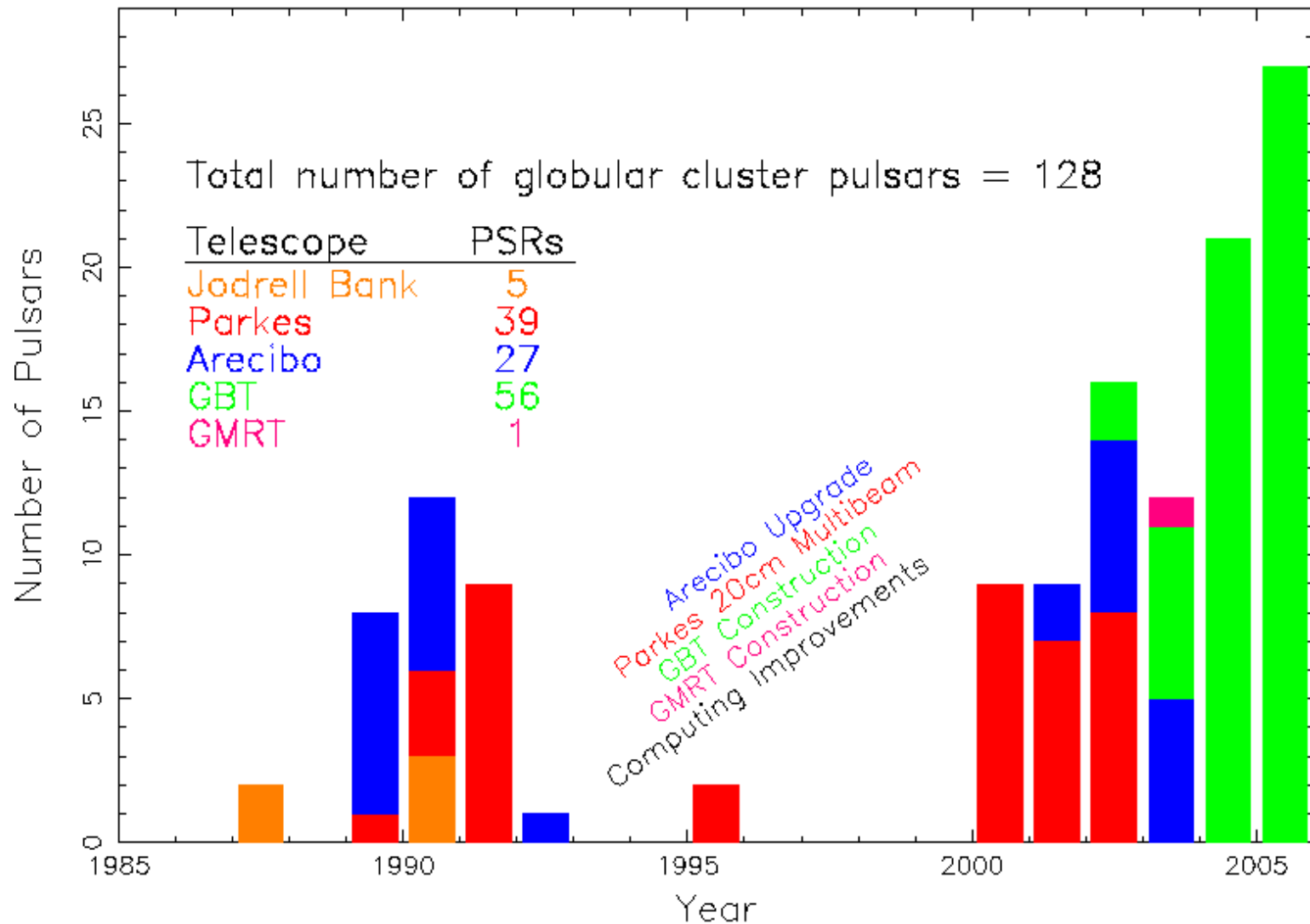
# The observed pulsar sample



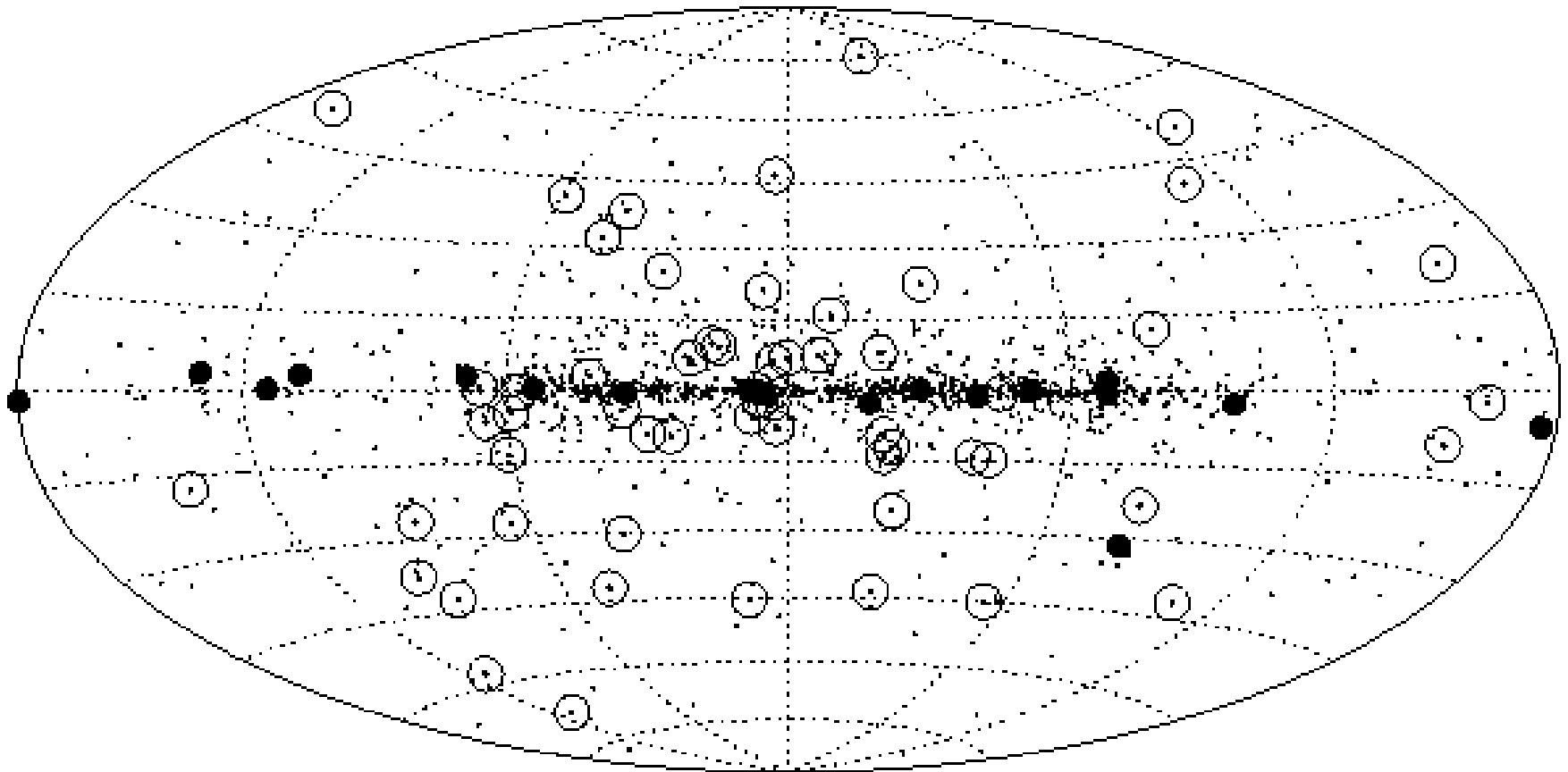
# The observed pulsar sample



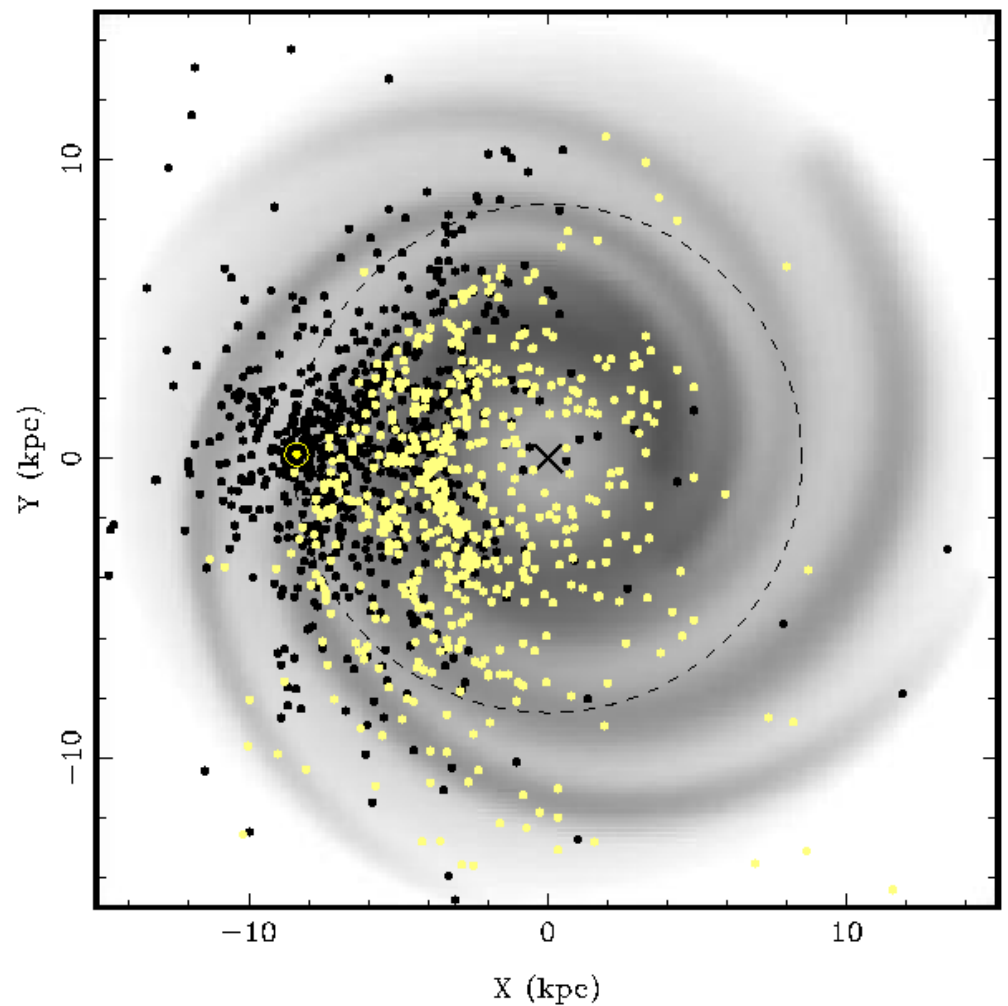
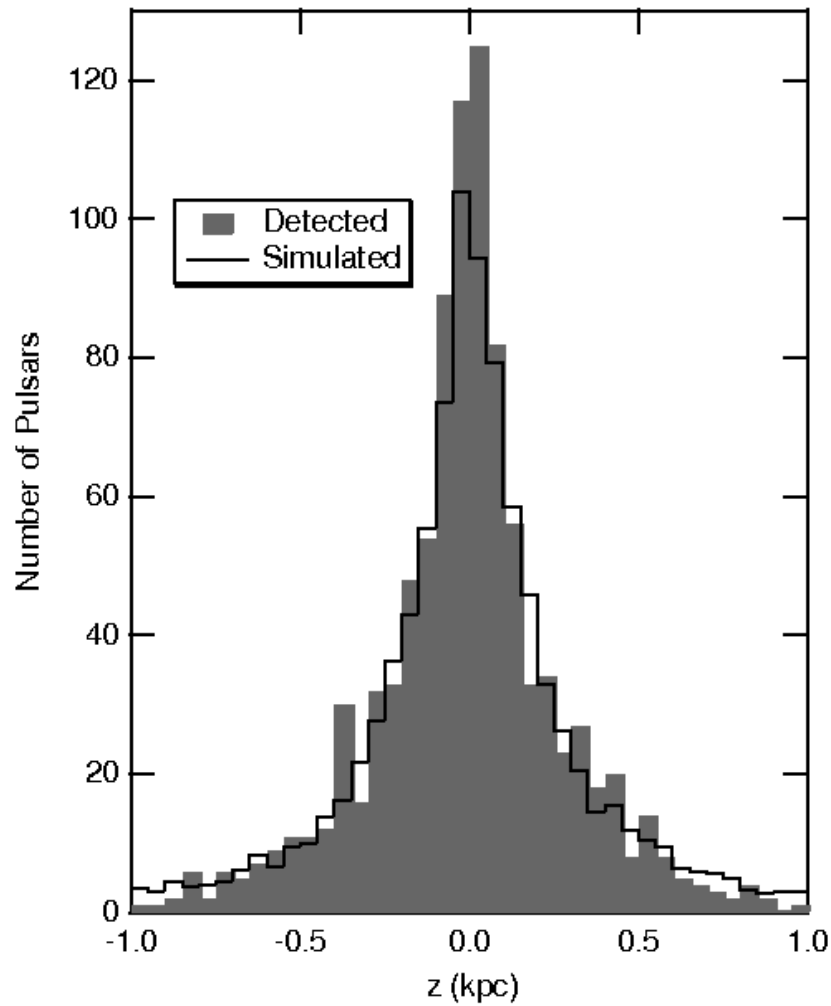
# The observed pulsar sample



# The observed pulsar sample



# The observed pulsar sample

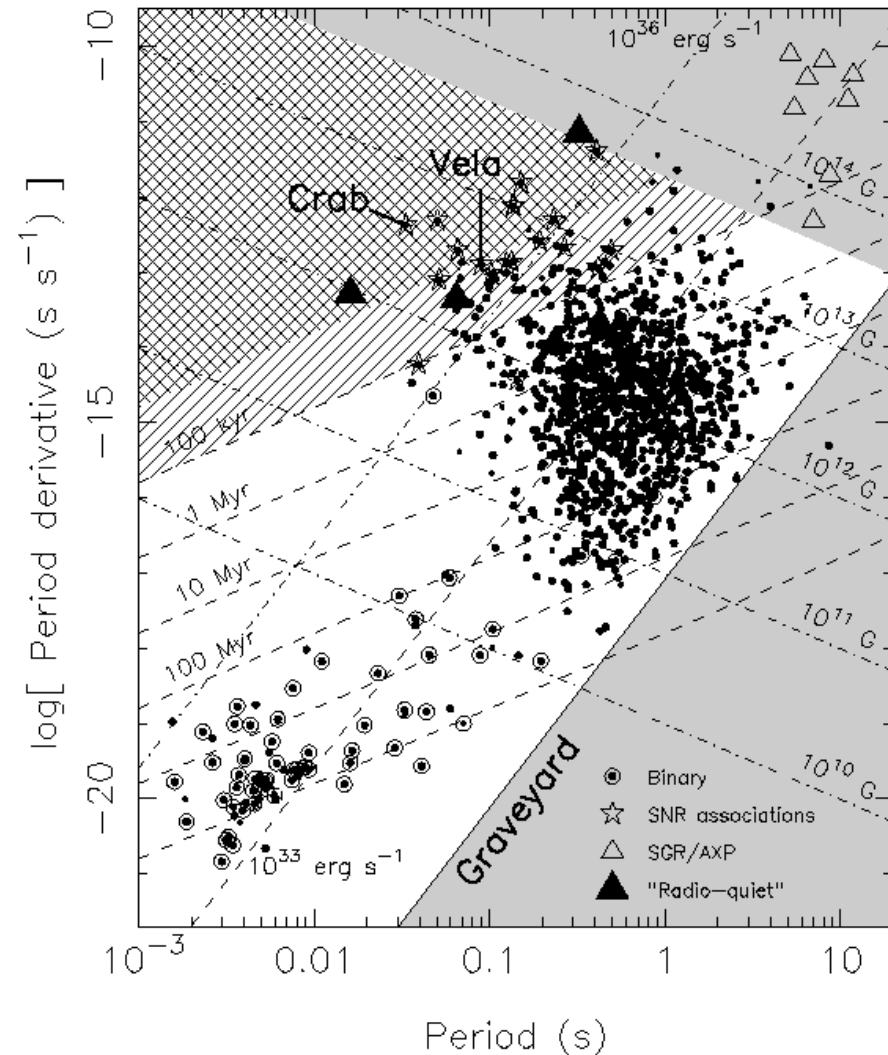


# The observed pulsar sample

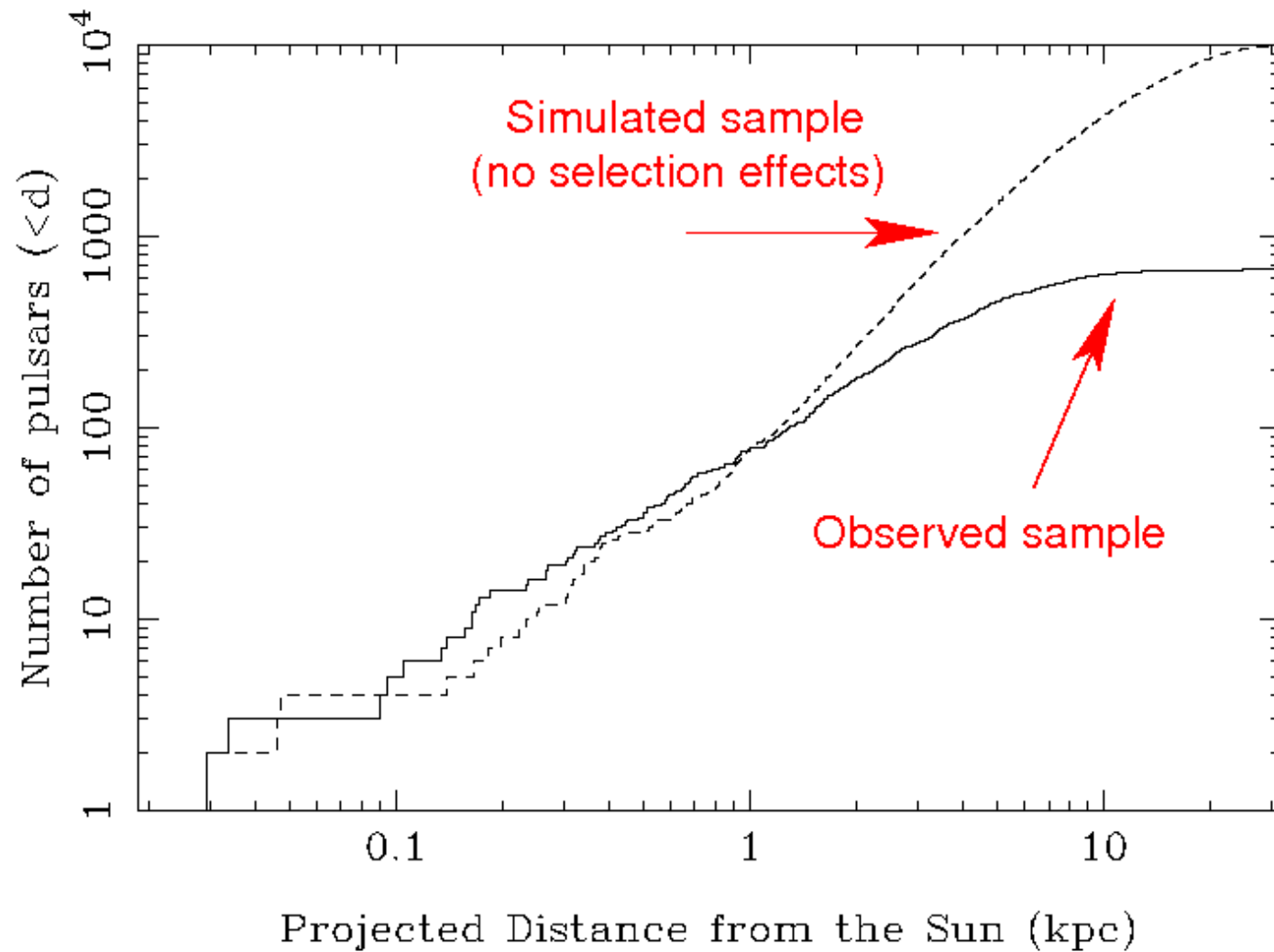
$$B \propto \sqrt{P\dot{P}}$$

$$\tau \propto P/\dot{P}$$

$$\dot{E} \propto \dot{P}/P^3$$



# How complete is the sample?





# Pulsars with $f > 10$ Hz

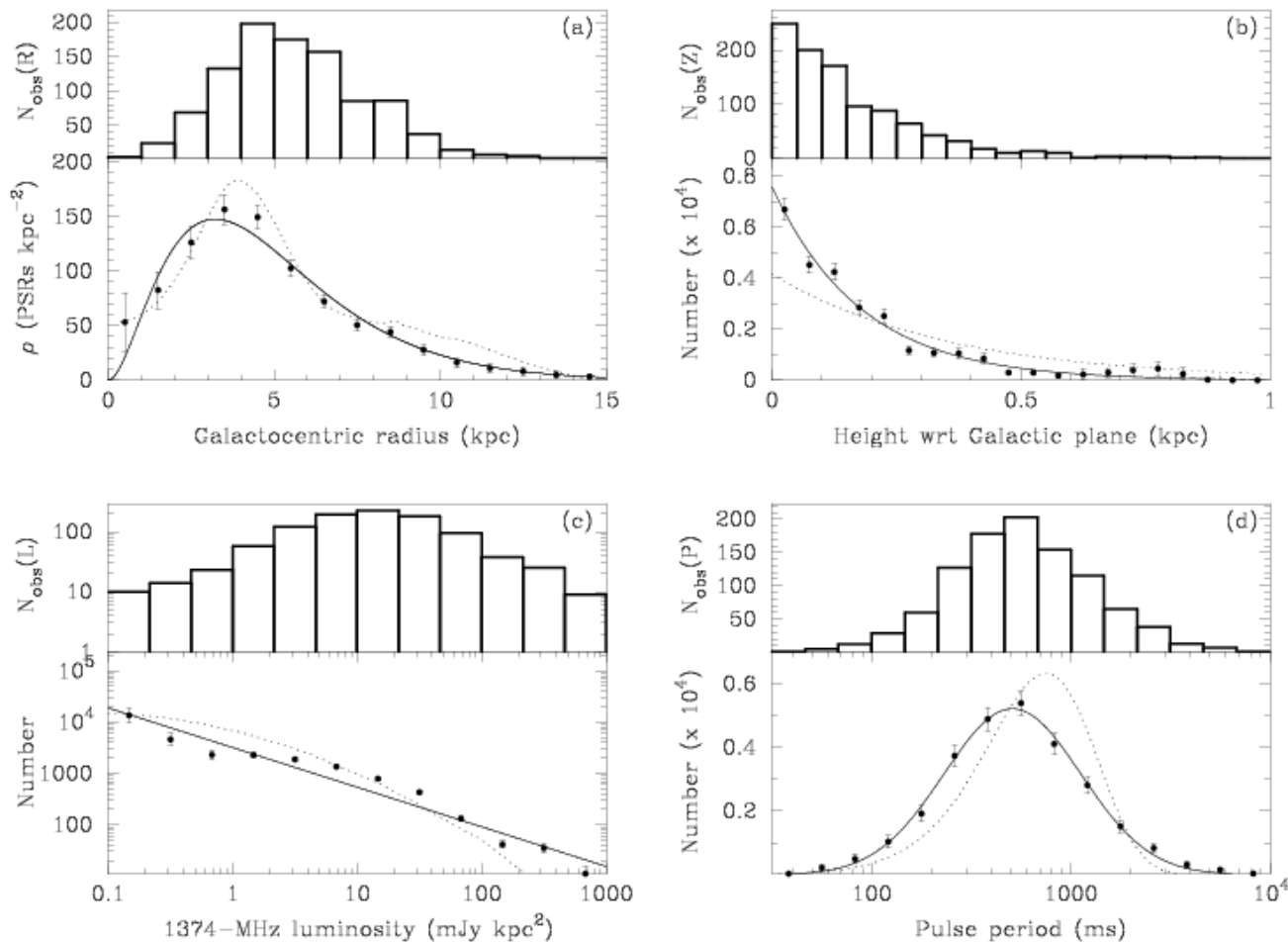
- Over 200 currently known
  - Half of these are in globular clusters
  - Mostly recycled objects in binary systems
  - Some young, normal pulsars cf. Crab
  - Several double neutron star binaries
    - 0737-3039A (Burgay et al. 2003)
    - 1829+2456 (Champion et al. 2004)
    - 1756-2251 (Faulkner et al. 2004)

# $f > 10$ Hz: normal pulsars

- Several new PSR-SNR pairs
  - J0205+6449 in 3C58,  $P = 65.7$  ms  
(Murray et al. 2002; Camilo et al. 2002)
  - J1833-1034 in G21.5-0.9,  $P = 61.8$  ms  
(Camilo et al. 2006)

These are faint radio pulsars at distances of several kpc.

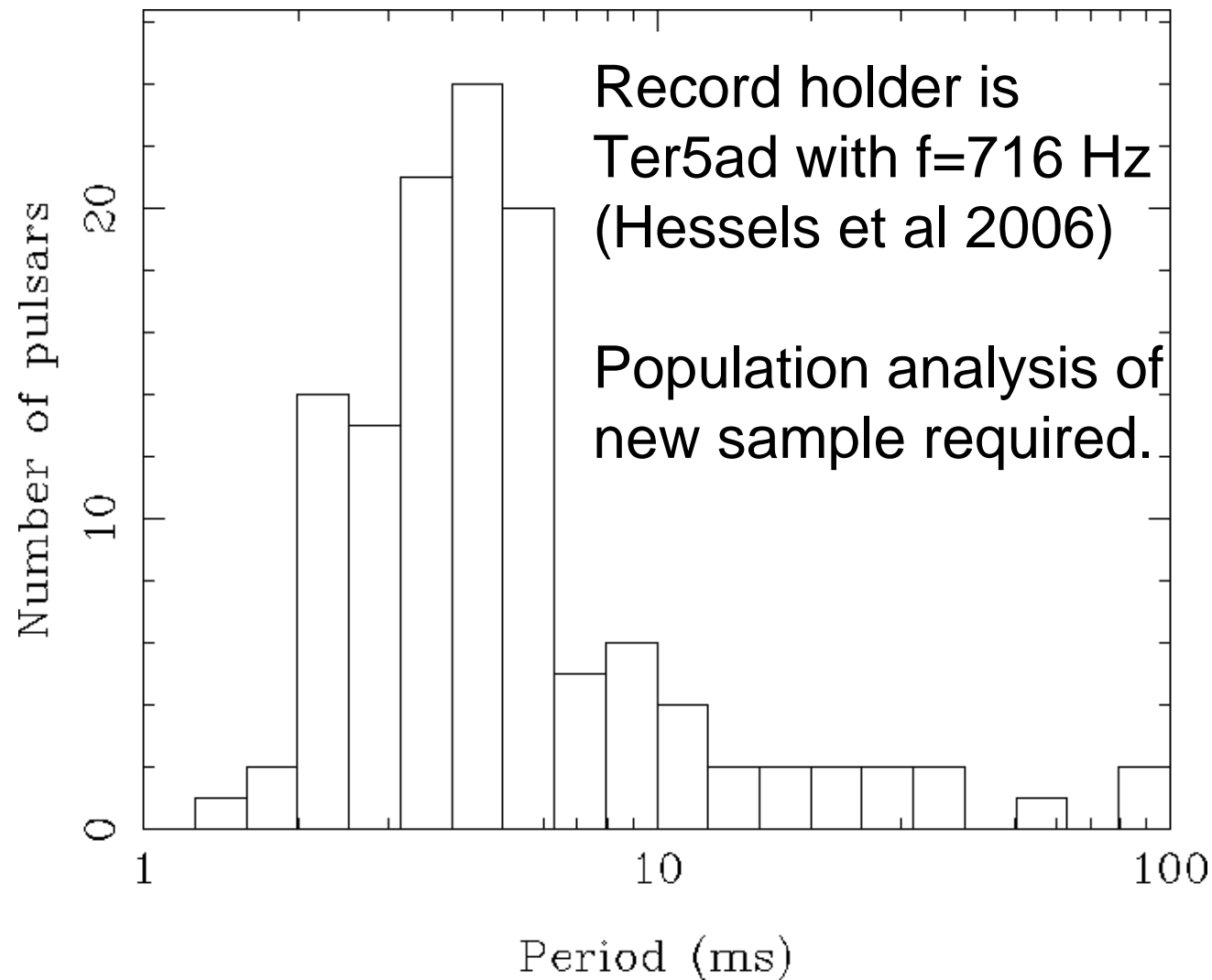
# $f > 10$ Hz: normal pulsars



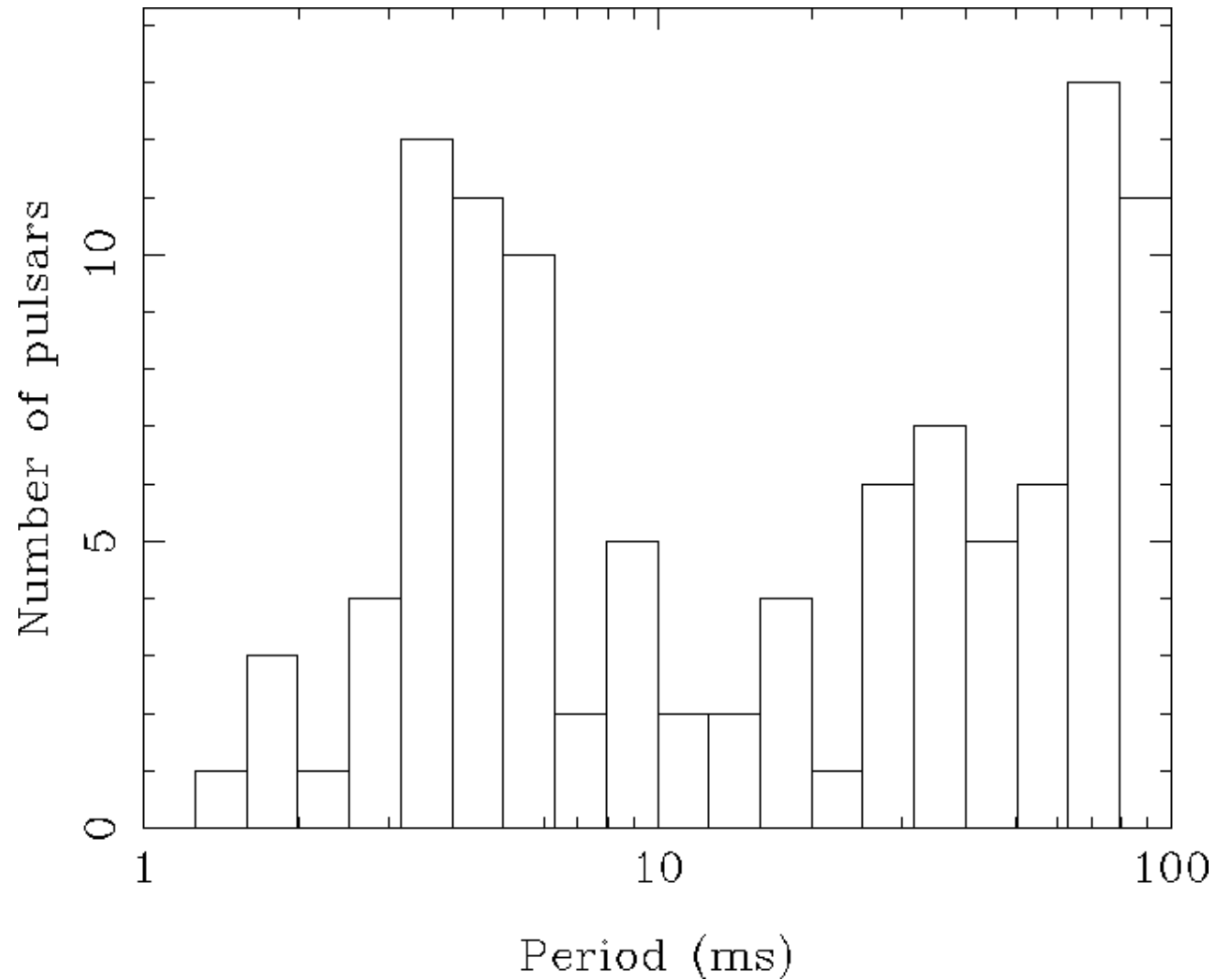
Lorimer et al. (2006)

Approximately 2.5% of all normal pulsars have  $f > 10$  Hz

# $f > 10$ Hz: globular clusters

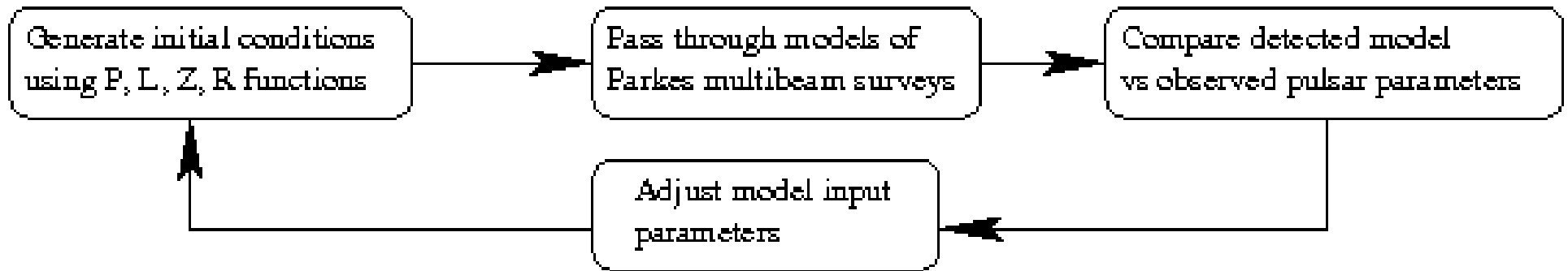


# $f > 10$ Hz: Galactic disk



# MSP population model

Work in progress using Parkes surveys...

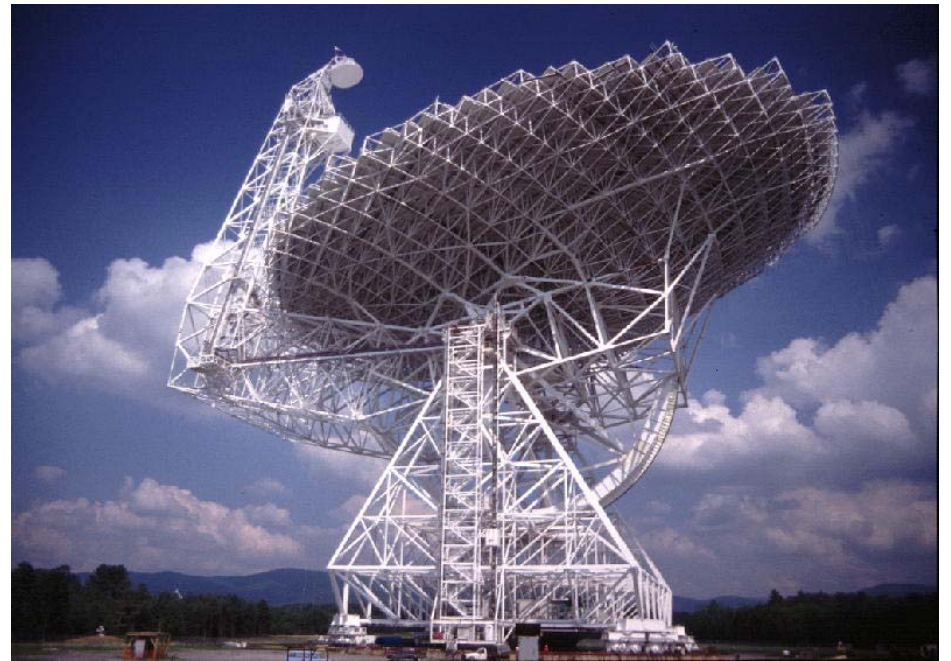


- Current population has 20,000 MSPs
- Predict ~900 MSPs with  $d < 3$  kpc

# Current and future surveys



Arecibo - ALFA (1.4 GHz)



Green Bank - Pband - 350 MHz

# Current and future surveys

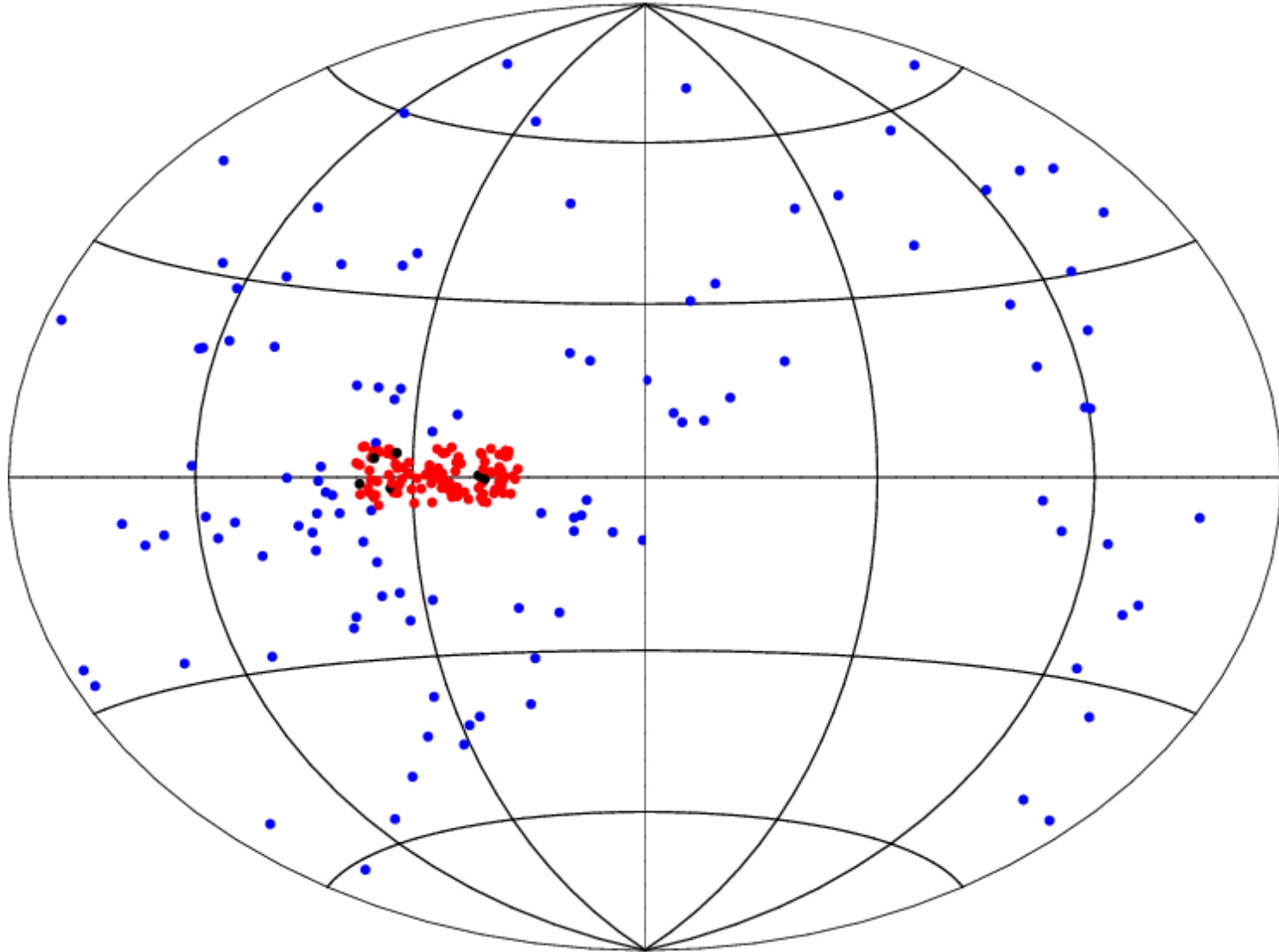
- Arecibo
  - P-ALFA survey
  - 35 new PSRs

Cordes et al. (2006)
- Green Bank
  - 350 MHz survey
  - ~dozen new PSRs

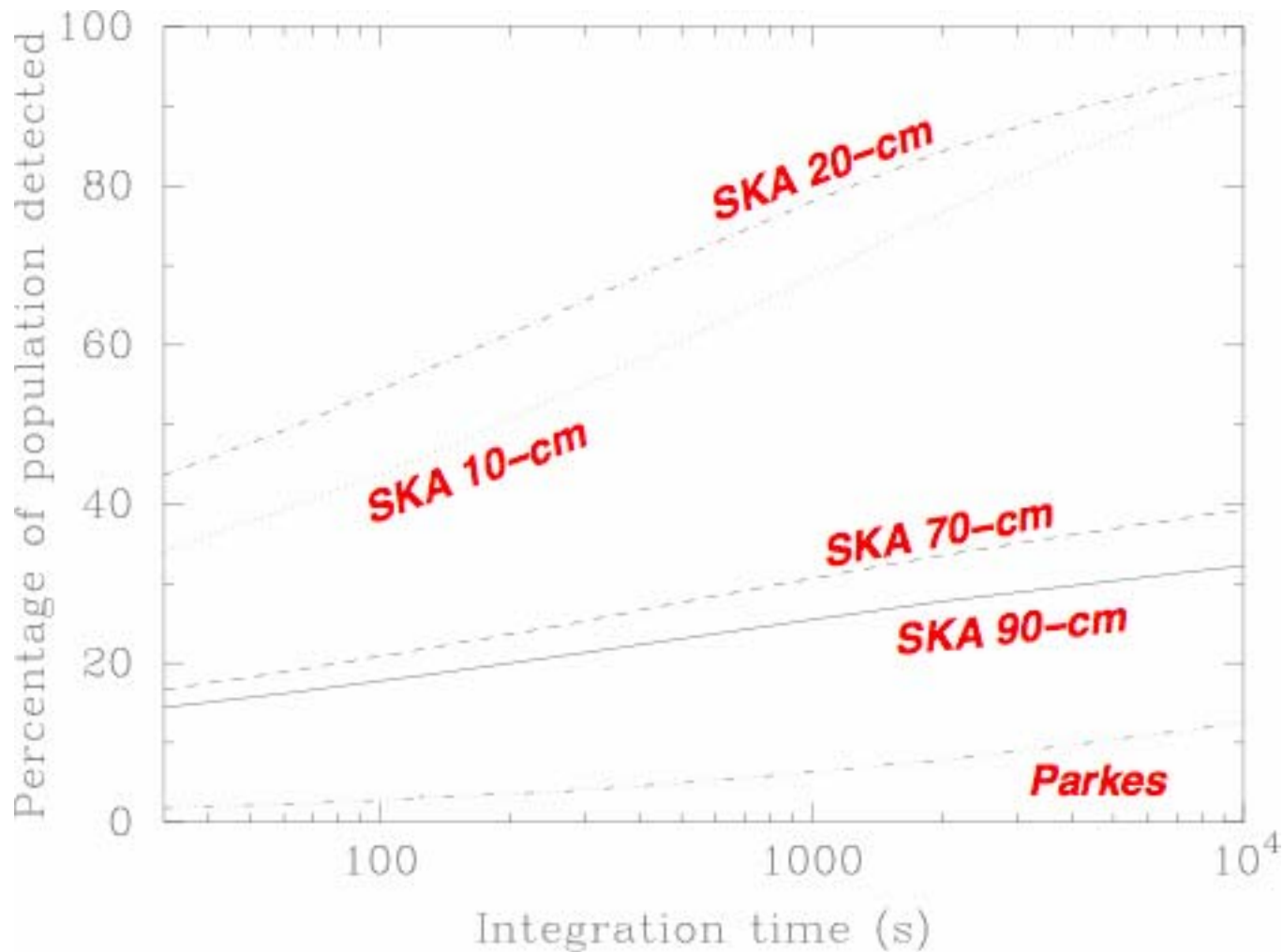




200 new MSPs expected!



# Looking further ahead



# A pulsar survey with SKA

By 2020...

~complete sample

>20,000 normal PSRs  
several thousand MSPs

10s of DNS binaries?  
PSR-BH binary?

Meeting at CfA tomorrow  
All are welcome to attend

