The Extragalactic Radio Sky at Faint Flux Densities

Dr Carole Jackson
Research School of Astronomy & Astrophysics
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Probing deep fields…

~ 3000 galaxies

Radio waveband samples different population of galaxies

13 radio sources
Current Deep Radio Surveys

\[ \frac{\Delta N}{\Delta N_0} \text{ vs. } \log_{10} \text{(flux density / Jy)} \]

- 0.15 GHz
- 0.41 GHz
- 1.4 GHz
- 2.7 GHz
- 5.0 GHz
- 8.4 GHz
Current Deep Radio Surveys
HDF-s ATCA Image (rms=7 microJy)
The future ..... 1 nJy at 1.4 GHz?
Radio-loud AGN
(Quasars & radio galaxies)

CSIRO ATCA
PKS 2356-61 FRII RG

Starburst galaxies

NRAO VLA
M81 spiral galaxy
Physical characteristics
Of the source populations

Spectral Shape

Simple $S \propto \nu^\alpha$ with $-0.7$
or fitted spectral model

-Ignores (peaked) low-
frequency population (if there is one)

-Ignores GHz-peaked
sources
Recipe for predicting the radio sky from the LRLF + Evolution

For the 3 radio galaxy populations (FRI, FRII & SB):

- Determine the LRLF & Evolution
  Adopt reasonable evolution type (LDDE)
  Use source counts & complete samples to constrain model

- Transpose Frequency if required

- Calculate source density (sky area, z distr)

- Adopt reasonable source sizes & shapes
  Randomly place & orient sources on sky
FRI & FRII Evolution & the LRLF

Best-fit to 151 MHz source count

LDDE - FRIIs strongly evolving, FRIIs not
Evolution & the LRLF

LRLF from best-Fit model.

Starburst galaxy

LRLF from 2dFGRS-NVSS (Sadler et al 2002)

Evolution from HDF (Haarsma et al 2000)
Faint radio skies at 151 MHz

1 degree sky region

P-z distribution

10 mJy at 151 MHz
Faint radio skies at 151 MHz

1 degree sky region

2 mJy at 151 MHz

P-z distribution
Faint radio skies at 151 MHz

1 degree sky region

1 mJy at 151 MHz

P-z distribution
Faint radio skies at 151 MHz

10 arcmin square sky region

P-z distribution

1 mJy at 151 MHz
Faint radio skies at 151 MHz

0.1 mJy at 151 MHz

10 arcmin square

P-z distributions
FRI & FRIIs

SBs
Faint radio skies at 151 MHz

From simulated skies - predict resolution required
  - fraction of sources 'overlapped' (line of sight)

Assumes no frequency-size dependence (probably ok up to 1 GHz?)

Assumes no size-RG age dependence

FRI+FRII LRLF + evolution (?) - degenerate, really FR-split ???

Starburst LRLF + evolution (?) - difficult to determine (HDF small sample)
  - Late-type galaxies in LRLF ?

Other populations ?
Faint radio skies at 325 MHz

325 MHz - WENSS source count

Transpose LRLFs to 325 MHz & generate model count to 0.1mJy

Molonglo Demonstrator project - to 300 MHz science - HI absorption against bright RGs
Faint radio skies at 325 MHz

1 degree sky region

2 mJy at 325 MHz
Faint radio skies at 325 MHz

10 arcmin square

0.1 mJy at 325 MHz