

Source finding and measurement in EMU

Andrew Hopkins

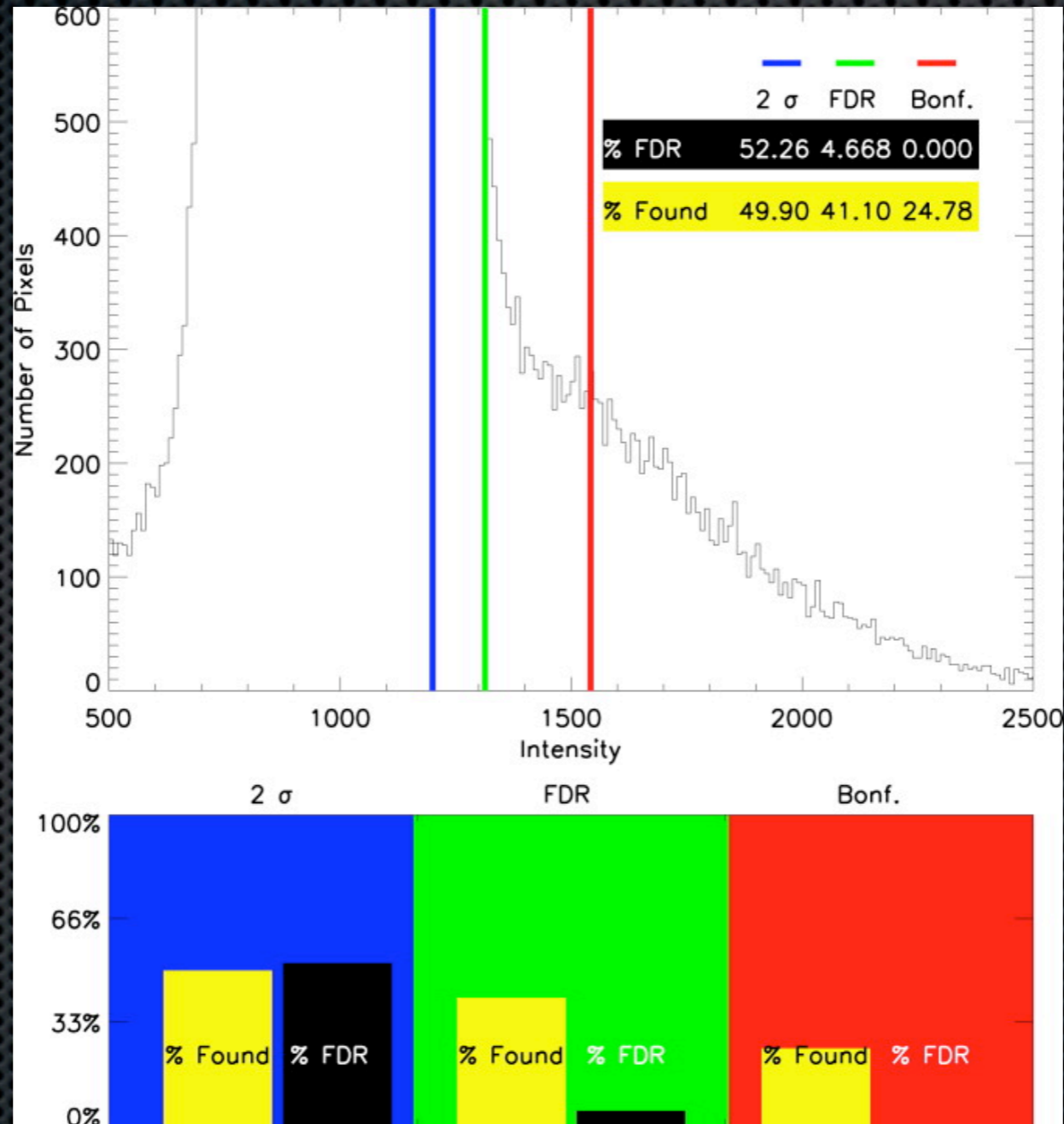
Anglo-Australian Observatory



Different issues

- ✦ Background estimation
- ✦ Threshold definitions (3σ , 5σ , varying?)
- ✦ Gaussian fitting (multiple component), isophotal contours, curve-of-growth
- ✦ Deblending
- ✦ Complex or extended sources
- ✦ Dynamic range

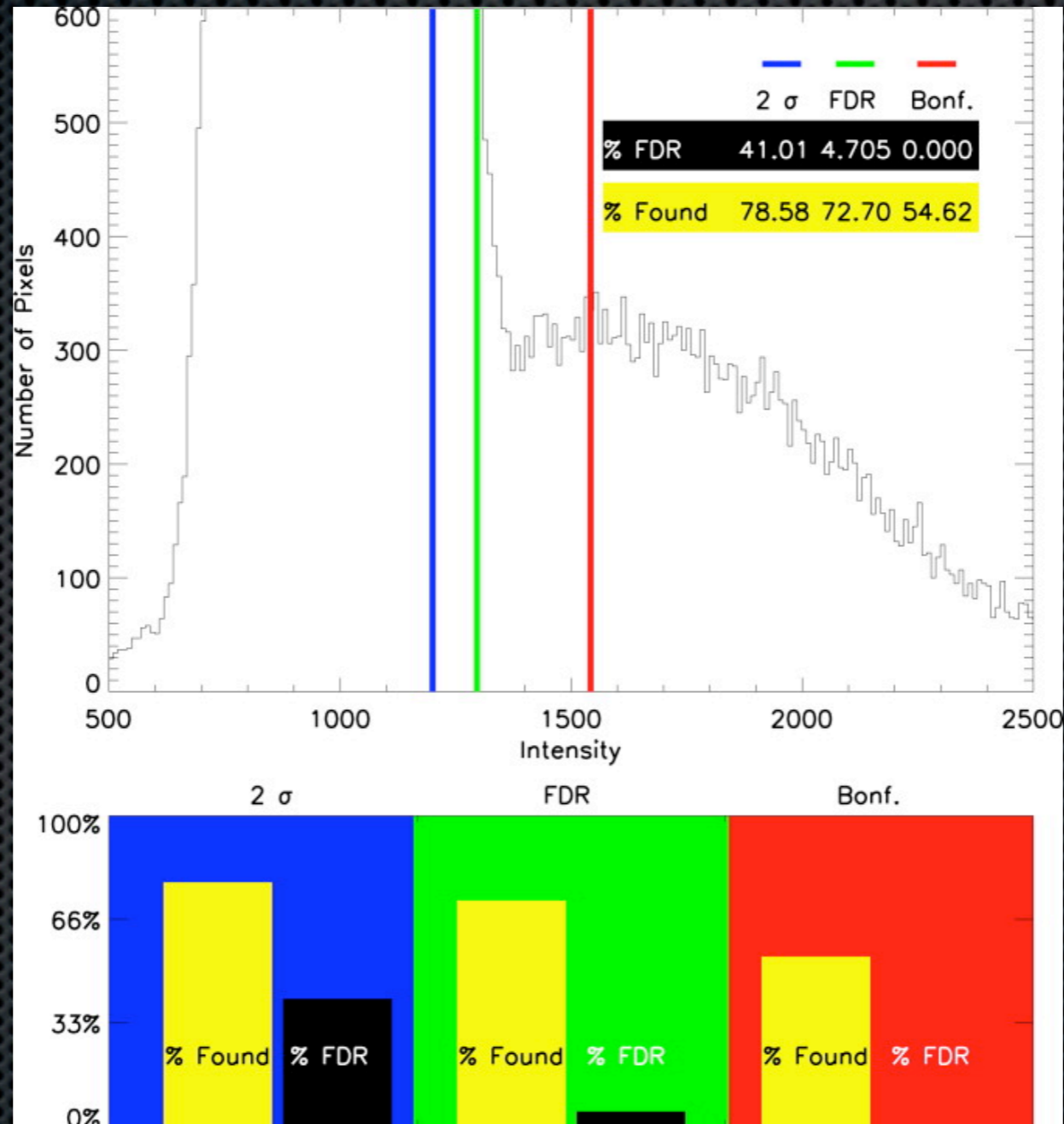
False Discovery Rate



Miller et al., 2001, AJ, 122, 3492

Hopkins et al., 2002, AJ, 123, 1086

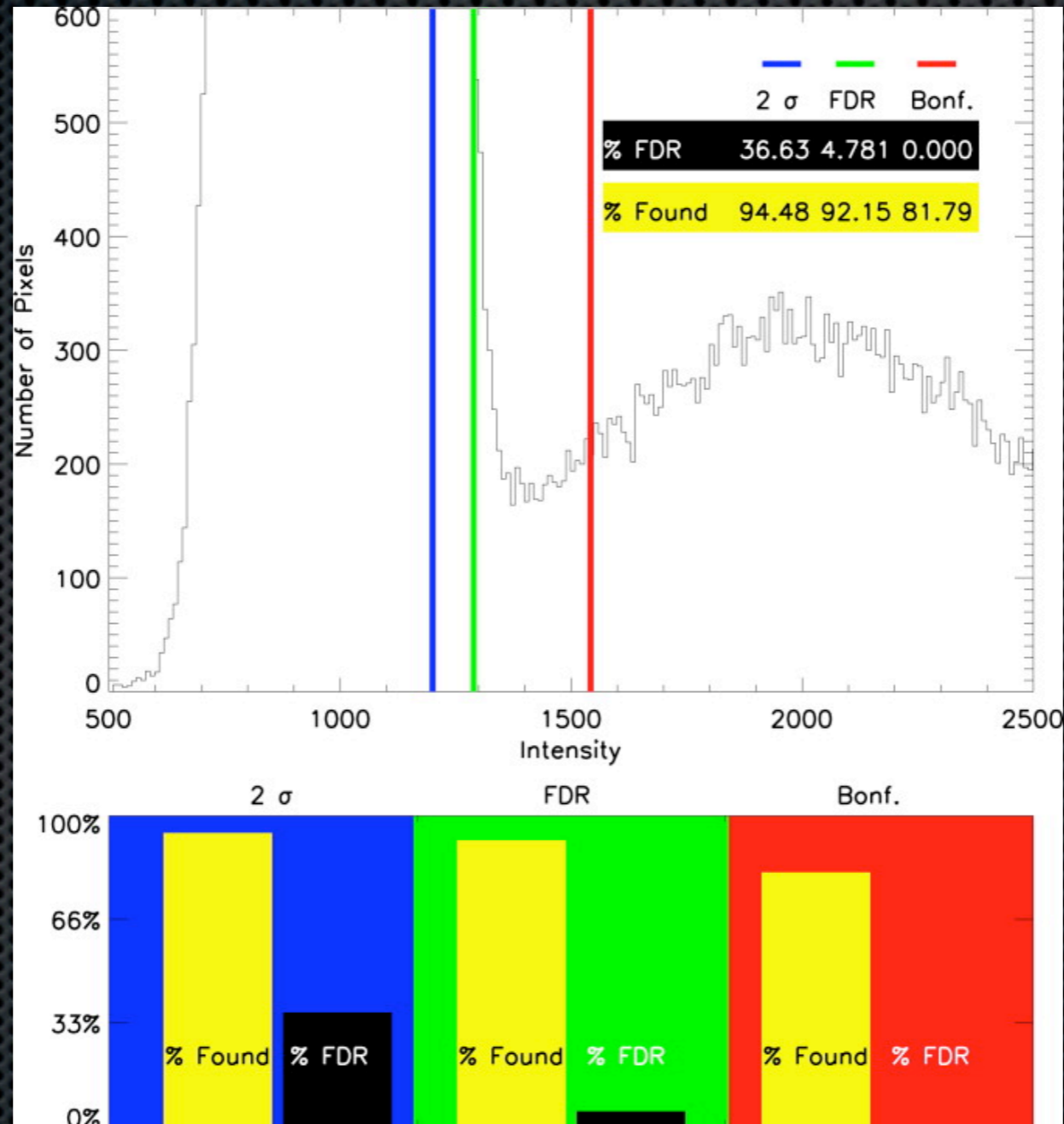
False Discovery Rate



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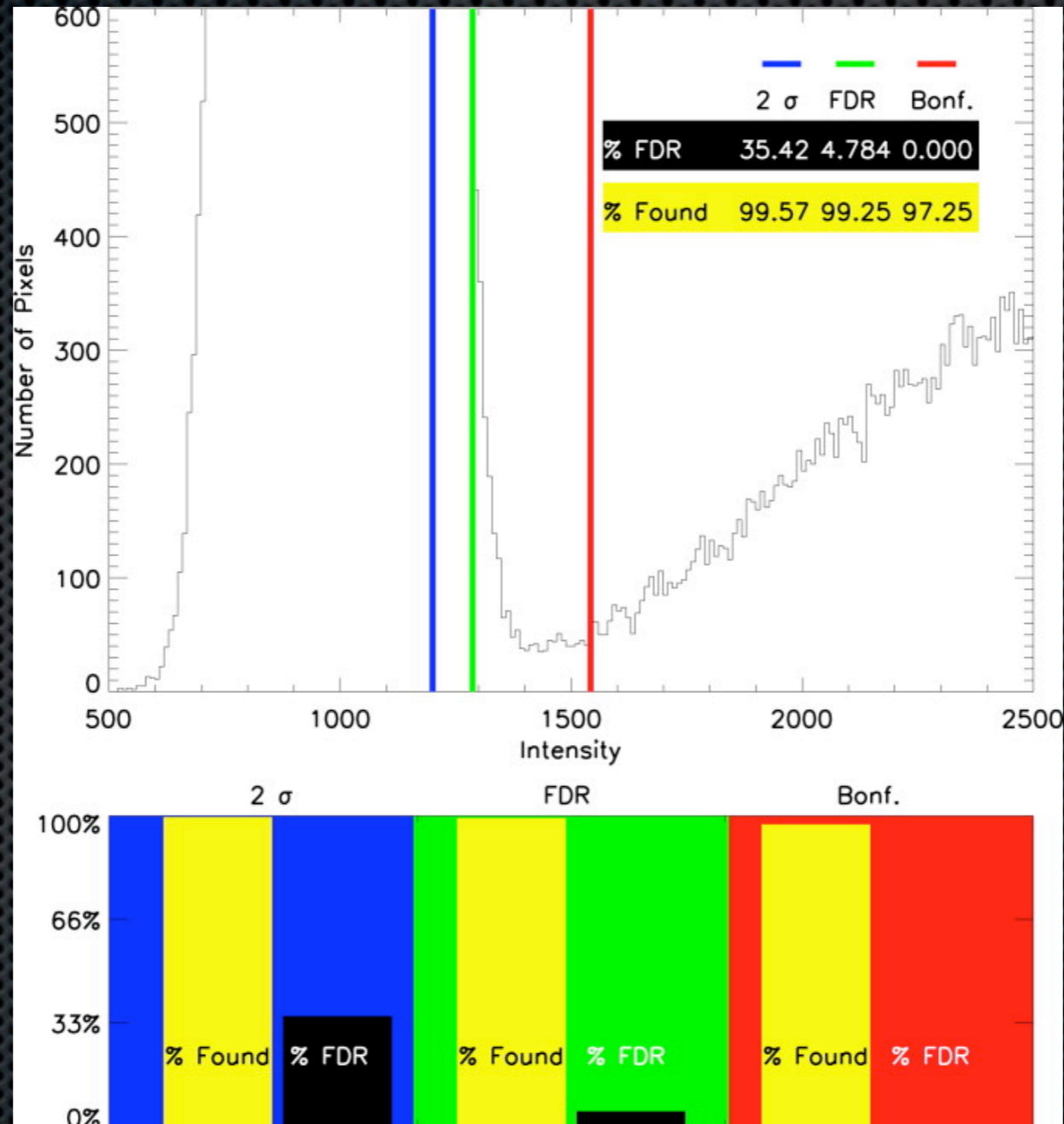
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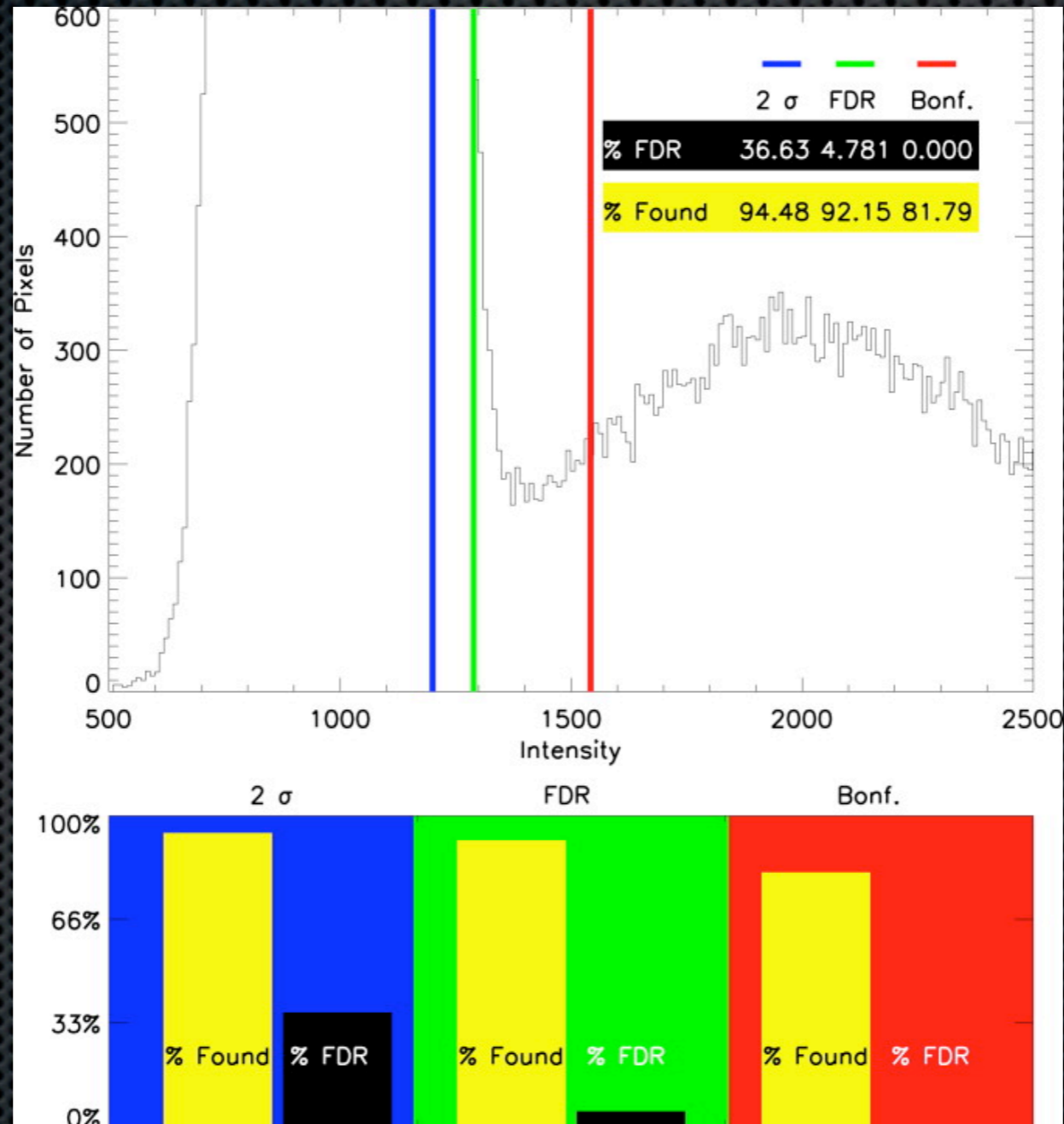
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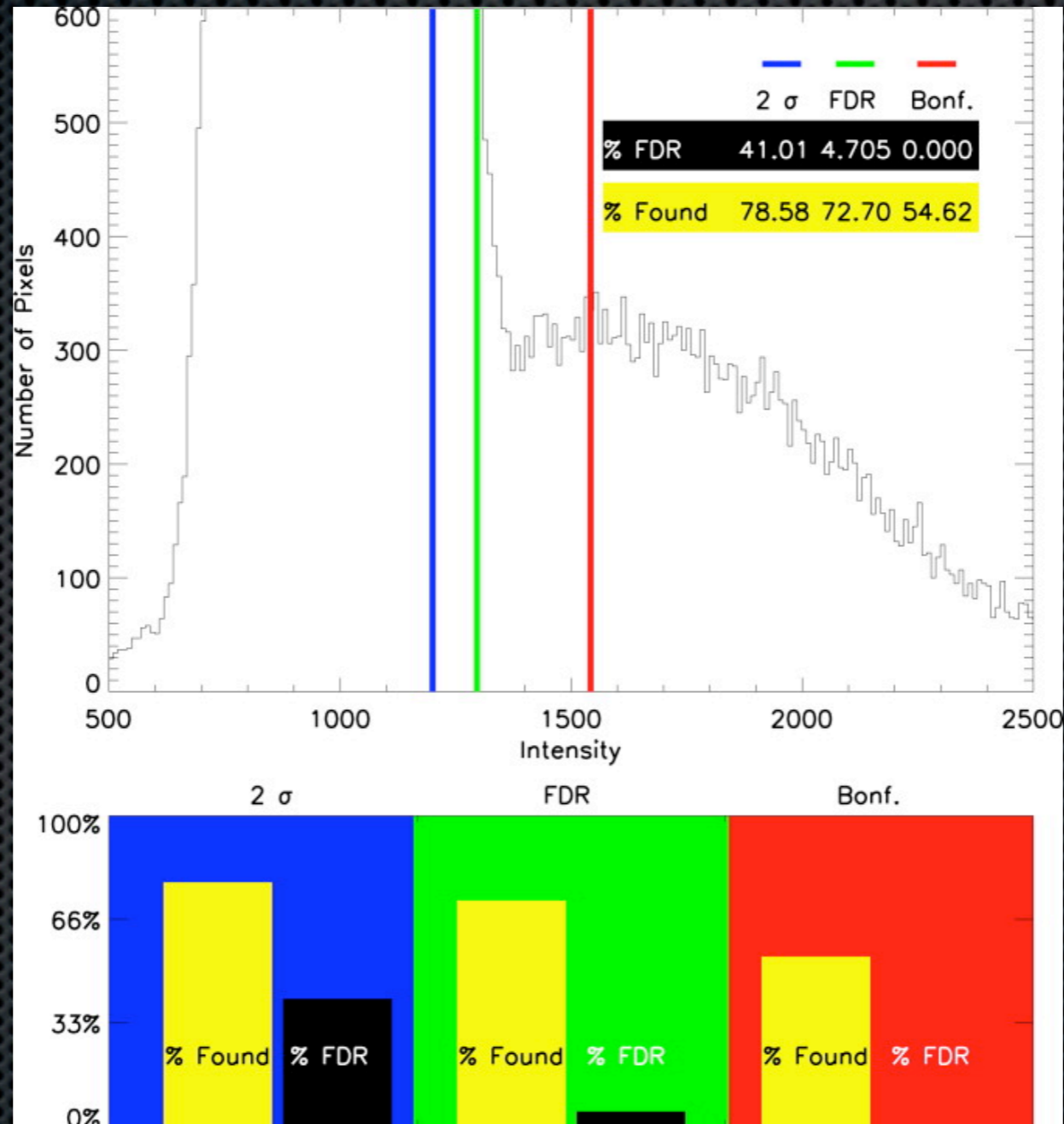
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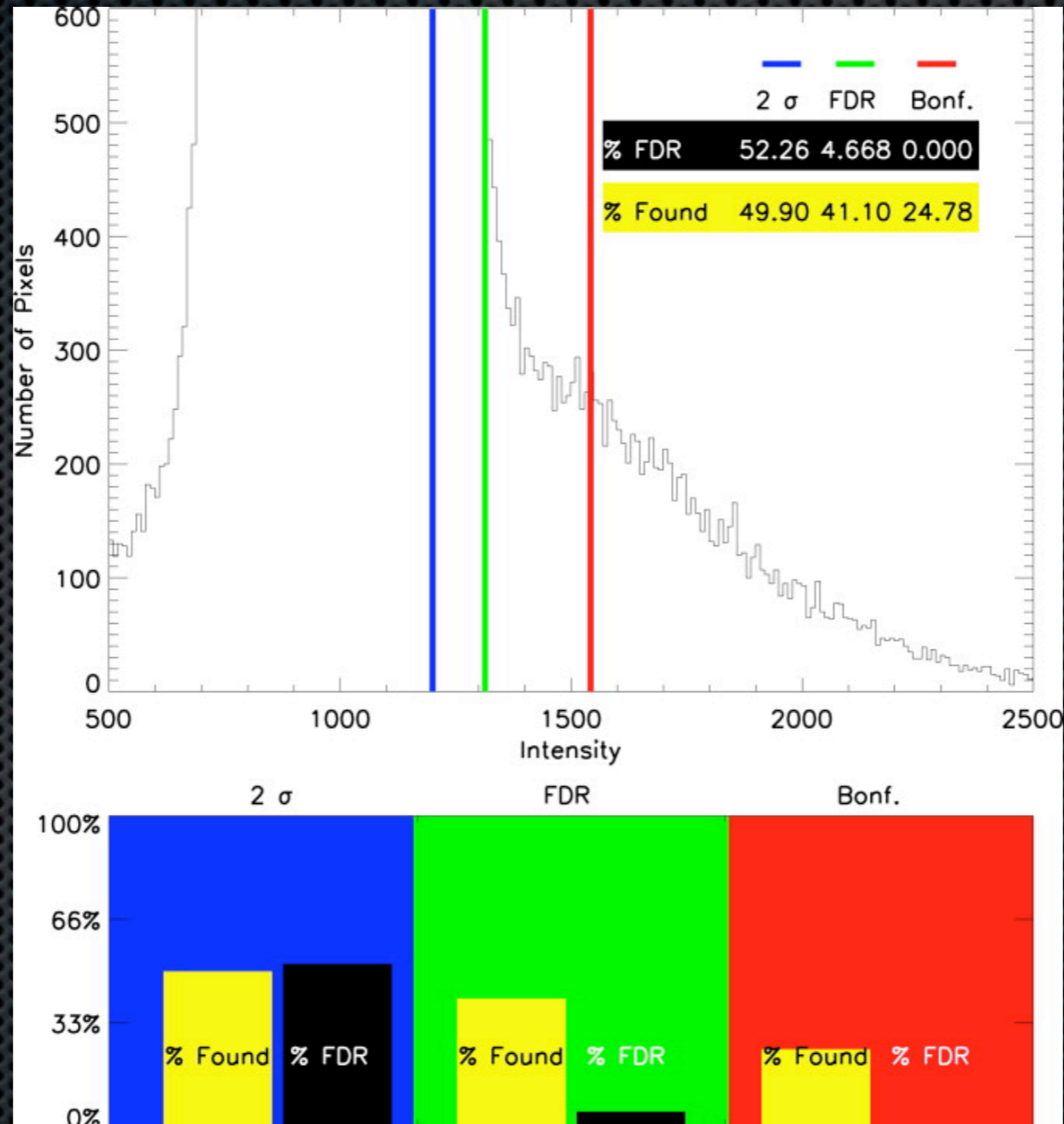
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Miller et al., 2001, AJ, 122, 3492

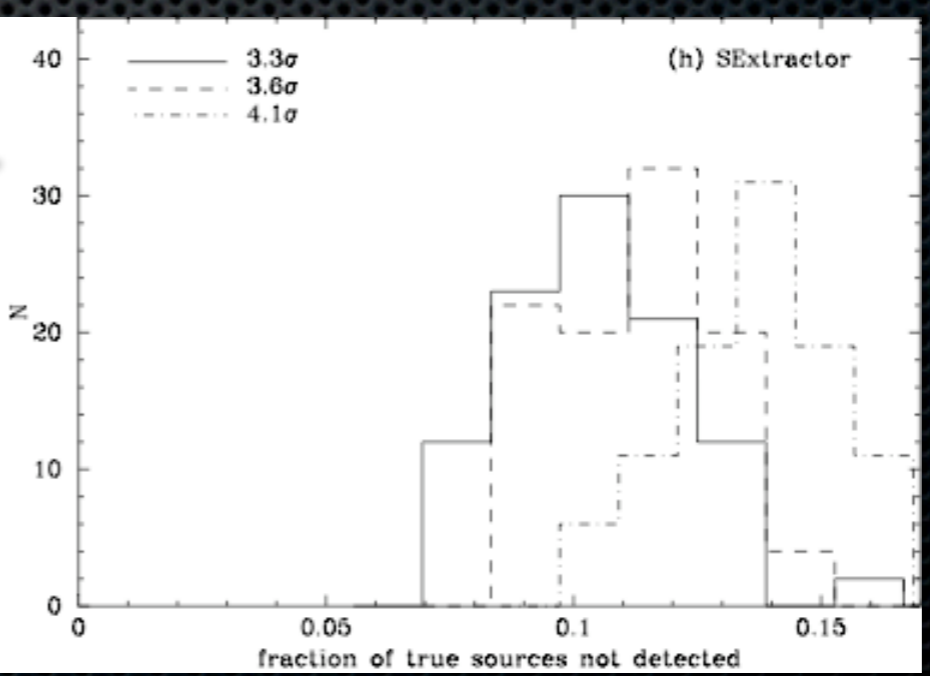
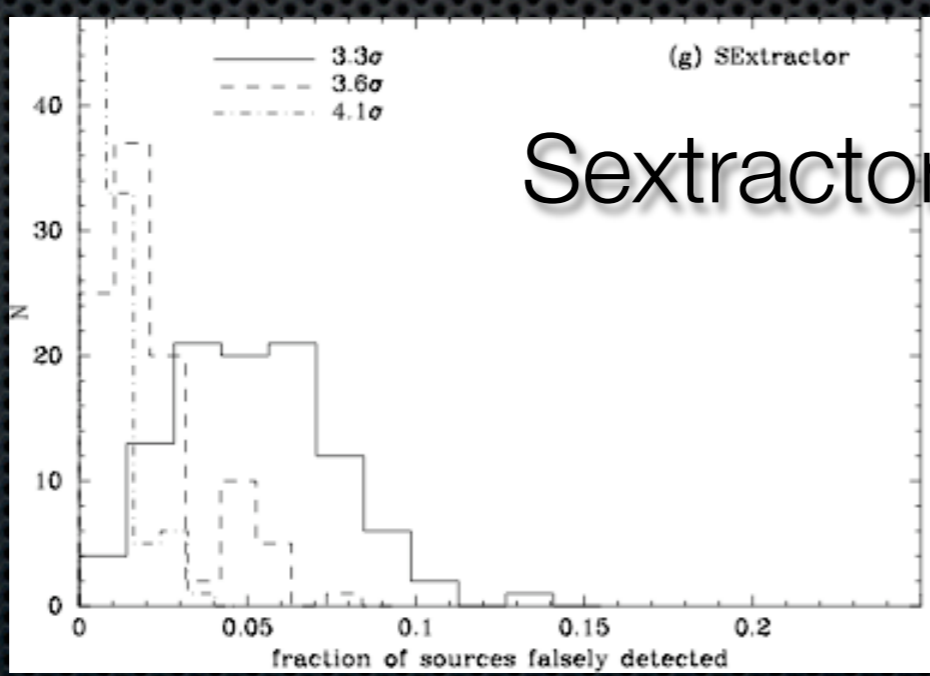
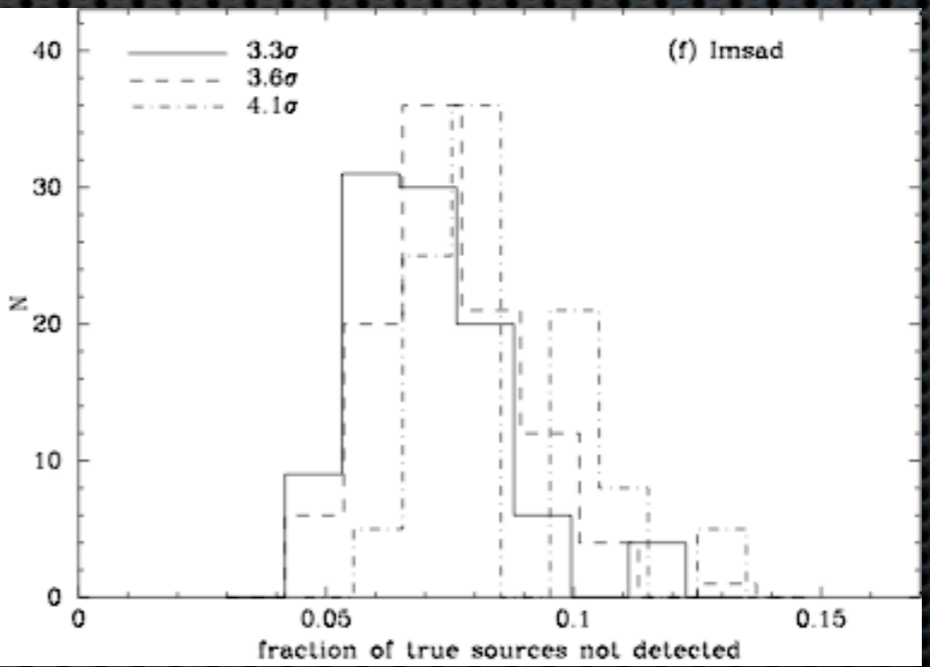
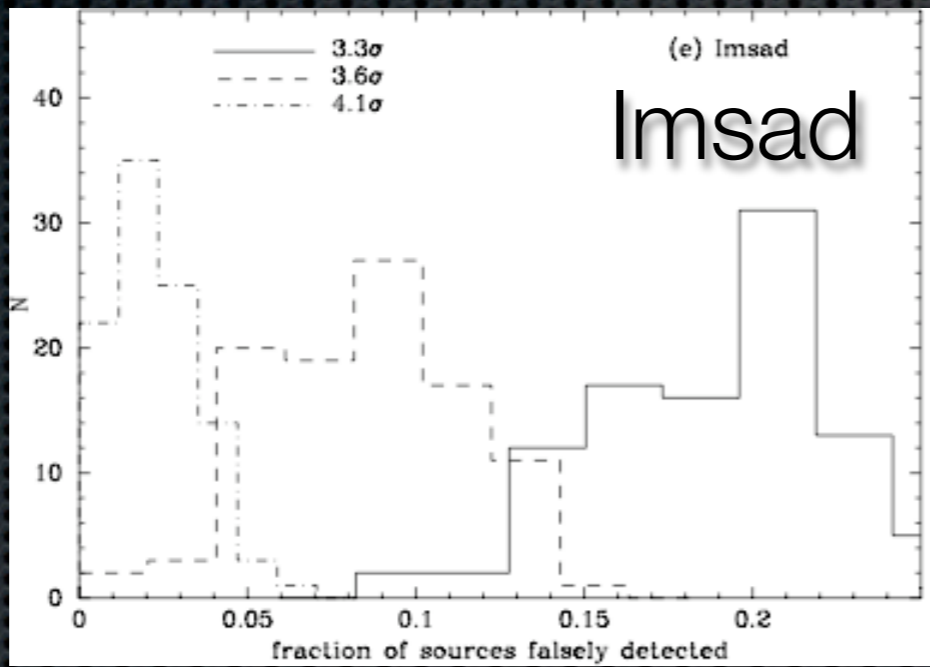
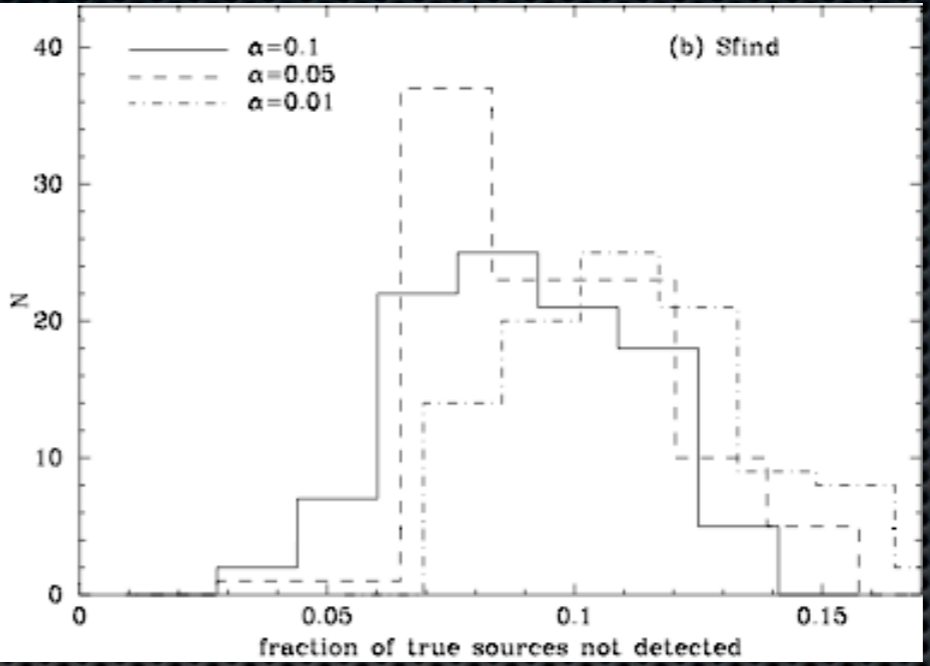
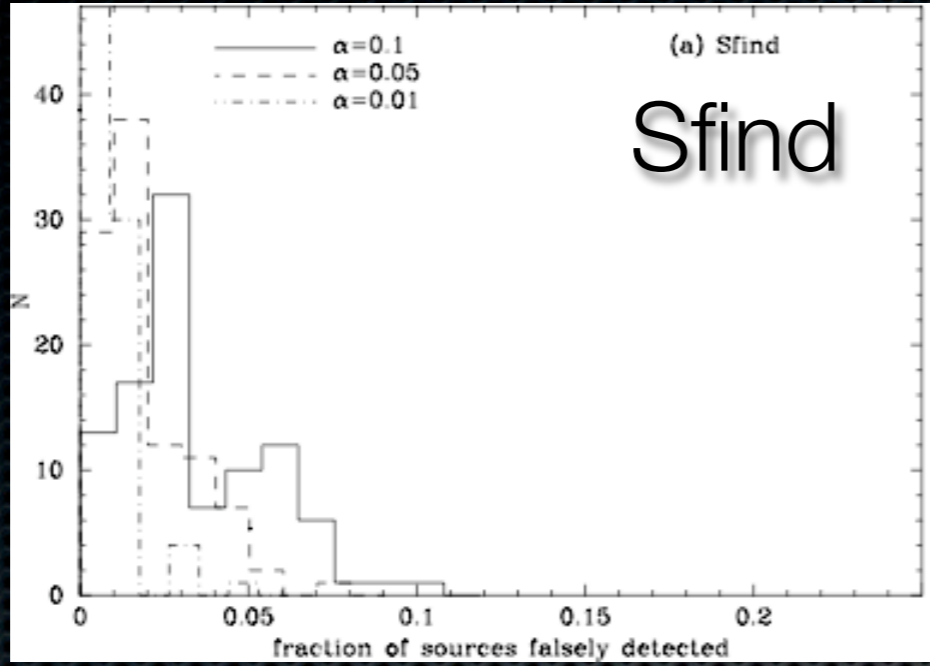
Hopkins et al., 2002, AJ, 123, 1086

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Different tools (existing)

- ✦ VSAD (AIPS)
- ✦ Imsad (miriad)
- ✦ Sfind (miriad)
- ✦ SExtractor (standalone)
- ✦ DUCHAMP (ASKAPsoft)
- ✦ Wavelet/matched-filter techniques
- ✦ Many others, including those specific to facilities or surveys (LOFAR pipeline, SDSS pipeline, etc)

Different techniques

- FDR technique for setting thresholds (this has been recently updated with an approach that defines the fraction of false detections for **sources**, not just **pixels**, see: <http://arxiv.org/abs/0910.5449>)
- Which technique for flux density estimation? Gaussian fits, flux sums, curve-of-growth, floodfill, others?
- For extended sources, shape and intensity distribution information need to be captured. Flux-moments (SExtractor), morphology parameters (CAS?), others?
- Can population statistics be used to help parameterise individual sources (two-point correlation functions, etc)?
- These all need to be tested and compared to identify an optimum solution. Different existing tools have different approaches.

Where to next?

- Really want to compare and test different **tools**, but more fundamentally different **techniques**, to identify an optimum solution
- This solution is likely to be different for point sources and extended sources. We need to identify where to draw the line, or how to implement parallel detection techniques (ideally one approach would asymptote to the other in the appropriate limit, e.g., a flux-sum/flood-fill approach for extended emission reproducing point-source fluxes)
- Need to set up tests and comparisons of existing techniques, using common datasets (agreed in this workshop), and identify the optimum solution. Volunteers?