

Observational Cosmology

Bruce Bassett

SAAO and UCT

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South African Observational Cosmology

- SAAO (Mainly the SALT astronomers and post-docs)
- UKZN - UWC - UCT
- UCT Maths/SAAO (2006-)

Renee Hlozek (MSc, SA, astrogrid course)

Patrice Okouma (MSc, Gabon)

Yabebal Taddese (MSc, Ethiopia)

Jacques Kotze (PhD, SA)

Mike Brownstone (PhD, USA)

SAAO

- Steve Crawford (post-doc) –
“Luminous Compact Blue Galaxies in Intermediate Redshift Galaxy Clusters”
- Yasuhiro Hashimoto (SA) –
“Robust quantitative measures of cluster X-ray morphology, and comparisons between cluster characteristics”

SAAO

- **Alexei Kniazev (SA)** –
“A Search for PNe in Nearby Galaxies with SDSS Imaging Data”
- **Nic Loaring (SA)** –
“The evolution of host mass and black hole mass in QSOs from the 2dF QSO Redshift Survey”

SAAO cont...

- **Petri Vaisanen (SA)** –
“Adaptive optics discovery of a supernova in the nuclear regions of the luminous infrared galaxy IRAS 18923-3413”
- **Kurt van der Heyden (post-doc)** –
“The Peculiar SN 2005hk: Do Some Type Ia Supernovae Explode as Deflagrations?”

SALT and observational cosmology

- SKYMAPPER, DES, LSST, VISTA, UKIDDS, SPT will produce 1000's of square degrees of deep optical, IR and microwave imaging in the south...
- Very few spectroscopic facilities in the south
- SALT is ideal for galaxy clusters (8' FoV, 100 object MOS)
- Several projects to measure dark energy including LRGs and Lyman Alpha forest (*Berlind*).

My own interests

- Mainly interested in dark energy and the links between the early and late universe

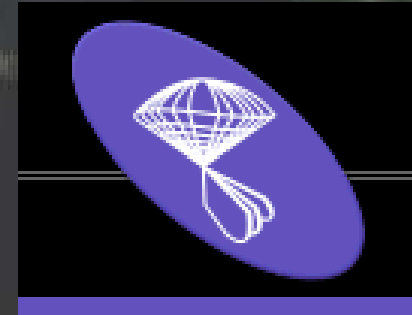
“ Until it is solved, the problem of the dark energy will be a roadblock on our path to a comprehensive fundamental physical theory. ”

Steven Weinberg
Austin Texas

“ Since vacuum energy density is central to both fundamental physics and cosmology, and yet extremely poorly understood, experimental research into its nature must be regarded as a top priority for physical science. ”

Frank Wilczek
MIT

SDSS Supernova Survey (2004 - 2007)



Fermilab: J. Frieman (U Chicago), F. DeJongh, J. Marriner, G. Miknaitis

University of Chicago: B. Dilday, R. Kessler, M. Subbarao
(Adler Planetarium)

University of Washington: A. Becker, C. Hogan

Ohio State University: D. Depoy, J. Marshall, J. Prieto

University of Tokyo: M. Doi, K. Konishi, T. Morokuma, N. Takanashi, K. Tokita, N. Yasuda

University of Portsmouth: R. Nichol, M. Smith

South African Astronomical Observatory: B. Bassett, E. Elson, K. van der Heyden

Rochester Institute of Technology: M. Richmond

Apache Point Observatory: J. Barentine, H. Brewington, J. Dembicky, M. Harvanek, J. Krzesinski, B. Ketzeback, D. Long, O. Malanushenko, V. Malanushenko, R. McMillan, K. Pan, S. Snedden

KIPAC/Stanford University: R. Blandford, S. Kahn, R. Romani, C. Zheng

New Mexico State University: T. Gueth, J. Holtzman

HET Partners: Goettingen (W. Kollatschny), Munich (R. Bender, U. Hopp), PSU (D. Schneider), U Texas (C. Wheeler, P. Hoefflich)

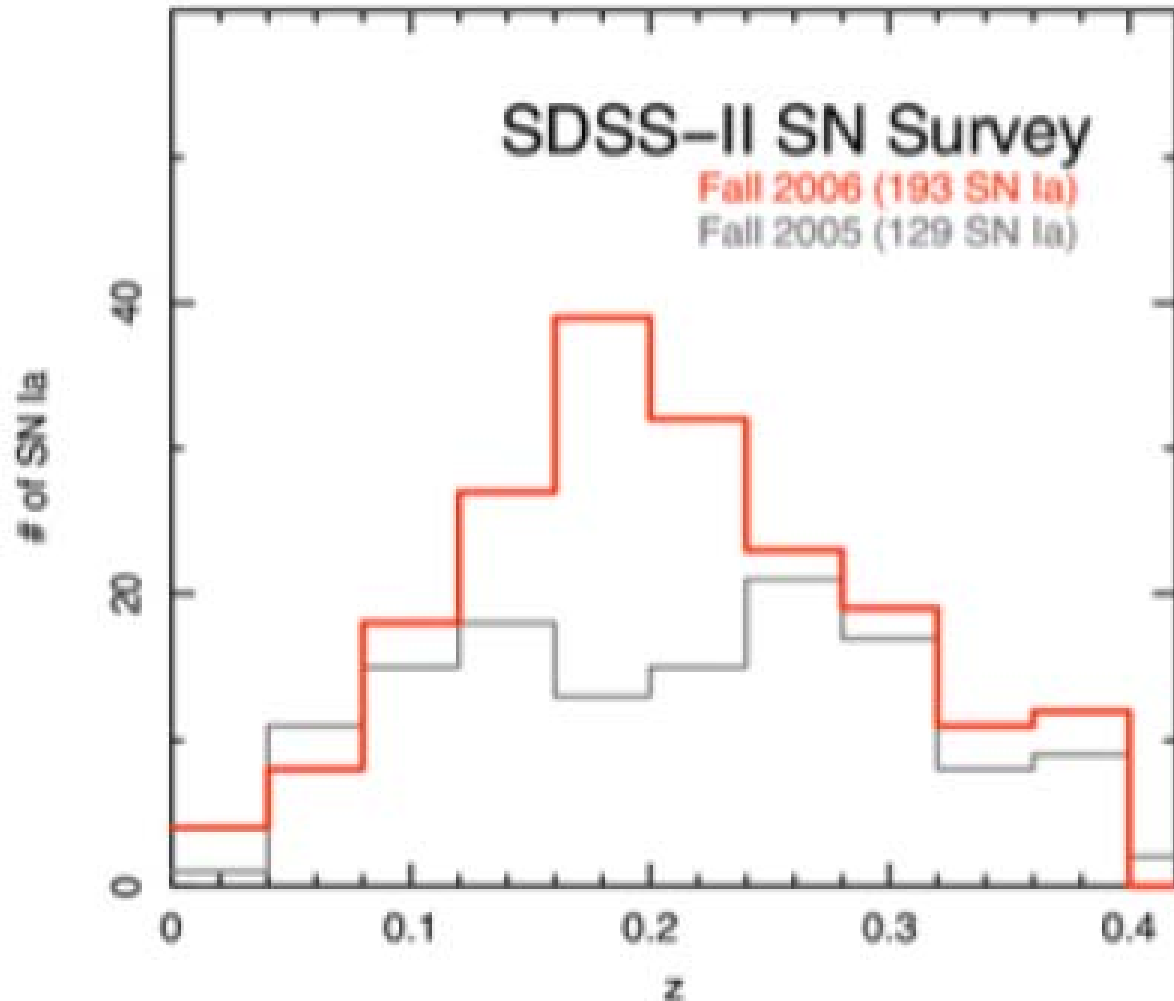
University of Notre Dame: P. Garnavich

Space Telescope Science Institute: A. Riess, H. Lampeitl

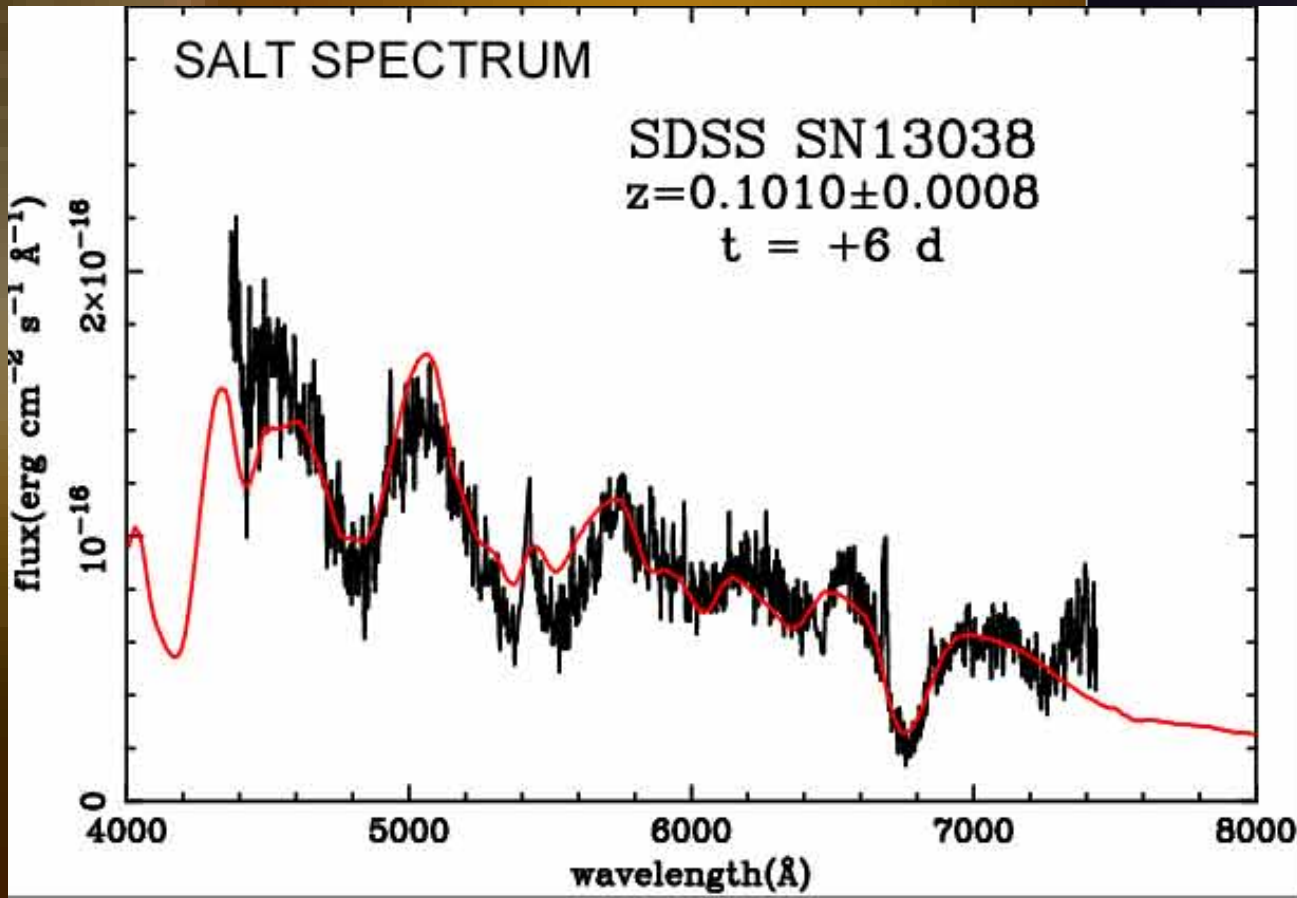
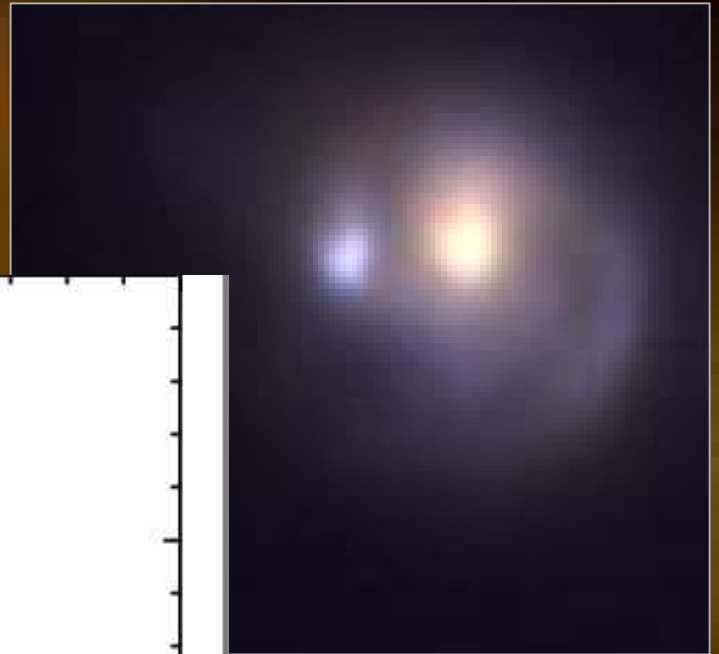
Sloan Digital Sky Survey II Collaboration

Currently: BB, K. van der Heyden (SAAO), P. Vaisanen (SAAO)

Progress to 2006



SALT involvement...



SALT spectrum (BB, Chen, van der Heyden, Vaisanen)

The future for our SNIa research

- SKYMAPPER, DES...(ROBONET?)
- Will use SALT to obtain UV/blue spectral templates for future high-z supernova surveys
- IRSF IR light curves
- Automated SNe detection and statistical methods for next-generation surveys which will get 1000 times more candidates (e.g. LSST)

Possible Vanderbilt overlap:

Rob Knop + SNAP?

Lou Strolger (WKU); Keivan and KELT?

???

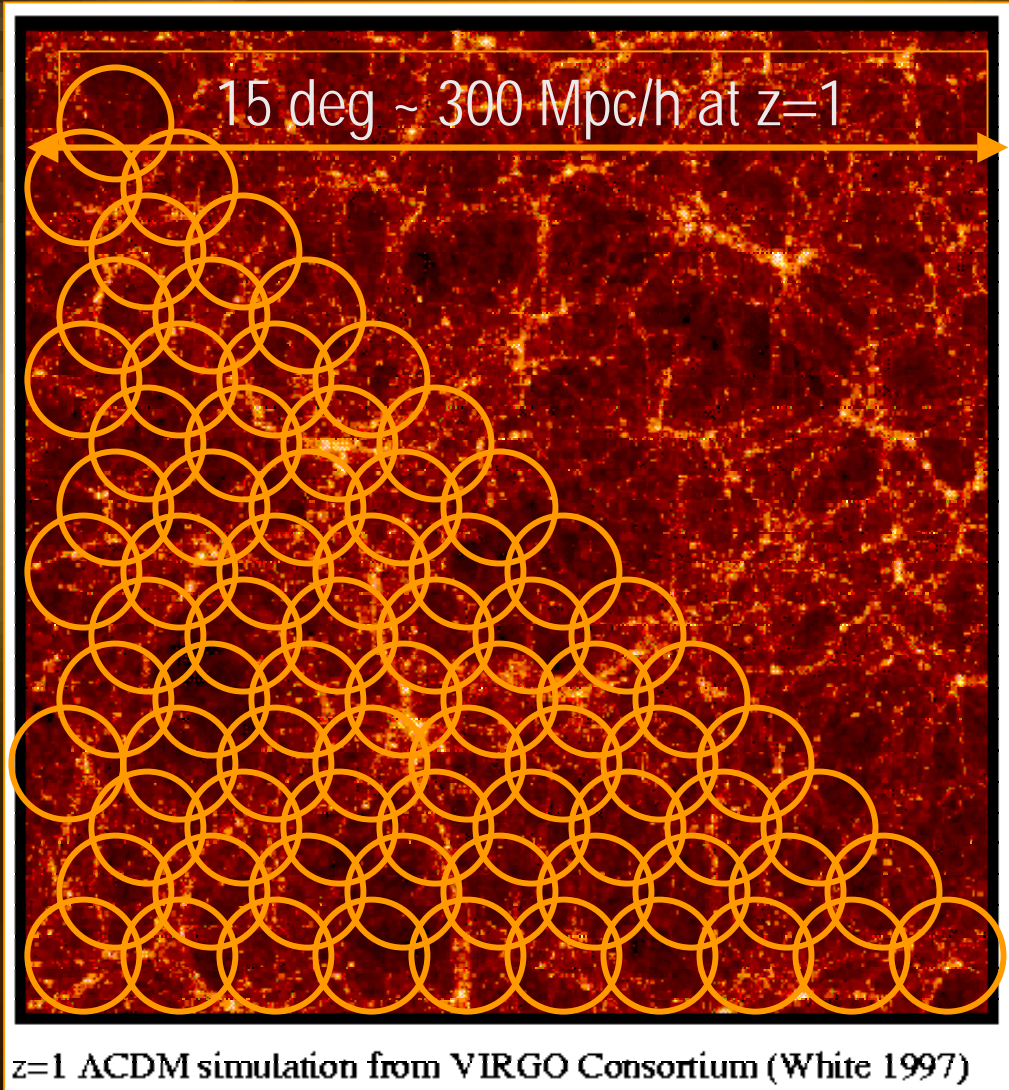
Wide Field Multi-Object Spectrograph (WFMOS)

- \$45M proposed 5000-fibre spectrograph for Gemini/Subaru
- Completed feasibility study, CDR to begin
- Would run from 2013-2015 and would measure distances and Hubble rate to $\sim 2\%$ at $z = 1$ and $z = 3$
- Primary Aims: to measure w to $\sim 5\%$ and get high-res spectroscopy for 10^6 Milky Way stars



WFMOS
Feasibility Study
2005

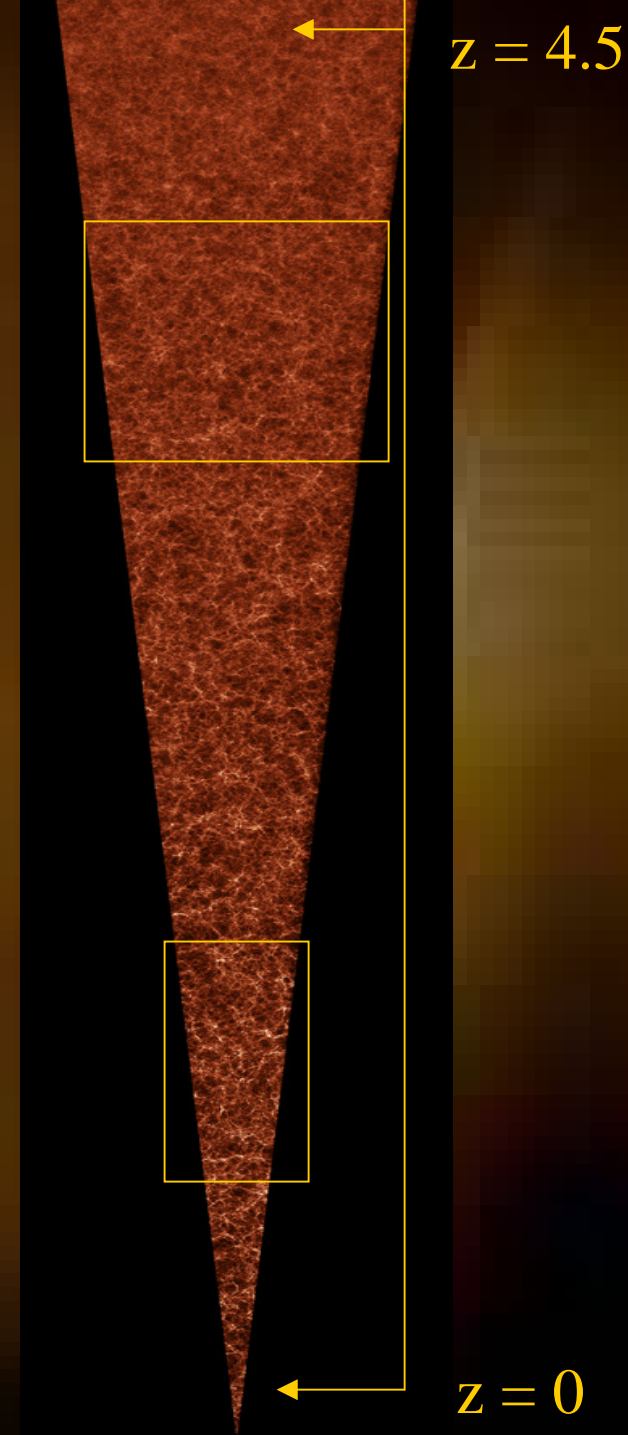
Surveys of Large Scale Structure

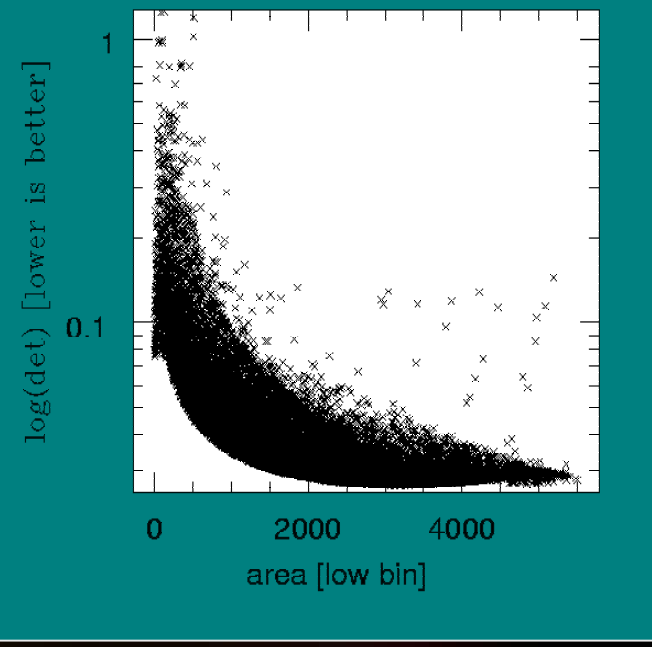
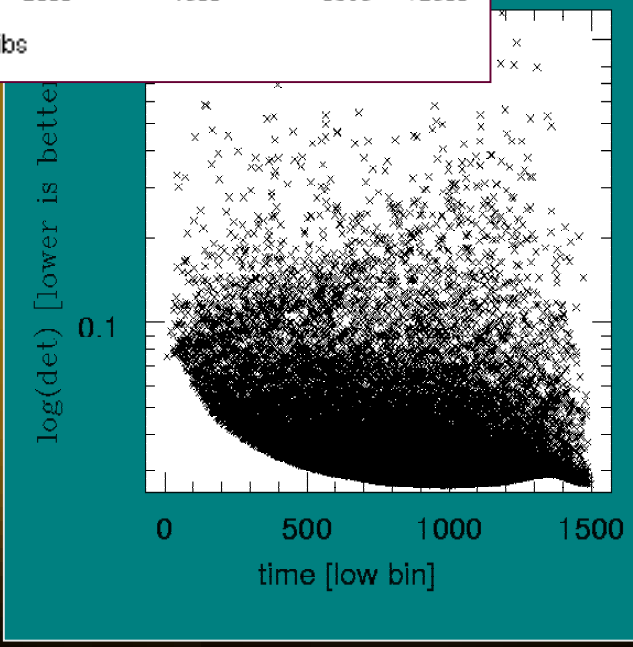
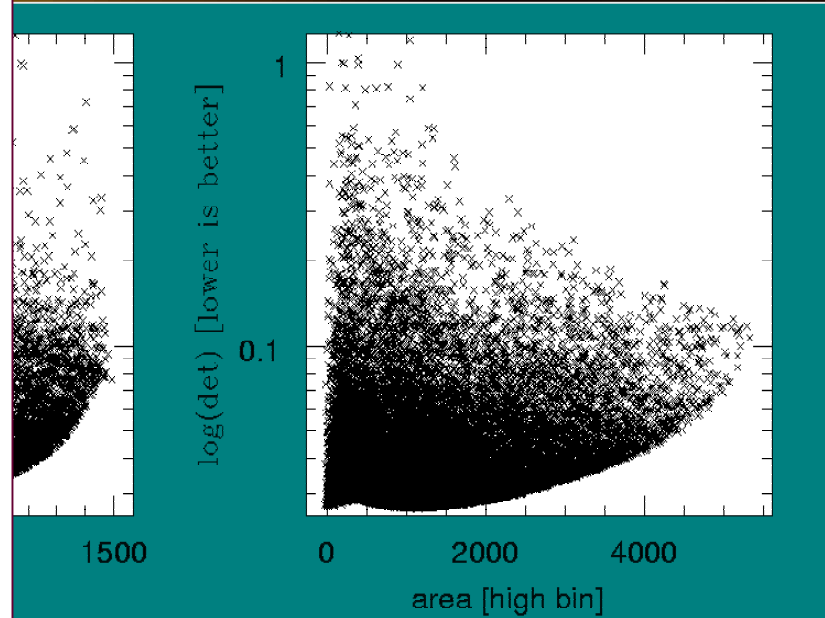
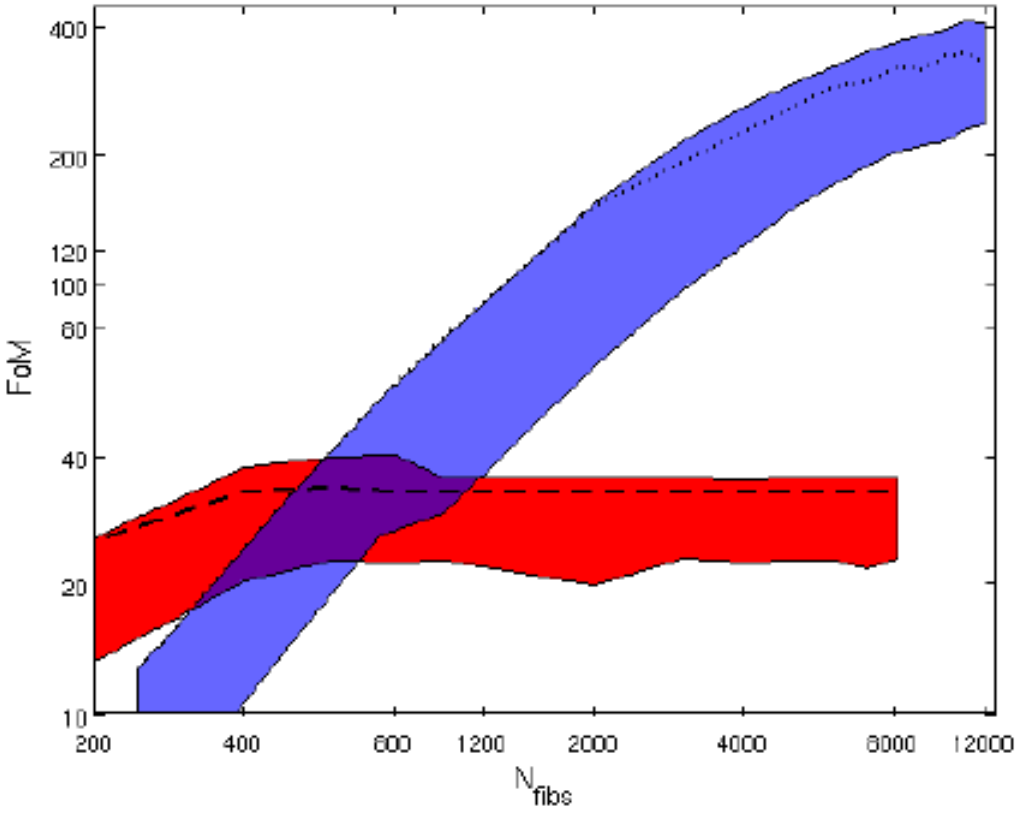


Comparison of MOS
fields of view

- WFMOS
- FLAMES
- FMOS
- DEIMOS
- VIRMOS
- GMOS

- My Involvement:
optimisation framework
(IPSO) for the team A design
of WFMOS.
- N-body, galaxy/clustering and
VO research possibilities
(Berlind and Holley-Bockelmann)





KAT & HSHS

- HSHS = Hubble Sphere Hydrogen Survey proposal lead by J. Petterson at CMU.
- Need to understand cosmological observations using neutral hydrogen for both surveys
- Requires large N-body simulations (again good potential overlap with Vanderbilt, *Kelly Holley-Bockelmann*)

Theoretical dark energy

- Building field theory/fundamental models of dark energy
- Trying to solve the coincidence problem...
- Broader issues in dark energy research

Vanderbilt Overlap:

Robert Scherrer

Tom Kephart

Conclusions...

- Lots of opportunities for collaboration
- Short-term exchange of staff and students as a first step will be very beneficial
- How do we take the next step?