

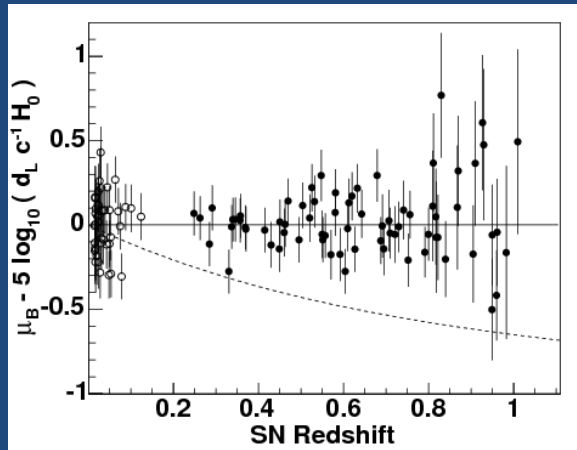
Optimizing Galaxy Cluster Detections as a Probe of Dark Energy



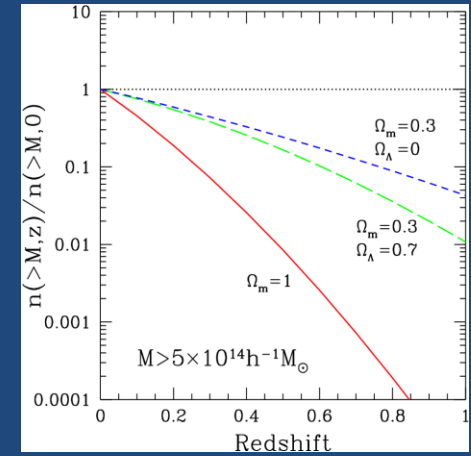
Wayne Barkhouse, Dept. of Physics & Astrophysics, UND



What is Dark Energy?

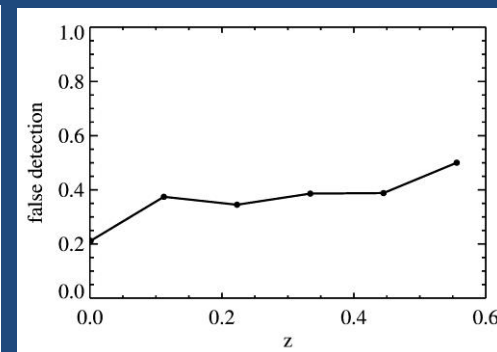
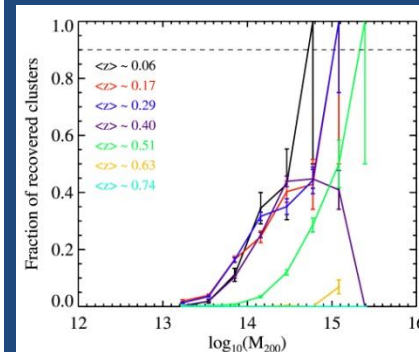
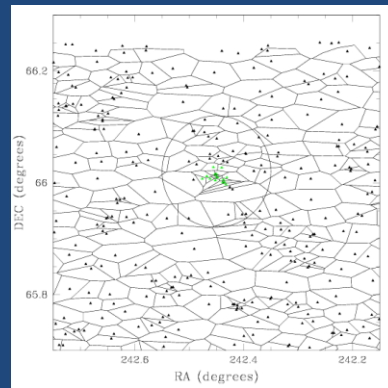
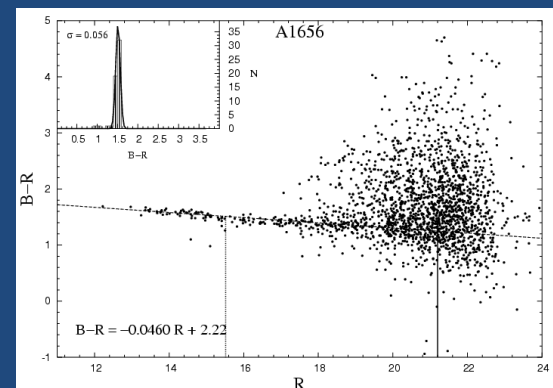


Galaxy Clusters and Cosmology



Cluster Detection

Comparison to Simulations



Relevance to NASA

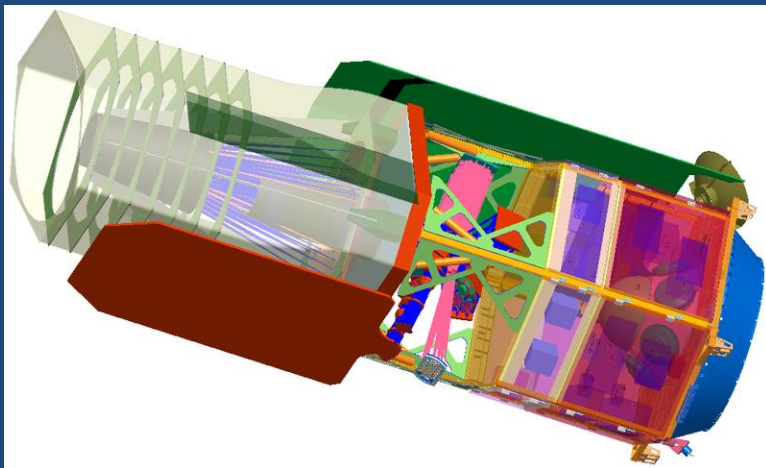
Dark Energy Task Force:
(co-sponsored by NASA)

“an ambitious observational program to determine the dark energy properties [be conducted].”

Strategic Subgoal 3D:

“discover the origin, structure, evolution, and destiny of the universe”

JDEM (Joint Dark Energy Mission):

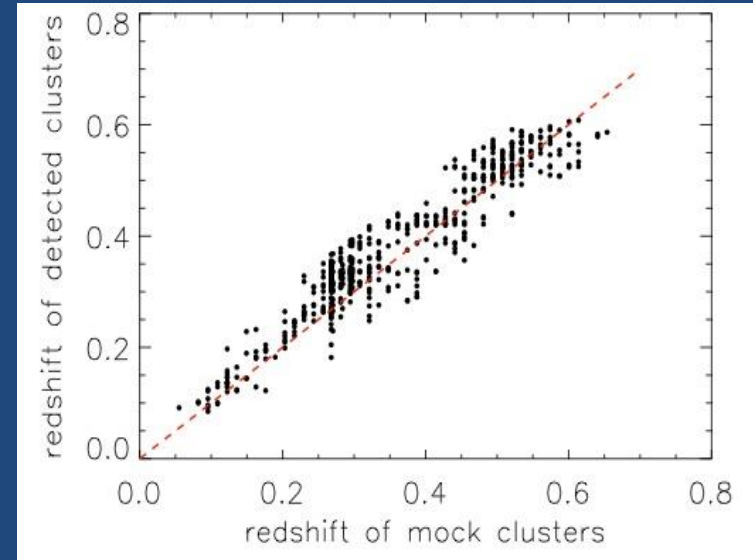
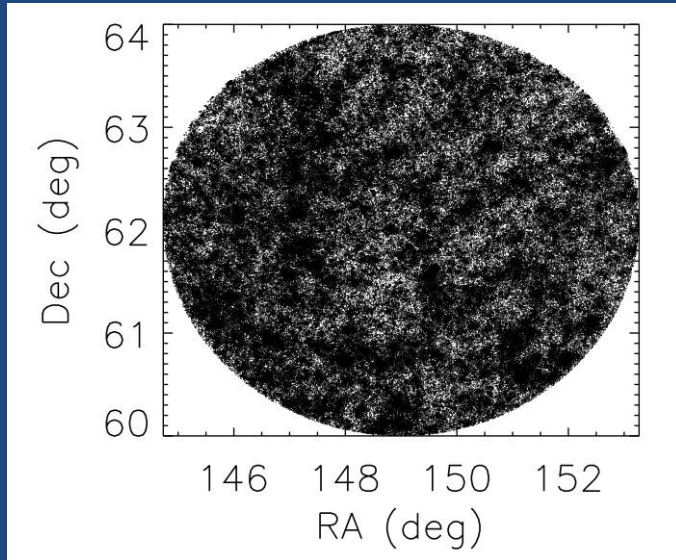


Wide-Field Infrared Survey Telescope
(WFIRST)

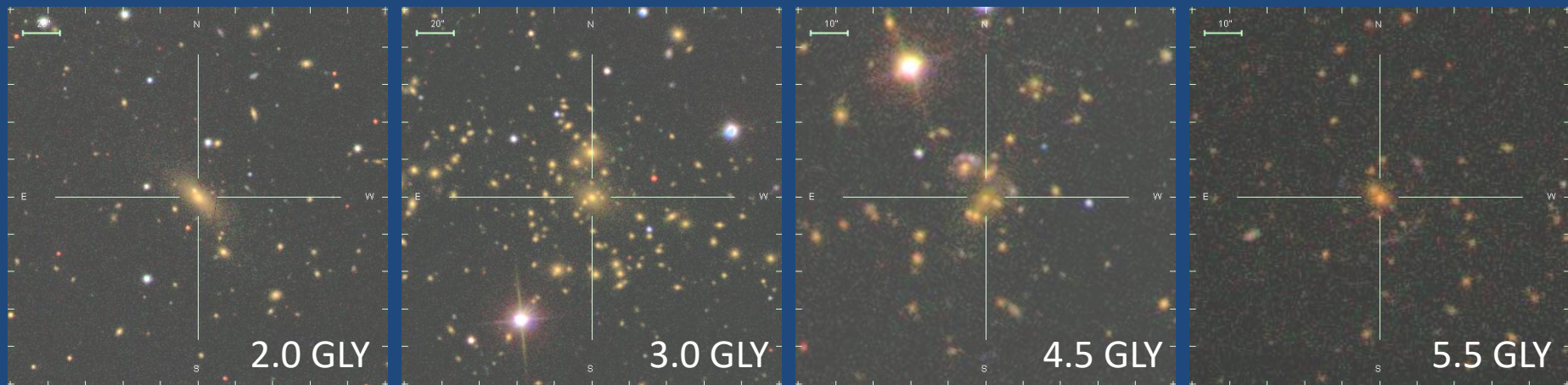
- 1.5-meter infrared telescope (2020? launch)
- high priority in NRC Decadal Survey (2010)

Progress to Date

Cluster Simulation: 10^{10} dark matter particles in a 250 Mpc^3 box



Cluster Detection using the Sloan Digital Sky Survey:



Collaborators:

Daniel Wik: Goddard Space Flight Center

- expert on X-ray reduction and Sunyaev-Zel'dovich Effect

Stephanie Corbett: undergraduate, UND

- 2010 ND EPSCoR AURA student

Jeeseon Song: University of Michigan

- generation of mock galaxy catalogs from N-body dark matter simulations (Song *et al.* 2011)

Future Plans

Future Developments:

- optimization of code using UND's shale supercomputer
- utilizing multi-wavelength data sets (e.g., X-ray, infrared, and SZE)

Publications:

- Application of cluster finding code on SDSS DR8 data, CFHTLS, and WISE data release
- science code for Dark Energy Survey and LSST

External Grants:

- 2011 NASA Research Opportunities in Space and Earth Sciences (ROSES) Program
- 2011 NSF CAREER and 2011 NSF "regular" research proposal

Future Plans

© Original Artist
Reproduction rights obtainable from
www.CartoonStock.com



**"Looks like the universe isn't the only thing
that's expanding!"**

Future De

- optimiz
- utilizing

Publicatio

- Applica
- WISE da
- science

External C

- 2011 N
- Scienc
- 2011 N

d, and SZE)

FHTLS, and

proposal