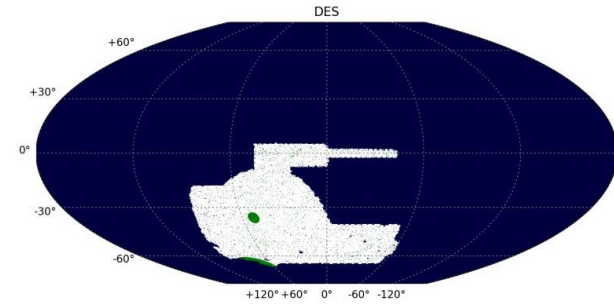


<https://classic.sdss.org/dr7/coverage/index.html>



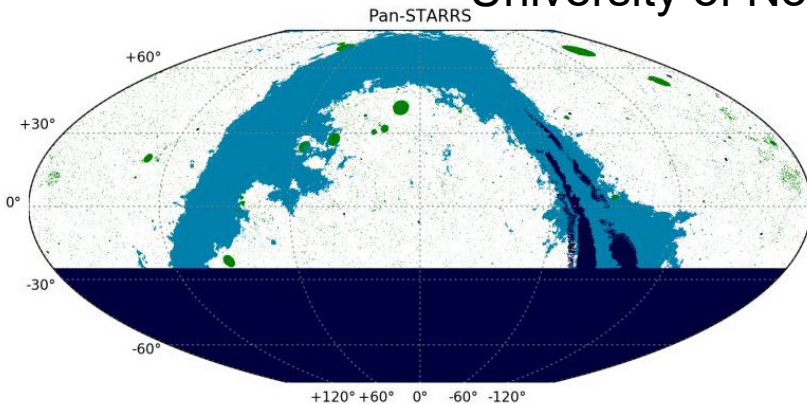
<https://arxiv.org/abs/1912.03302>

Towards projections for the impact of LSST's detection of new Milky Way satellite dwarf galaxies on the indirect detection of dark matter

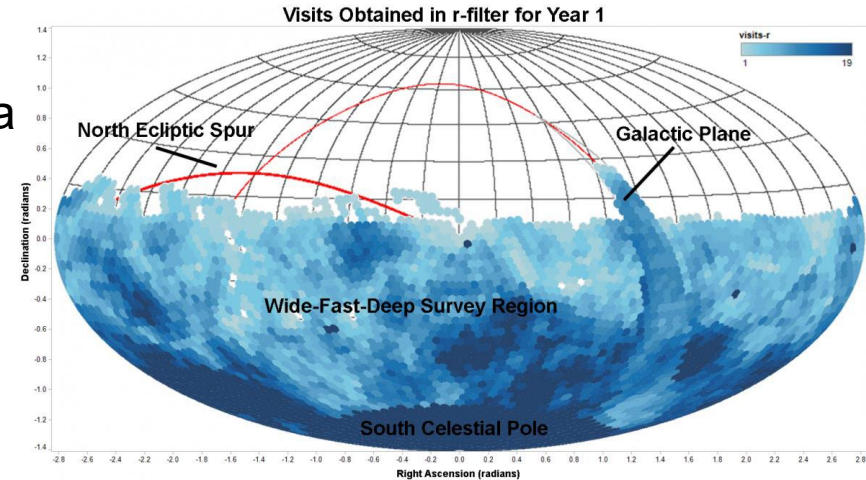
Dark Side of the Universe (DSU) 2023
ICTP-EAIFR
July 10, 2023



Chris Kelso
University of North Florida



<https://arxiv.org/abs/1912.03302>



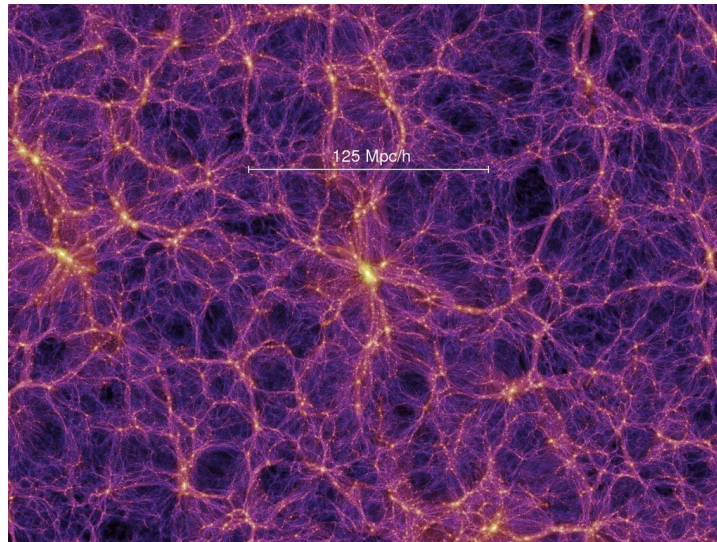
<https://www.lsst.org/scientists/understanding-simulations-and-data>

Outline

- Why Dwarf Galaxies for the indirect detection search for dark matter?
 - Dark Matter only N -Body Simulations used
 - “Calibrating” the simulations
 - Sloan Digital Sky Survey (SDSS)
 - Dark Energy Survey (DES)
 - Panoramic Survey Telescope and Rapid Response System (Pan-STARRS1 or PS1)
 - Conclusions and Future Outlook
-

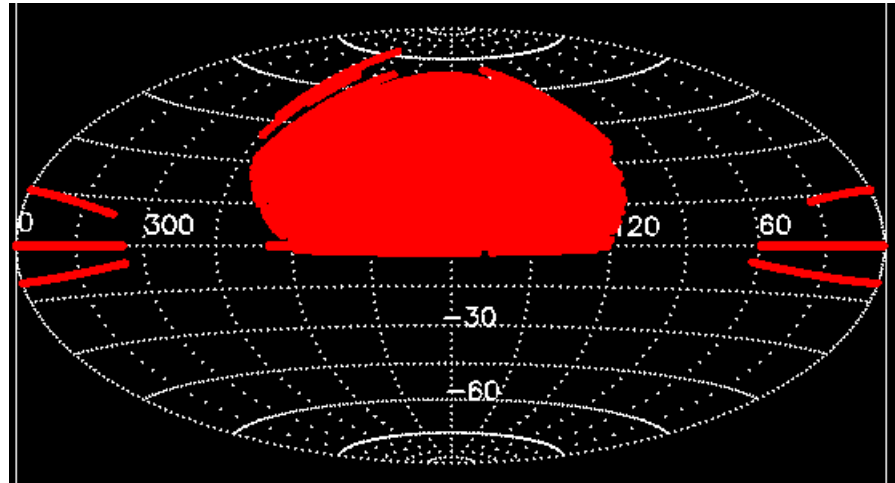
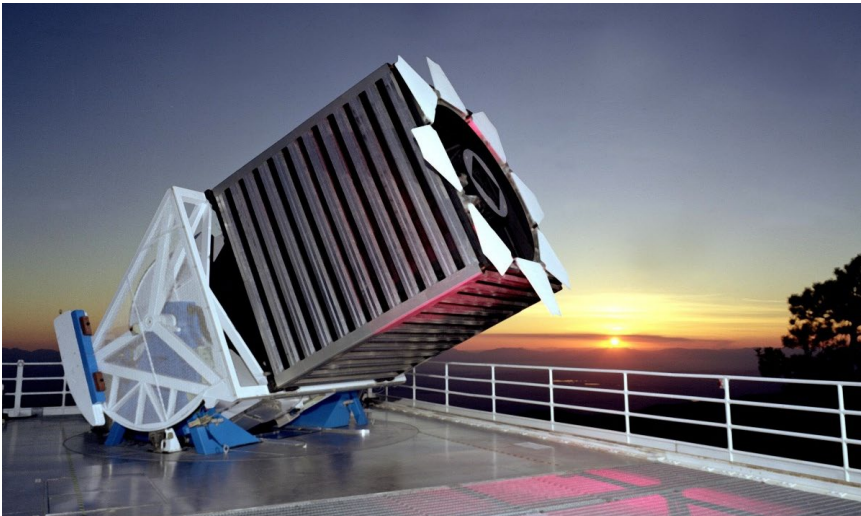
Dark Matter only N -Body Simulations

- We follow the work of Nadler et al (arXiv:1912.03303) and use the L-GADGET, N -Body, cosmological dark matter only simulation (<https://wwwmpa.mpa-garching.mpg.de/gadget/>)
- 46 Milky-Way like halos were identified in the larger simulation, and then “zoom in” simulations were performed on these
- 6 of these were identified as having the most similar formation histories to the Milky Way
 - These are the halos used for the results in this talk

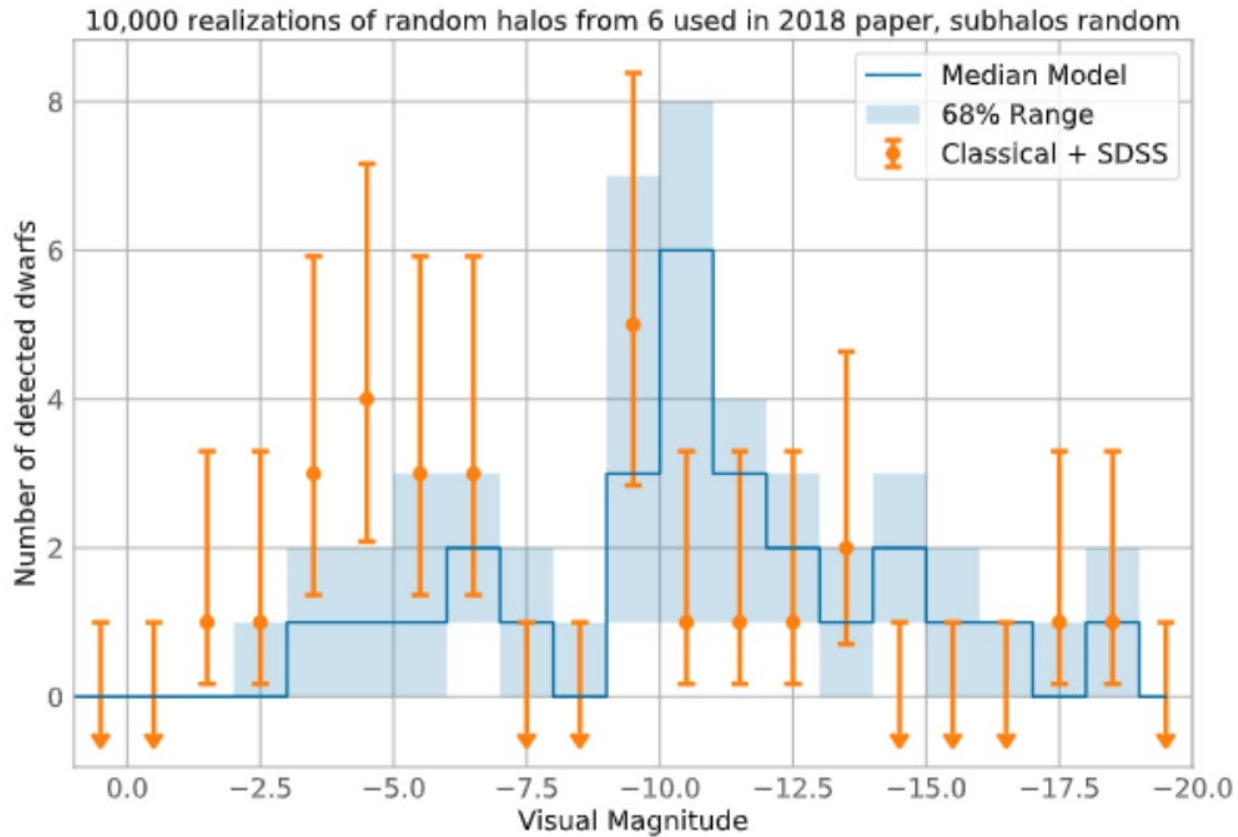


Calibration: SDSS

- The Sloan Digital Sky Survey (SDSS) is a 2.5-m wide-angle optical telescope at Apache Point Observatory in New Mexico, United States
- Data collection began in 2000 and continues today

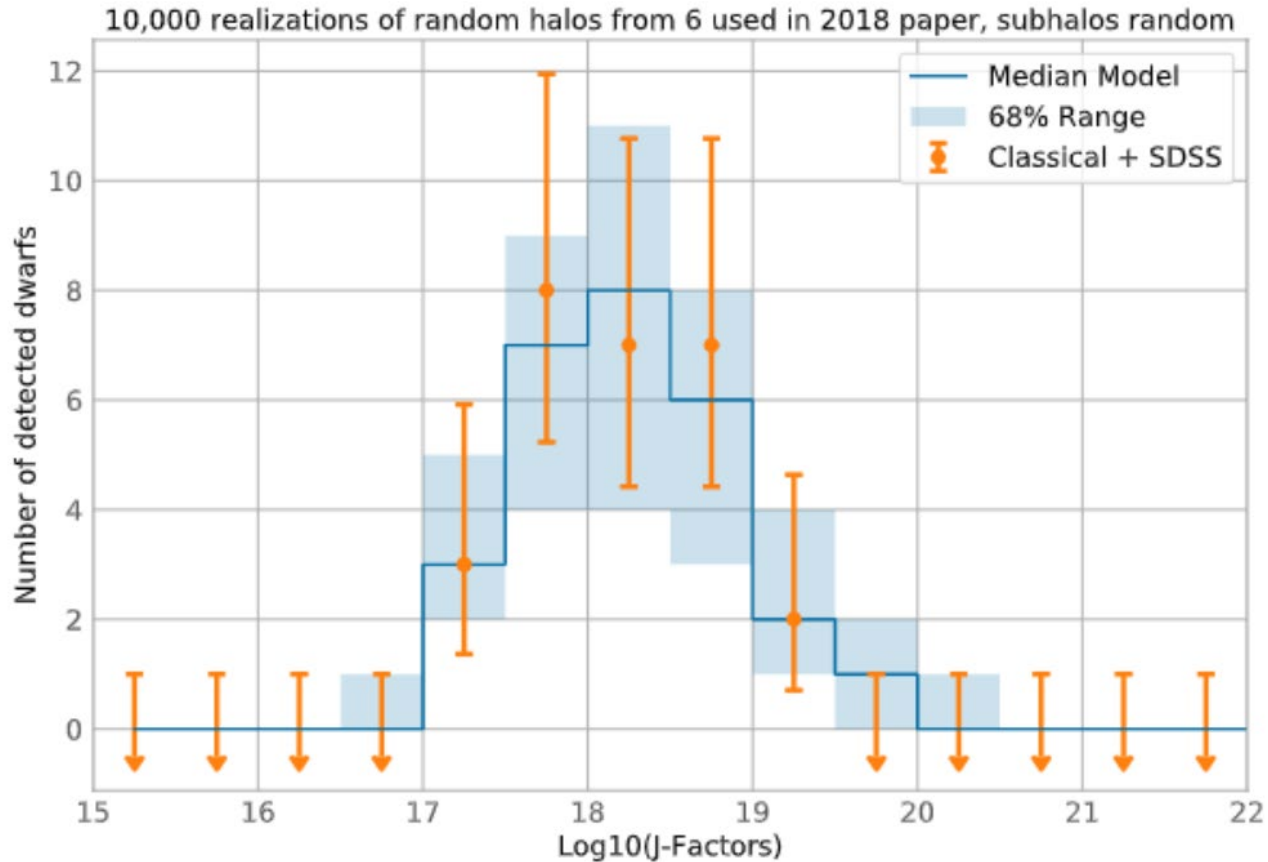


SDSS+Classical Dwarfs: Visual Magnitude



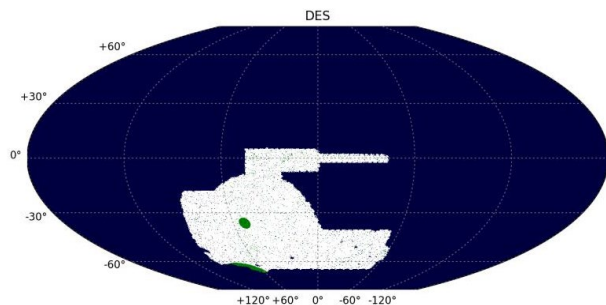
Brighter

SDSS+Classical Dwarfs: J-Factor



Calibration: DES

- The Dark Energy Camera (DECam) was mounted on the the 4-meter Víctor M. Blanco Telescope, located at the Cerro Tololo Inter-American Observatory (CTIO) in the Chilean Andes
- The camera operated from 2013-2019.

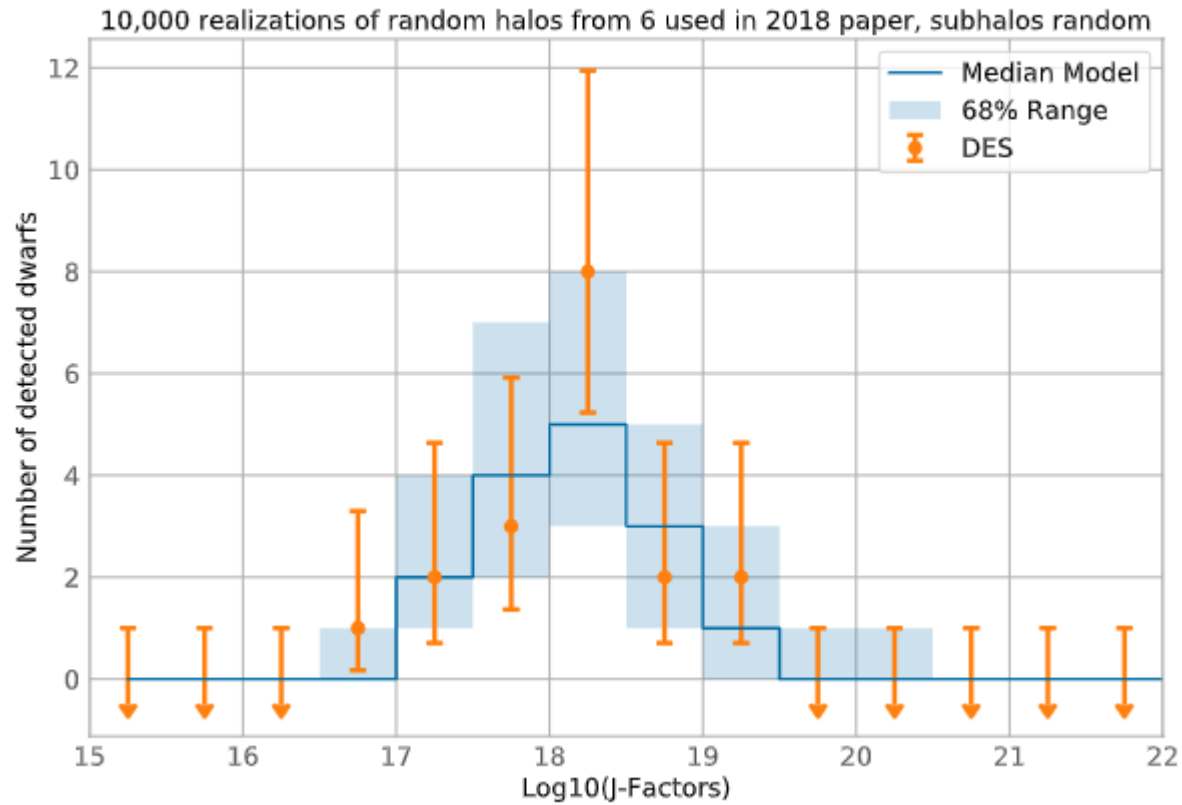


<https://arxiv.org/abs/1912.03302>



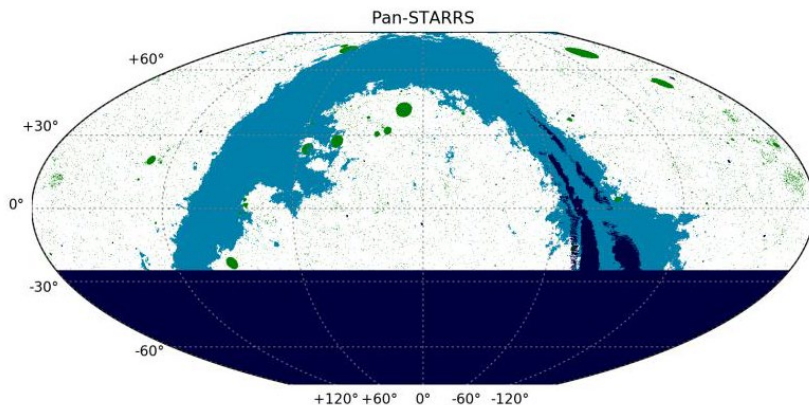
<https://www.darkenergysurvey.org/multimedia/photo-gallery/>

DES: J-Factor



Calibration: Pan-STARRS1 (PS1)

- Pan-STARRS1 (PS1) is a 1.8-meter diameter telescope on the Hawaiian Island of Maui.
- One of the world's largest digital cameras, with almost 1.4 Gigapixels.

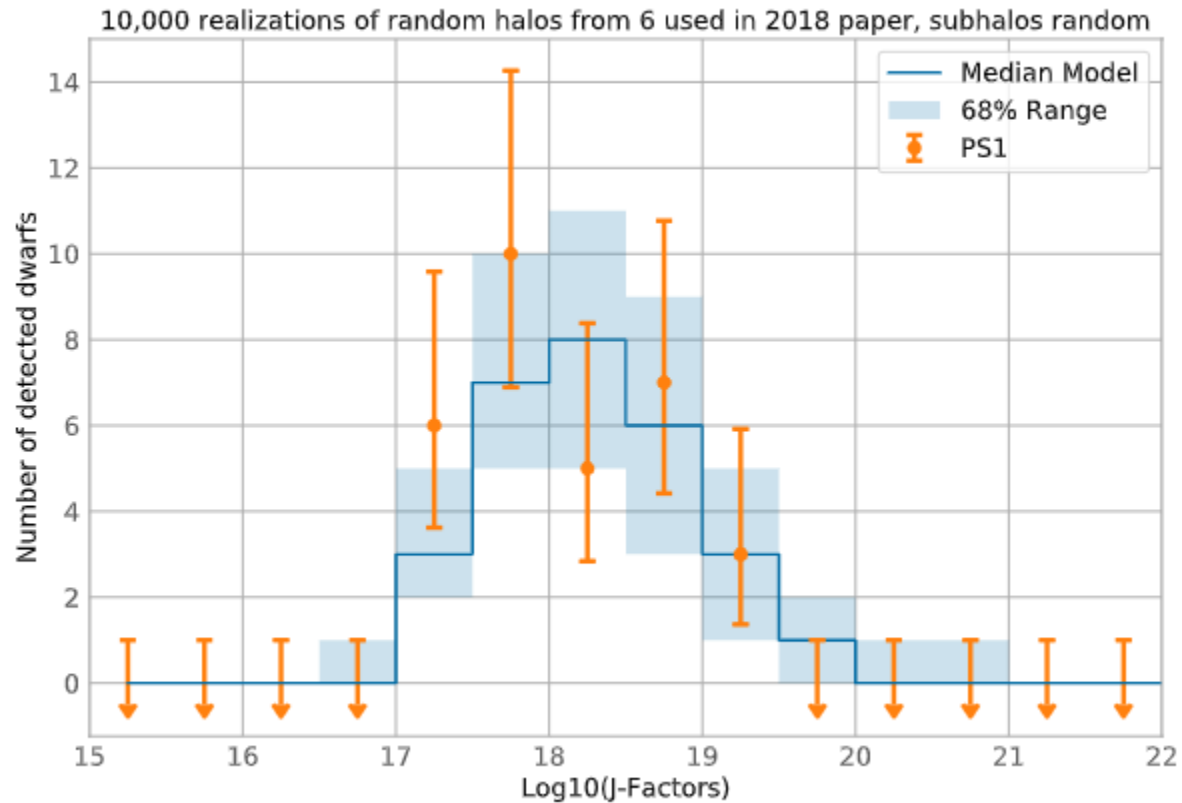


<https://arxiv.org/abs/1912.03302>



<http://www2.ifa.hawaii.edu/research/Pan-STARRS.shtml>

PS1: J-Factor

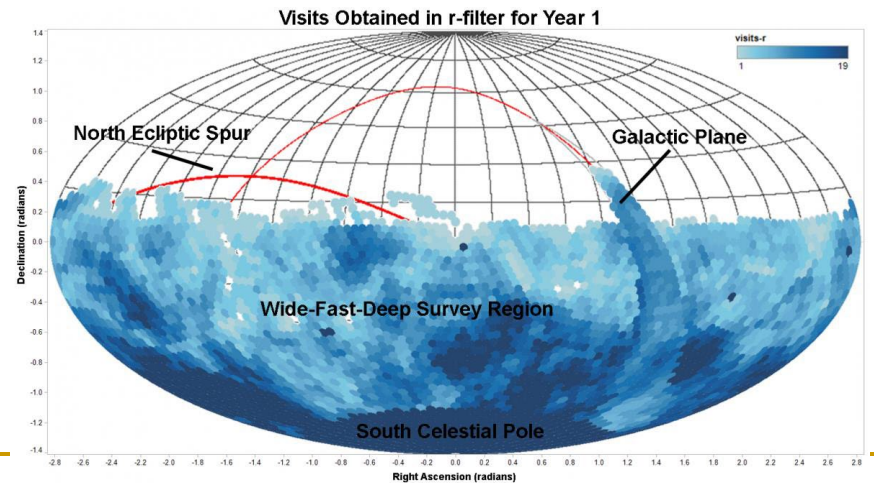


Next Step: LSST

- The Legacy Survey of Space and Time (LSST) is under construction at the Vera Rubin Observatory in the Chilean Andes
- LSST will have 3.2 Gigapixel camera and is expected to see first light in 2024 and run for 10 years



<https://gallery.lsst.org/bp/#/folder/2358042/>



<https://www.lsst.org/scientists/understanding-simulations-and-data>

Conclusions and Future Outlook

- We have used a N -body, dark matter only simulations of Milky Way-like halos to generate a Monte Carlo set of dwarf galaxies that seem to be representative of the actual properties of the true distribution of dwarf galaxies of the Milky Way
 - We will use this set of Monte Carlo models to forecast the properties of new dwarf galaxies likely to be discovered by LSST
 - We will determine the impact these new dwarf galaxies will have on the indirect detection search for dark matter
-