Revealing the Milky Way's Thick Disk and Halo Ultracool Dwarf Populations with Roman & Rubin Aaron Meisner (NOIRLab)





why study the halo and thick disk ultracool dwarf populations?

- old ultracool dwarfs, if detected to great enough distances, can be used as tracers of the Milky Way's structure
- tests of brown dwarf cooling evolution theories/models
- provide unique insights into exoplanetary atmospheres in lowmetallicity systems
- mass function: does low metallicity enhance or suppress star formation's least massive products?
- stellar/substellar boundary as a function of metallicity



The Milky Way Tomography with SDSS (Jurić et al 2008)



ultracool dwarfs with Roman+Rubin



Roman and Rubin will detect L and T dwarfs to much greater distances than currently available discovery engines (e.g., WISE), though they aren't expected to push to colder temperatures than already probed

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signature K-band suppression in metal-poor ultracool dwarfs



black line = T5.5 subdwarf



Roman+Rubin color selection



providing F129 (J-like) and F213 (K-like) if F213 is included in HLWAS

adapted from Zhang+ 2018

over the HLWAS footprint, i-band can be supplied by Rubin/LSST, with Roman

Roman Core Community Surveys (CCS) white paper

- initial Roman CCS "pitch" submitted in 2023 February
- Dwarf Populations with Roman" submitted in 2023 June
 - 23 co-authors/co-signers
 - not posted on arXiv, but in press with BAAS
- implying a ~25% increase in total time dedicated to HLWAS imaging
 - secondary goal is to reiterate the importance of planned HLWAS grism spectroscopy for ultracool dwarf science

Revealing the Milky Way's Thick Disk and Halo Ultracool Dwarf Populations with Roman

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Roman CCS white paper "Revealing the Milky Way's Thick Disk and Halo Ultracool

 main recommendation is to add Roman F213 coverage across Roman's full HLWAS footprint, with total exposure time matched to that of the other HLWAS bands,





"R2-D2" white paper

- Synergy Working Group (chair: S. Gezari)
- topic with strong Rubin+Roman synergy

R2–D2: Roman and Rubin – from Data to Discovery

THE AURA ROMAN-RUBIN SYNERGY WORKING GROUP

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In 2021, the STScI and NOIRLab directors commissioned a white paper about Roman+Rubin science synergies, produced by the AURA Roman-Rubin

• Ultracool dwarf science was highlighted by the white paper as a scientific

- adding F213 coverage across the entire Roman HLWAS would be hugely valuable for pushing ultracool dwarf science into the Milky Way's halo and thick disk
 - 1700× volume enhancement for metal-poor brown dwarfs compared to WISE!
- Rubin and Roman will combine powerfully for optical-infrared color selection of (metal-poor) ultra cool dwarfs

takeaways

