Searching for GEMS: Building the Largest Volume-Limited Sample of Giant Planets around M Dwarfs

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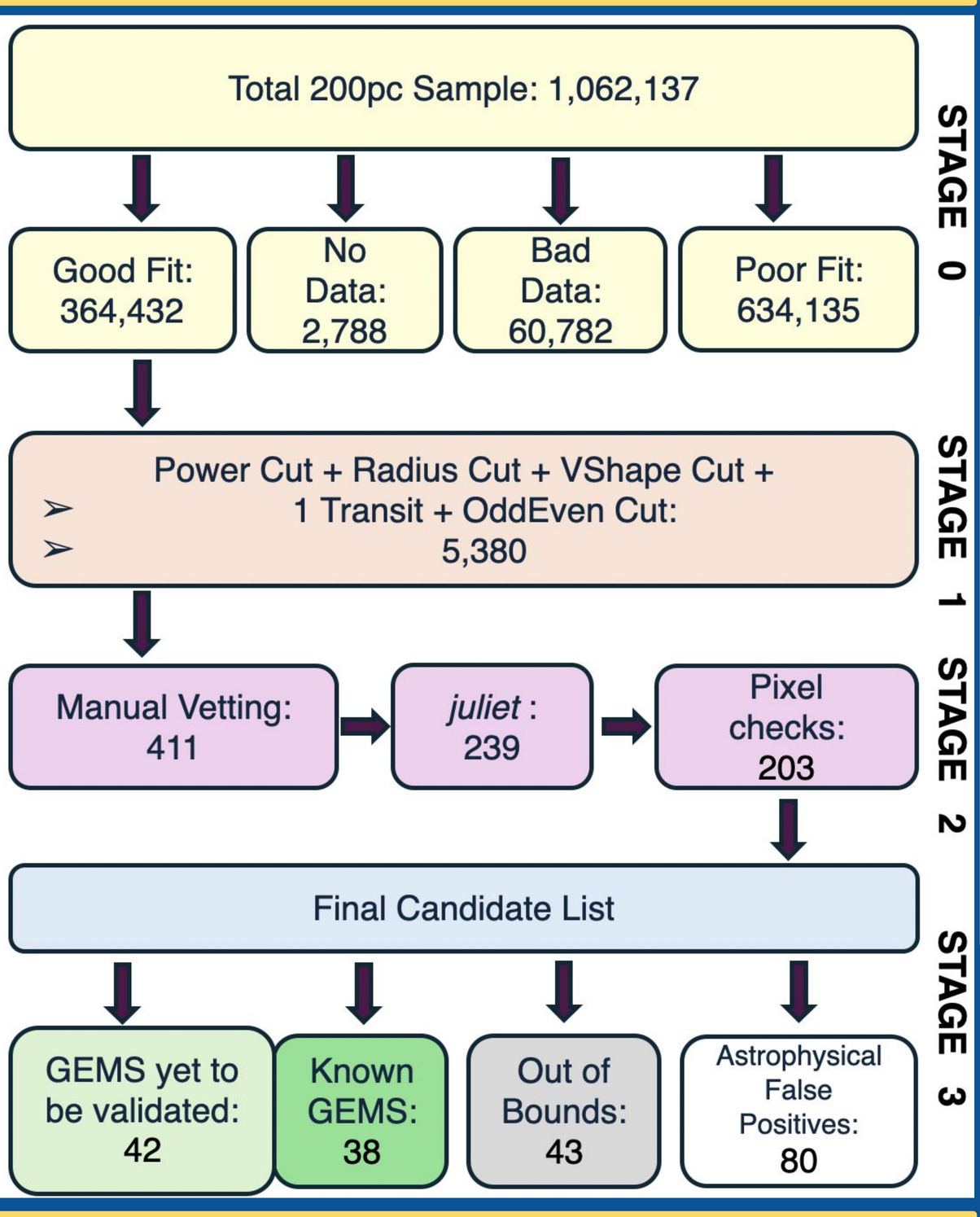
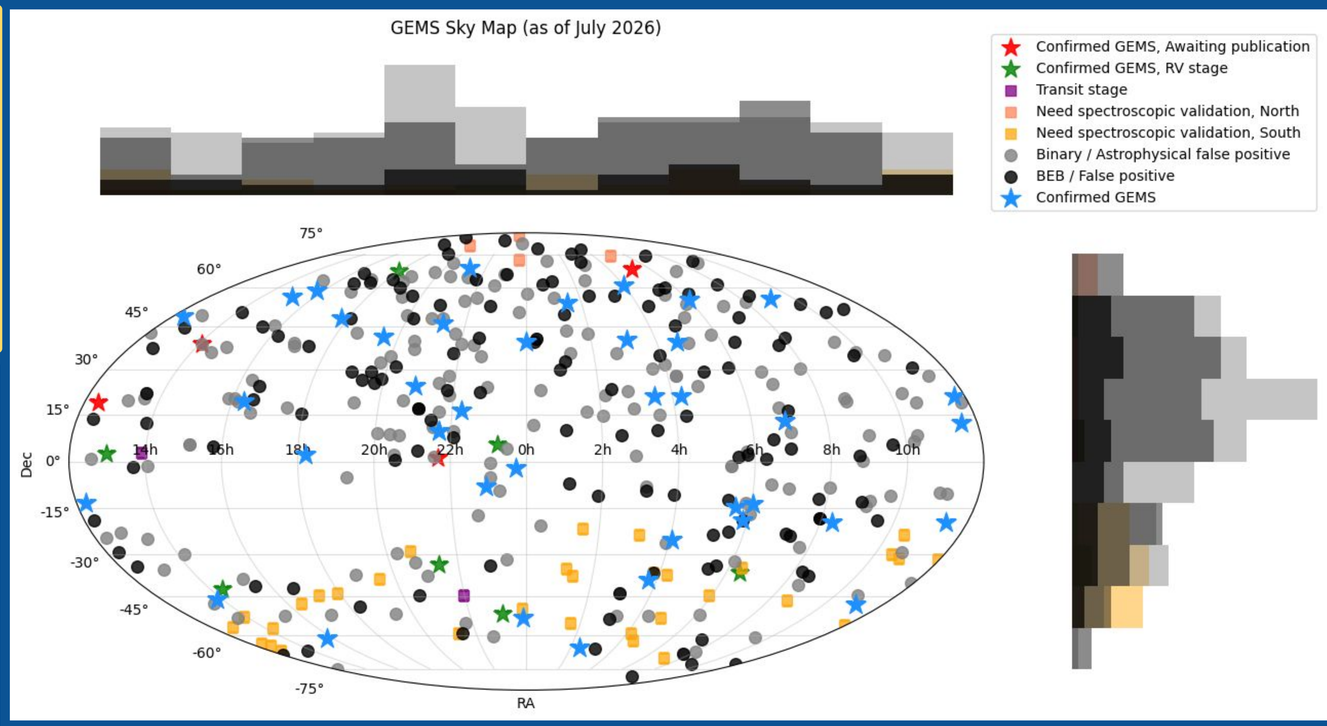
Giant Exoplanets around M-dwarf Stars

- Giant planets around M dwarfs are intrinsically rare.
- Their existence challenges traditional core-accretion models.
- The GEMS survey combines **uniform candidate vetting with follow-up observations** to build the largest reliable sample for occurrence rate studies.

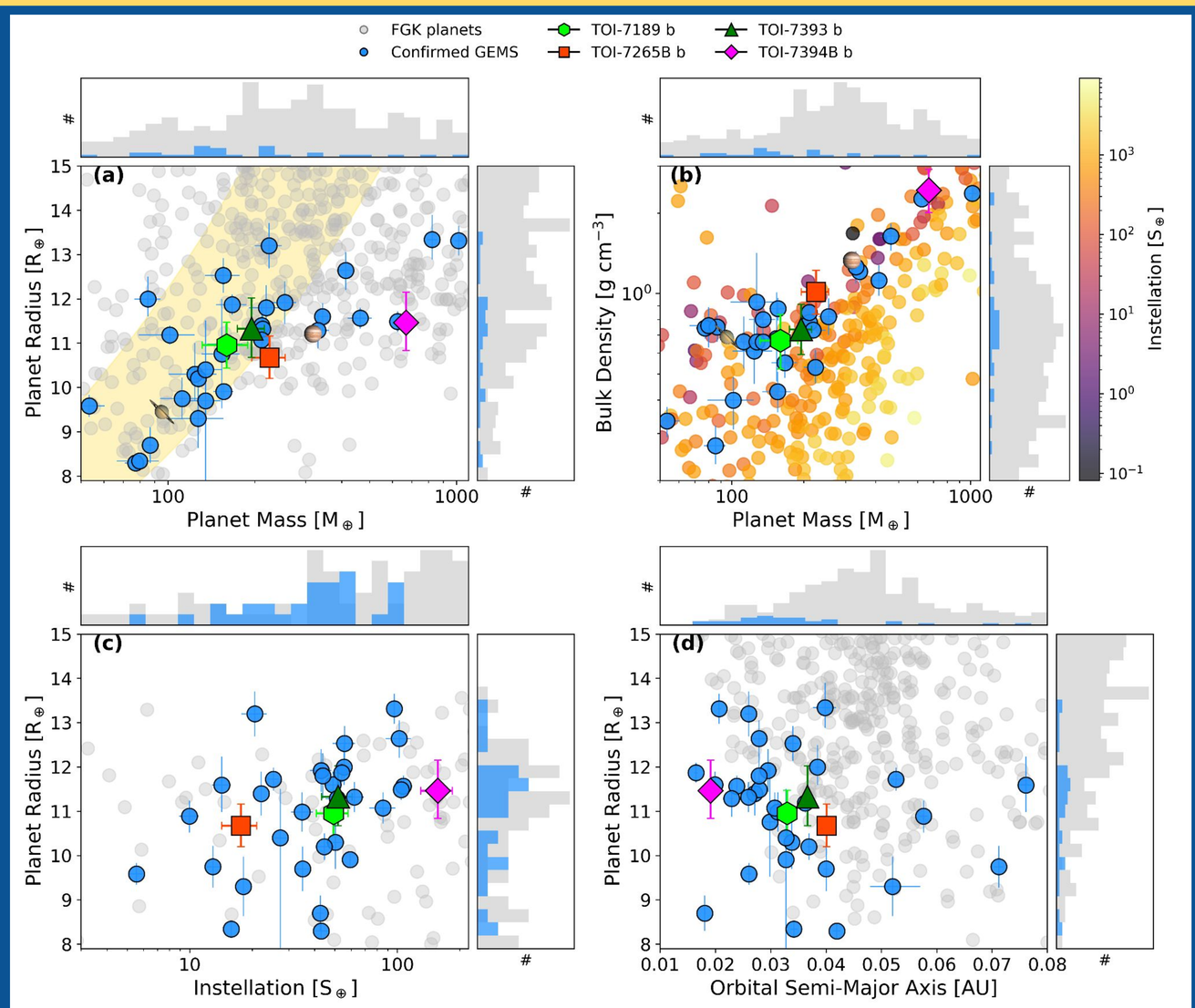




The Largest Volume-Limited GEMS Survey

We are targeting *all* M-dwarfs within 200 pc, creating the largest volume-limited search for transiting giant planets around M dwarfs. The expanded survey provides the statistical foundation needed to measure giant planet occurrence rates across the M-dwarf sequence.

- Automated transit search (through Extended Mission 1)
- High-contrast imaging → rule out nearby contaminants
- Ground-based photometry → reject background eclipsing binaries
- Spectroscopic follow-up → identify spectroscopic binaries
- Precision radial velocities → confirm planets and measure masses
- **Occurrence rate & demographic analysis → characterize the giant planet population around M dwarfs**



Latest Results and Next Steps

Confirmed four GEMS around similar host stars, yet with strikingly diverse densities and internal structures.

Next Steps:

- Complete **manual vetting** of all 200 pc candidates
- Quantify survey completeness through injection-recovery
- Measure **giant planet occurrence rates** across the M-dwarf sequence
- Constrain giant planet formation as a function of stellar mass

References and Acknowledgement

1. Kanodia et al. 2024, 2. Glusman et al. 2026, 3. Premnath et al. 2026
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