

# A Study of the Wide Main Sequence: The Long-Term Photometric Variability of Low Mass Stars

*Tiffany D. Clements (nee Pewett), Todd J. Henry, Altonio D. Hosey,  
Sergio B. Dieterich, Wei-Chun Jao, Jennfer G. Winters,  
Adric R. Riedel, and the RECONS Team*

to be presented at the:

227th Meeting of the American Astronomical Society  
January 2015 in Kissimmee, FL

The RECONS (REsearch Consortium On Nearby Stars, [www.recons.org](http://www.recons.org)) team has carried out a long-term photometric variability study using the SMARTS 0.9m telescope at the Cerro Tololo Inter-American Observatory (CTIO). The program has obtained up to 15 years of observations in the  $V$  band for hundreds of M dwarf stars. This unique study has provided insight into how the ubiquitous M dwarfs change over decadal timescales, revealing their long-term magnetic cycles and how the presence or lack of such activity may affect their sizes and consequent luminosities, and thus their positions on the H-R Diagram.

Using carefully vetted parallaxes and photometric colors, many measured by the RECONS team, we have created a highly accurate H-R Diagram of the nearest (within 25pc) stars using their  $V - K$  colors to represent temperatures and absolute  $V$  magnitudes as proxies for luminosities. We find that for M dwarfs, the main sequence widens significantly, by up to four magnitudes in  $M_V$ , corresponding to a factor of almost 40 in optical flux. This spread implies a wide range of stellar radii for M dwarfs of the same temperature. Our study of long-term photometric variability indicates that there is a trend in cyclic activity that is highest for the most luminous red dwarfs and lowest for the rare, cool red subdwarfs. This provides valuable insight into the complex interplay of age, metallicity, and magnetic fields that molds the character of the red dwarfs.

*This effort has been supported by the NSF  
through grants AST-0908402, AST-1109445, and AST-1412026,  
and via observations made possible by the SMARTS Consortium.*