# Very Cool Brown Dwarfs and Subdwarfs Identified at IRTF

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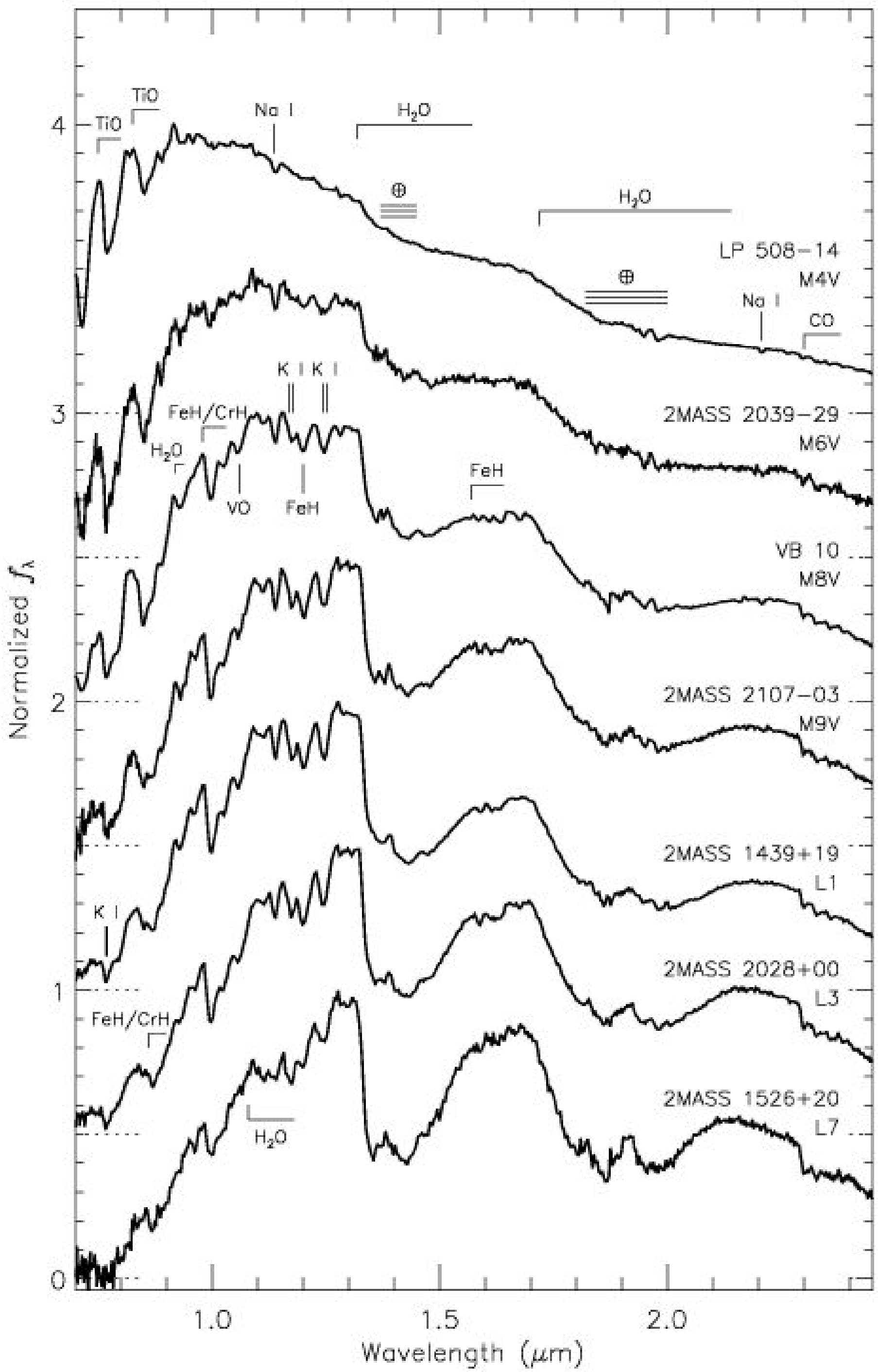
Burgasser, A.J. et al. 2004, AJ, 127, 2856.

The 2MASS T dwarf search program is aimed at completing the census of the coolest known brown dwarfs in the proximity of the Sun (distances less than about 20 pc).

There are a number of reasons to do this:

(1) To ascertain the frequency of brown dwarfs in the Solar Neighborhood (are they as numerous as stars? is the closest system to the Sun a brown dwarf?);
(2) To build up a sample of these objects to characterize their physical properties -- temperature, gravity/mass, metallicity, cloud properties, etc.;
(3) To measure the substellar end of the field mass function; and
(4) To provide empirical data with which to constrain low-temperature atmosphere models, the same models that are used to predict the spectral properties of extrasolar giant planets.

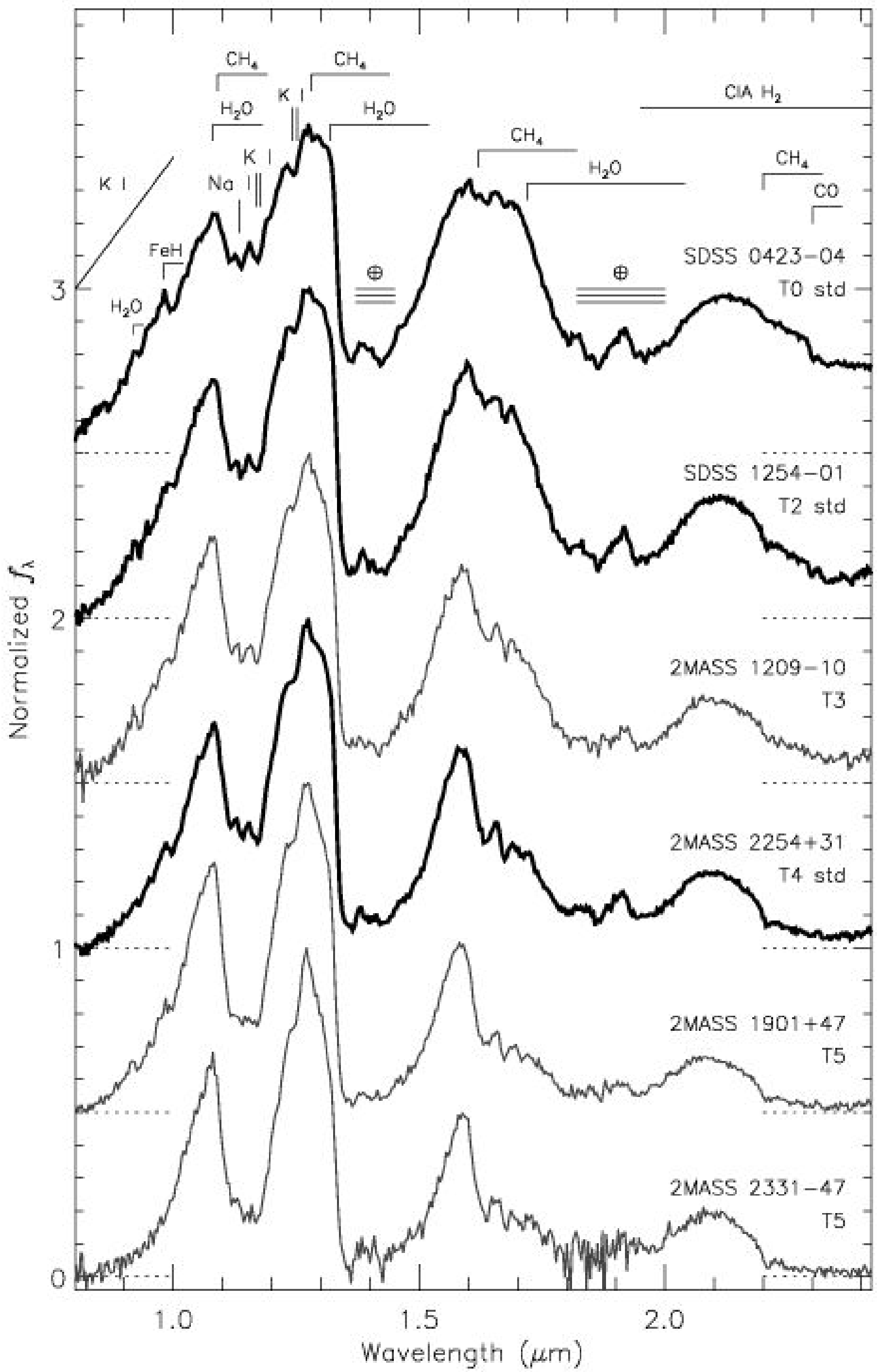
The next figure shows representative spectra of low-mass stars and substellar objects obtained with the prism mode of SpeX.




SpeX prism spectra for M and L dwarfs comparison stars. The increasingly strong water absorption bands with cooler objects is evident.

The objects classified as "L" are considered to be substellar (less than 0.08 M_sun).

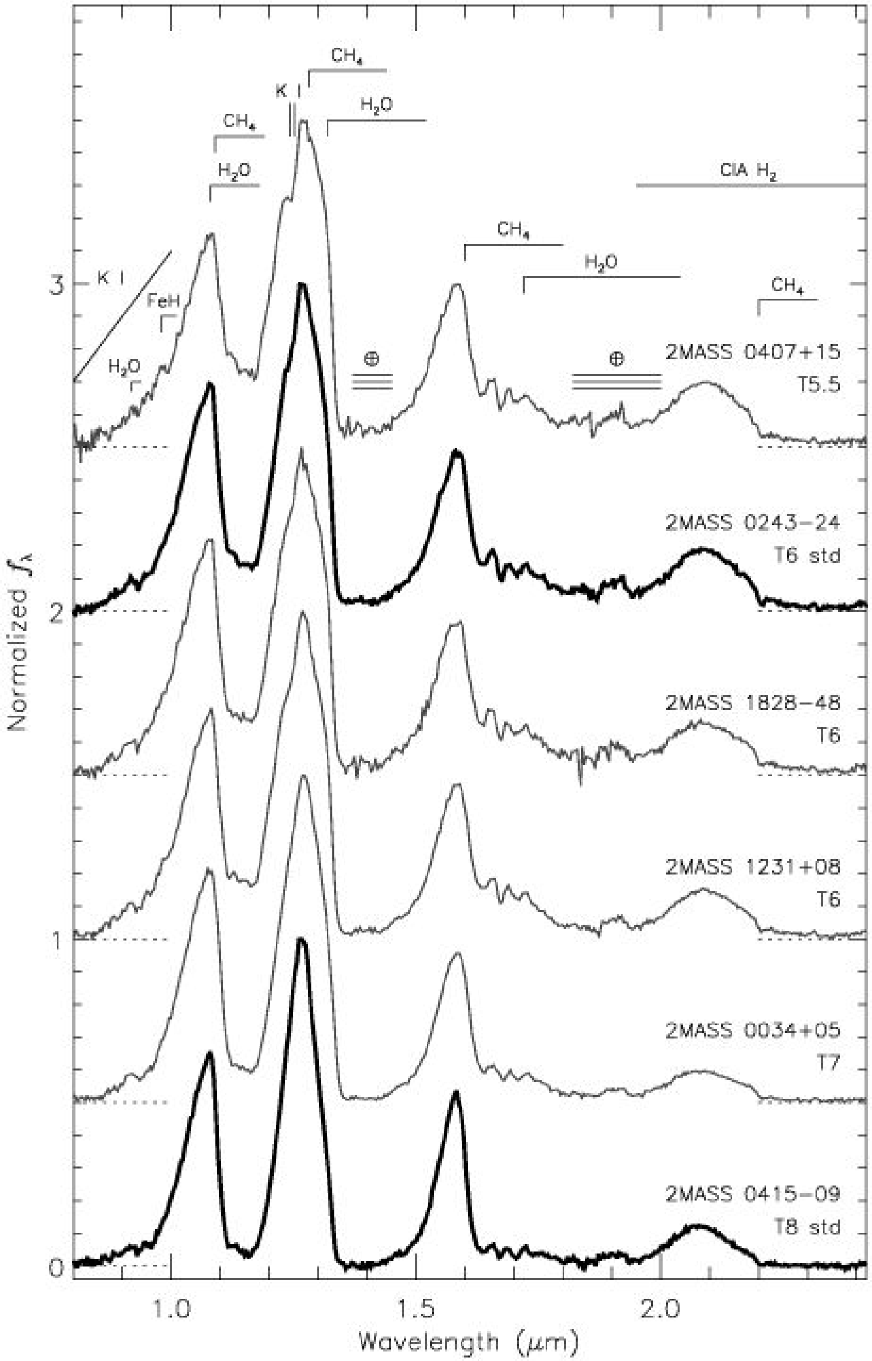
The effective temperature ranges from 3000 - 1700K for the M4 to the L7 spectral types.




SpeX prism spectra of T dwarf discoveries (thin gray lines) and spectral standards (thick black lines).

Note the increasingly strong methane (CH4) absorption with cooler objects.

The temperature of the objects range from 1500 - 1000 K for the T0 to the T5 spectral types.




SpeX prism spectra of T dwarf discoveries (thin gray lines) and spectral standards (thick black lines).

The spectra are now completely dominated by methane (CH4) absorption.

The temperature ranges from about 1000 - 700 K for the T5 to T8 spectral types.

SpeX has permitted highly efficient spectral typing of low mass objects by providing the complete 0.8-2.5 micron spectral energy distributions of these objects in a single exposure.

This has allowed us to examine the influence of collision-induced $H_2$ absorption, a probe of gravity and metallicity in cool brown dwarfs. Furthermore, the IRTF data have enabled us to fully characterize candidates that are not T dwarfs, resulting in the serendipitous discovery of some of the coolest subdwarfs now known. The IRTF observations have allowed us to expand our science results beyond the initial program goal of identifying new T dwarfs to finding new classes of cool stars and brown dwarfs that formed early in the history of the Galaxy.