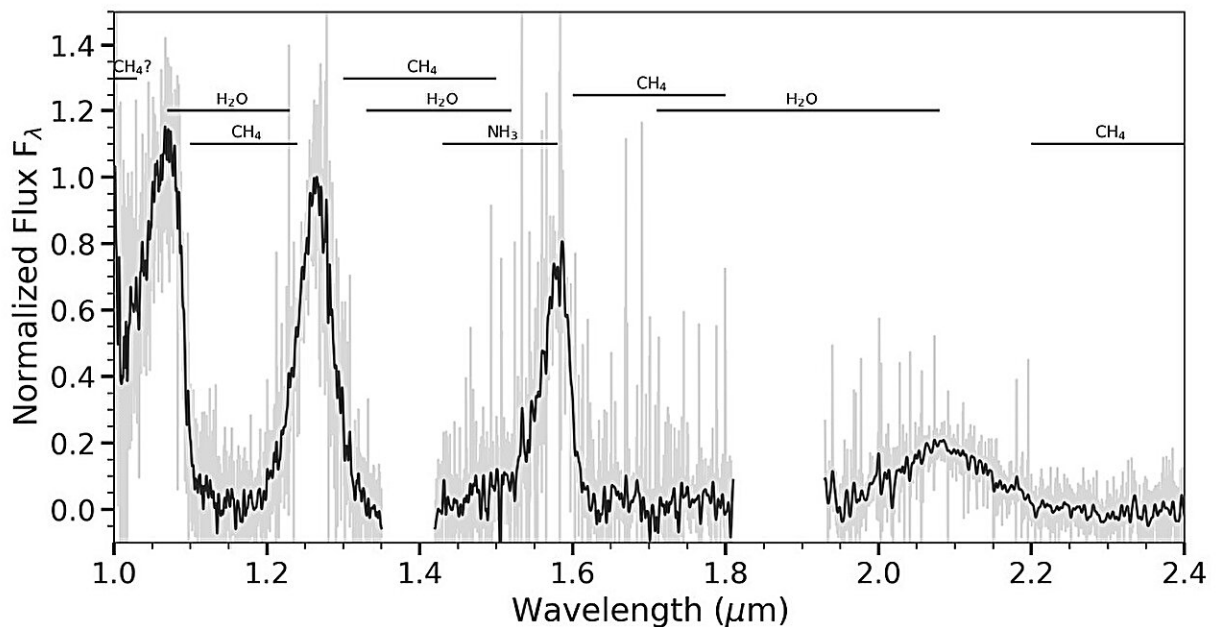


W1055+5443 is a Y-type brown dwarf, observations find

October 24 2023, by Tomasz Nowakowski



Keck/NIRES near-infrared spectrum for CWISE J105512.11+544328.3: original spectrum (gray) and 5-pixel smoothed spectrum (black). The spectrum is normalized to the J-band peak between 1.27 and 1.29 μm . Credit: *arXiv* (2023). DOI: 10.48550/arxiv.2310.09524

Using the Keck II telescope, astronomers have performed near-infrared spectroscopic observations of a nearby brown dwarf known as CWISE

J105512.11+544328.3, or W1055+5443 for short. Results of the observational campaign, presented October 14 on the pre-print server *arXiv*, reveal that this object belongs to the rare class of ultracool brown dwarfs, dubbed Y dwarfs.

Brown dwarfs are intermediate substellar objects between planets and stars with masses below the hydrogen burning limit—about 80 Jupiter masses. One rare subclass of [brown dwarfs](#), with effective temperatures lower than 500 K, is known as Y dwarfs. They are the coolest and least luminous substellar objects so far detected.

W1055+5443 is a brown dwarf at a distance of some 22.5 [light years](#), discovered in 2012 and initially classified as a T dwarf (a subclass of brown dwarfs with effective temperatures between 500 and 1,500 K). However, new observations made by a team of astronomers led by Grady Robbins of the University of Florida, suggest that the object should be reclassified as a Y dwarf. The finding is based on the data collected with the Near-Infrared Echellette Spectrometer (NIRES) on the Keck II telescope.

"Near-infrared spectral analysis is so far the most effective method for classifying late T and early Y dwarfs, as they are very faint in the optical," the researchers explained.

The observations found that W1055+5443 has an effective temperature of about 500 K and an absolute magnitude of 15.18 mag. These results indicate that W1055+5443 is most likely an early Y dwarf rather than a late T dwarf.

Moreover, the team found that the spectrum of W1055+5443 shows strong ammonia absorption plus methane and water absorption in the H-band, what further supports the Y-type classification. The astronomers added that the brown dwarf showcases an anomalously high H-band peak

amplitude.

The study also found that the K-band flux of W1055+5443 is surprisingly high. According to the authors of the paper, the K-band spectrum of this object appears better matched to that of a mid-late T dwarf rather than a Y dwarf, yet it is still not a perfect match. The tangential velocity of W1055+5443 was estimated to be at a level of 50 km/s—therefore relatively high when compared to the solar neighborhood median value for brown dwarfs.

The [astronomers](#) noted that the unusual properties of W1055+5443 may be explained by a previously undetected companion object. However, based on the available data and binary modeling performed by them, they excluded this possibility.

Summing up the results, the scientists concluded that W1055+5443 is of spectral type Y0. They propose further observations of this brown dwarf as many of its properties like age or mass are still undetermined.

More information: Grady Robbins et al, CWISE J105512.11+544328.3: A Nearby Y Dwarf Spectroscopically Confirmed with Keck/NIRES, *arXiv* (2023). [DOI: 10.48550/arxiv.2310.09524](https://doi.org/10.48550/arxiv.2310.09524)

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