

[초IT-01] Evidence of Dust in M dwarfs

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The blue spectra of M dwarfs have much weaker lines than predicted by current M dwarf model atmospheres and much weaker water bands in the infrared. At temperatures below 2950K (spectral types later than M5.5V) the lines are weaker in a near solar-composition star than in a model with $[M/H] < -2.5$ but the weakening is still evident at 4000K (M0V).

Tsuji and others have nominated dust absorption and scattering in the atmosphere causing heating of the photospheric layers to explain such line weakening, but considered it only to operate in the coolest M dwarfs. Our new observations suggest that dust is ubiquitous in cool dwarf atmospheres, dominating the blue opacity in dwarfs cooler than 3000K and is appreciable even at 4000K. This is not restricted to near-solar-composition stars because observations of two $[M/H] < -2.0$ subdwarfs with temperatures between 3900 and 4100K also show evidence of dust heating and obscuration.

Allard and Hauschildt found that their current dusty models, although an improvement over the dust-free models, could not produce the observed weakening in the coolest components of LHS1070 and they needed to significantly exaggerate dust formation and opacity effects to achieve it.

Much more work needs to be done on the formation of dust and its effect on the temperature and structure of M dwarfs.