

# How Would Clouds and Hazes Change Our Observations of Exoplanet Atmospheres?

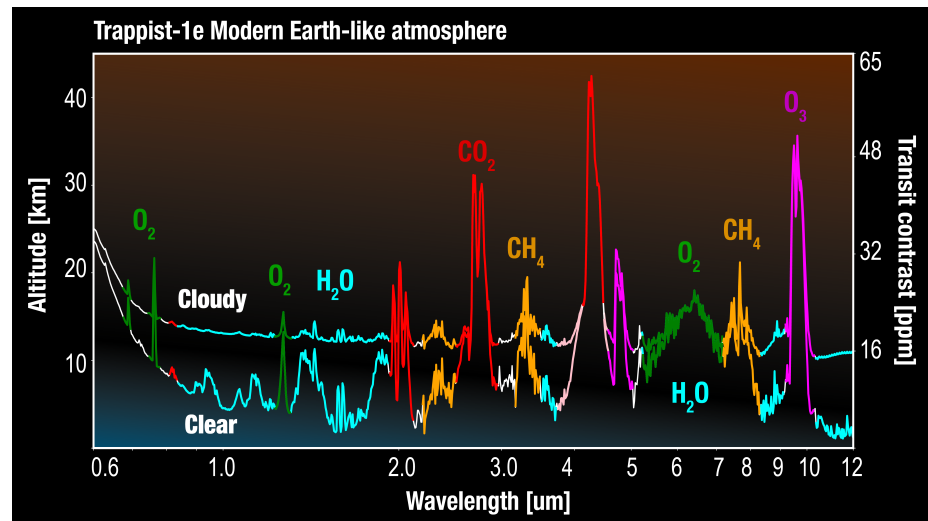
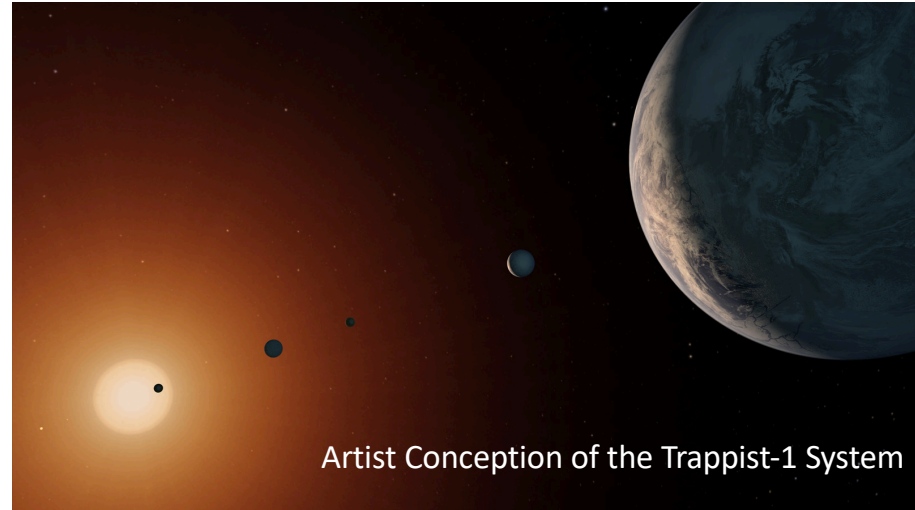


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If an exoplanet has liquid water on its surface (making it possibly habitable), there will also be clouds and hazes in the atmosphere. How would this affect what the Webb Telescope would measure, specifically in near-infrared light, which Webb uses?

Our simulations of exoplanet atmospheres in the TRAPPIST-1 system show that clouds and hazes strongly absorb and scatter near-infrared light. These effects make infrared light transmission spectroscopy less useful for detecting the presence of various kinds of molecules, including interesting habitability markers like oxygen.

It may be that habitability hides behind clouds! Infrared light transmission spectroscopy is one of the most important tools we have for determining the composition of an exoplanet's atmosphere. The reduced sensitivity of this technique due to the presence of clouds and haze means that habitable worlds orbiting M class dwarf stars may be very difficult to characterize with future observatories such as the James Webb Space Telescope.



Simulated infrared transmission spectra of the TRAPPIST-1e exoplanet atmosphere as seen by the James Webb Space Telescope. Note that the spectral peaks are much smaller for the cloudy atmosphere.