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Search for warm gas in debris disks with JWST.

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Abstract

Observations in far-infrared and (sub-)mm wavelengths have found evidence for a non-negligible amount of gas around 20 nearby main-sequence stars with debris disks. This gas, located in the outer regions of the systems, is likely to have originated via collisions or evaporation of planetesimals due to dynamical instabilities. Gas detected in the optical range with spectroscopy, located much closer to the star, and attributed to the presence of evaporating bodies, has also been found in these systems, pointing towards these objects, also known as exocomets, as a possible transportation mechanism for volatiles from the outer regions of planetary systems, beyond the snowline, to the inner regions where rocky planets are located.However, observations thus far have not been able to identify warm gas in intermediate regions, or the presence of water, and therefore we don't yet understand how the transportation mechanisms might compare to those observed in the solar system. We propose to use NIRSpec fixed slit mid-resolution observations in the 3 to 5 micron range to look for volatiles in a sample of 5 debris disk stars with known millimetric and optical gas, in particular targeting the 4.5-5 micron water features that is not observable from the ground. The detection of CO and water could not only help constrain the amount and temperature of gas, key in planet formation studies, but also shed light into the dynamics and architecture of planetary systems, and have implications in astrobiological studies, such as water delivery theories.

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