Astronomy/Astrophysics Colloquium

Exocomets and their effect on planet atmospheres

It is known that ~20% of nearby stars host planetesimal belts orbiting 10s of au from the star. For a growing number CO gas has been detected coincident with the planetesimal belts showing that their planetesimals have a similar composition to Solar System comets. It is expected that some of these planetesimals may be perturbed into the inner regions of the system where they may collide with any planets residing there. The hot dust seen in several systems may be evidence of such comet-like dynamics, and in one system this picture is reinforced by the detection of CO close to the CO2 sublimation radius. This talk will present the evidence for the aforementioned scenario and consider the effect of collisions with such an exocomet population on the atmospheres of inner planets. These atmospheres can be stripped in collisions, but can also be enhanced by the delivery of volatiles, in a way that can be quantified from simulations of impacts. It will be shown that whether an atmosphere grows or depletes can be inferred from the planet's mass and semimajor axis (for given assumptions about the cometary impactors); the atmospheres of close-in exoplanets like those of TRAPPIST-1 will deplete while those at larger separation will grow in impacts. The Earth sits at the boundary, where more detailed consideration of the impactor populations finds that its bombardment history would lead to an atmosphere similar to the present one regardless of its initial mass.

Presented by
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Location: Broadcast via Zoom

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