C/O IN PROTOPLANETARY DISKS: THE EFFECT OF RADIAL DRIFT AND VISCOUS ACCRETION

Main sequence stars commonly host giant planets. The chemical composition of gas giant atmospheres can provide important constraints on their formation, accretion and migration history. Notably, an important signature of giant planet atmospheric chemistry is the carbon to oxygen (C/O) ratio, which may be different than the stellar value according to recent observations. One explanation for this discrepancy is the fact that the main carries of carbon and oxygen, i.e. H_2O, CO_2 and CO, have different condensation temperatures. This changes the relative abundance of C and O in gaseous and solid form throughout the disk as a function of the snowline location of these volatiles. We aim to determine how dynamical effects such as radial drift of solids and viscous gas accretion onto the central star change the C/O ratio in a protoplanetary disk. We quantify these effects by numerically determining the H_2O, CO_2 and CO snowline locations for a range of initial particle sizes. We find that radial drift moves the snowline location inwards compared to a static disk. From this result, we calculate the C/O ratio in both a passive and an active disk as a function of a particle's initial size, as well as for several particle size distributions. Our results have direct implications on the C/O ratio in giant planet atmospheres that have formed in situ.