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# The effect of late gas disks on the late stages of planet formation

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The external supply of gas to planetary atmospheres may be important to set their final compositions. In this talk, I will summarize recent works that quantified in an exoplanetary context, how much gas can be delivered to planets from late gas disks, which appear to be rather ubiquitous around main-sequence stars with bright planetesimal belts. This new gas component is indeed found to be present for tens and sometimes hundreds of millions of years around main-sequence stars. The gas is thought to be released from planetesimals when they collide together in their parent belt, which creates a gas disk (made of volatiles) that can viscously spread further in the system and encounter the already formed planets that can capture this gas, which will affect the primordial atmospheres of these planets. Kral et al. (2020) show that this very late accretion onto planets is very efficient and may allow capturing large quantities of carbon and oxygen (and potentially some nitrogen and hydrogen) leading to new atmospheric masses onto capturing terrestrial planets between that of the Earth's atmosphere to planets with massive atmospheres with sub-Neptune-like pressures. New secondary atmospheres with high metallicities will be created on terrestrial planets bathing in these late gas disks, resetting their primordial compositions inherited from the protoplanetary disk phase, and providing a new birth to planets that lost their atmospheres to photoevaporation or giant impacts. This volatile delivery for tens of Myr may also be favourable to the development of the first bricks of life. It will also affect the metallicity and C/O ratio of giant planets accreting late gas, which is an effect that may be observable in the close future. This very efficient accretion opens the way to a new planet detection method (for planets down to Earth masses at a few au from their stars) that I will present in this talk.