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Presentation Title: How the radial pebble flux determines a terrestrial-planet or super-Earth growth mode
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The PLATO mission has the goal to find and characterize terrestrial planets in the habitable zone of sun-like stars. From a formation perspective, one can question how these systems of terrestrial planets differ from the commonly found super-Earth systems. Previous works have argued that super-Earths are scaled-up terrestrial planets that formed in a similar way, through the mutual accretion of planetary embryos, but in discs more dense in solids than the Solar Nebula. Here, we will argue instead that the radial mass flux of pebbles drives two distinct formation pathways. Numerical integrations, which combine pebble accretion, migration and N-body gravity between embryos, show that a difference of a factor of two in the pebble mass-flux is enough to change the evolution from the terrestrial to the super-Earth growth mode. If the radial mass-flux of pebbles is small, the initial embryos within the ice line grow slowly and do not migrate substantially. The resulting population of approximately Mars-mass embryos becomes unstable when the gas disc dissipates and a small number of terrestrial planets are formed by mutual collisions. Instead, if the pebble mass-flux is high, the embryos within the ice line grow sufficiently in mass by the accretion of pebbles to migrate though the disc and finally concentrate at the inner disc edge. This results in the formation of a system of close-in super-Earths in the 5 to 20 Earth-mass range, bounded by the pebble isolation mass. These super-Earth systems generally experience instabilities after disc dissipation which trigger additional merging events and dislodge the system from resonant chains. We conclude that the terrestrial growth mode produces small rocky planets on wider orbits, like those in the Solar System. In contrast, the super-Earth growth mode produces planets in short-period orbits inside 1 AU, with masses larger than the Earth. The latter should be surrounded by a primordial H/He envelope, unless subsequently lost by stellar irradiation. Finally we will discuss how the pebble flux may be regulated by the possible presence of more distant giant planets that could halt the radial flow of pebbles.

(This work is part of a series of papers in prep by Lambrechts et al, Izidoro et al and Bitsch et al. on the formation of planetary systems by pebble accretion and migration.)