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The big and the small: how giant planets shape their smaller neighbours (invited talk)

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Planets form in protoplanetary discs surrounding newly formed stars, where dust grains clump and form km-sized planetesimals. As the dust grains start to grow to mm-cm sized pebbles, they drift inwards very rapidly due to the gas drag within the disc. As the pebbles drift inwards towards the hotter disc regions, they can evaporate and enrich the inner disc with their vapor to largely super-stellar values. At the same time, planetary embryos (of roughly Moon size) start to form, and they can continue to grow rapidly by the accretion of the inward drifting pebbles. As the planets start to grow, they will eventually open gaps in protoplanetary discs and alter the pressure structure of the disc. In fact, once the planets reach masses of around 20 Earth masses, they cause a pressure inversion in the disc, halting the inward drift of pebbles. There are several key consequences originating from this process: 1) the planet will stop accreting pebbles and transition towards gas accretion, and 2) the system interior of the growing planet can not receive pebbles any more. Consequently, the planets interior to the growing giant planet will stop growing and at the same time, the composition of the inner disc will change, as the inward flux of pebbles - that transport volatiles - stops.
In this talk, I will discuss the physical process of planet formation and how the growth of giant planets shapes the growth and composition of inner systems at home and abroad. I will further discuss the dynamical impacts of the growing giant planets on the inner system structure. I will close this talk by pointing to test cases that can help us to constrain the formation models via observations.

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Session Classification: Formation of gaseous giant planets and their impact on short-period low-mass planets: from solar system to exoplanetary systems