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MRI-accreting inner regions of protoplanetary discs

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Short-period super-Earths and mini-Neptunes have been shown to be common, yet it is still not understood how and where inside protoplanetary discs they could have formed. To form these planets at the short periods at which they are detected, the inner regions of protoplanetary discs must be enriched in dust. Dust could accumulate in the inner disc if the innermost regions accrete via the magneto-rotational instability (MRI). We developed a model of the inner disc which includes MRI-driven accretion, disc heating by both accretion and stellar irradiation, vertical energy transport, dust opacities, dust effects on disc ionization, thermal and non-thermal sources of ionization. The inner disc is assumed to be in steady state, and the dust is assumed to be well-mixed with the gas. Using this model, we explore how various disc and stellar parameters affect the structure of the inner disc and the possibility of dust accumulation. We show that properties of dust strongly affect the size of the MRI-accreting region and whether this region exists at all. Increasing the dust-to-gas ratio increases the size of this region, suggesting that dust may accumulate in the inner disc without suppressing the MRI. Overall, conditions in the inner disc may be more favourable to planet formation earlier in the disc lifetime, while the disc accretion rate is higher.