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Synergetic effects of collisions, turbulence and sawtooth crashes on impurity transport.

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This paper investigates the interplay of neoclassical, turbulent and MHD processes, which are simultaneously at play when contributing to impurity transport. It is shown that these contributions are not additive, as assumed sometimes. The interaction between turbulence and neoclassical effects leads to less effective thermal screening, i.e. lowers the outward flux due to temperature gradient. This behavior is attributed to poloidal asymmetries of the flow driven by turbulence. Moreover sawtooth crashes play an important role to determine fluxes across the $q=1$ surface. It is found that the density profile of a heavy impurity differs significantly in sawtoothed plasmas from the one predicted by neoclassical theory when neglecting MHD events. Sawtooth crashes impede impurity accumulation, but also weaken the impurity outflux due to the temperature gradient when the latter is dominant. Hence the combination of turbulent and MHD effects tends to oppose the effect of neoclassical thermal screening.

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