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## Gyrokinetic XGC1 study of the neoclassical scrape-off layer flow, and its interplay with the pedestal flow and structure

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Gyrokinetic particle code XGC1 is used to study the plasma flow in quiescent edge plasmas under different pedestal conditions. For a lower single null with forward ion Grad-B drift, the scrape-off flow is always in the co-current direction toward the inner divertor. A strong interplay is found between the scrape-off layer flow and the pedestal top flow, with the interplay being dependent on the pedestal structure. With an L-mode type of mild pedestal, the plasma flow is strong in the scrape-off layer (compared to the thermal speed), but negligible in the pedestal top. With an H-mode type pedestal, on the contrary, the co-current rotation moves into the pedestal top from the scrape-off layer. The result is different for backward Grad-B drift. These simulation results are consistent with the experimental observations on C-MOD[1]: the strong co-rotation in the L-mode scrape-off layer when Grad-B is in the favorable direction, the absence of co-rotation source in the L-mode pedestal top, and the appearance of a spontaneous co-rotation source in the H-mode pedestal top (which propagates inward). With an RMP, the plasma co-rotation becomes even stronger.

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[1] J.E. Rice, W.E. Lee, E.S. Marmor, N.P. Basse, B.T. Bonoli, et al., Phys. Plasmas 11, 2427 (2004)