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Theoretical and simulation studies of plasma-wall interactions¹ XIANZHU TANG, Z. GUO, N. KRASHENINNIKOVA, G.L. DELZANNO, V. BOROVIKOV, D. PEREZ, A. VOTER, B. UBERUAGA, Los Alamos National Laboratory — A number of scientific issues in plasma-wall interaction are being studied at LANL, which broadly fall into three categories: (1) understanding the energy and angular distribution of plasma irradiation flux at the wall; (2) modeling the materials response to plasma and neutron irradiation; (3) understanding the wall feedback to the plasma in terms of recycling, wall potential, and dust transport. Here we focus on recent work which elucidate (1) the role of transport-driven (pre)sheath instabilities in modifying the particle energy and angular distribution of the plasma irradiation flux at the wall; (2) the role of wall boundary condition on upstream plasma profile; and (3) the controlling physics for plasma parallel flow acceleration along the open field lines that intercept the wall. A particularly interesting issue related to (2) and (3) is how low recycling at the wall affects the upstream plasma temperature through reduced collisionality, which we find to be opposite to the common view of a flattened profile of electron temperature close to the core value. A related subtlety is how wall recycling, through its effect on collisionality, changes the wall potential, which is a critical boundary condition in traditional tokamak edge modeling.

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