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Impact of drift direction on near-SOL tungsten impurity accumulation in DIII-D[1] SHAWN ZAMPERINI, DAVID DONOVAN, UTK, ZEKE UNTERBERG, ORNL, PETER STANGEBY, DAVID ELDER, UTIAS, JONAH DURAN, JACOB NICHOLS, UTK, MIKE ZACH, ORNL — Double-sided collector probes inserted into the far-SOL midplane of DIII-D during the 2016 metal rings campaign collected measureable amounts of tungsten (W) along their surfaces. One aim of the campaign was to seek experimental evidence for long-hypothesized, near-SOL impurity accumulation in the upstream crown region caused by the ∇par Ti force on the impurity ions. Upstream accumulation was inferred from the fact that the upstream facing side of the probes measured more W than the downstream facing side, despite the fact that the W-rings are on the downstream side (lower divertor). The collector probe data for two discharges that differed primarily in Bt-direction alone were analyzed in depth, showing that the upstream facing side of the probes measured twice as much W for ion ∇B-drift up vs down. This is explained by drift-dependent fuel-plasma flows measured on a number of tokamaks, including DIII-D. For ion ∇B-drift up, the fuel-plasma is roughly stagnant near the crown, thus ion-ion friction does not compete with the ∇par Ti force favoring accumulation, but for ion ∇B-drift down fast fuel-ion flow towards the inner target can "flush out" any accumulating impurities. The near-SOL accumulation understanding gained here is important as any impurity content in this region would act as a boundary value on the core impurity density, potentially creating unacceptable levels of core contamination.

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