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Tungsten divertor sourcing in DIII-D H-mode discharges and its impact on core impurity accumulation in different ELM regimes[1]
T. ABRAMS, R. DING, J. GUTERL, ORAU, A. BRIESEMEISTER, E.A. UNTERBERG, ORNL, H.Y. GUO, A.W. LEONARD, D.M. THOMAS, GA, A.G. MCLEAN, B. VICTOR, LLNL, D. RUDAKOV, UCSD, B. GRIERSON, PPPL, J.G. WATKINS, SNL, J.D. ELDER, P.C. STANGEBY, UTIAS — Significant progress has been made understanding W sourcing during Type I ELMy H-mode on DIII-D using fast high-resolution measurements of W sourcing coupled with OEDGE/ERO and TRIM.SP modeling. ERO modeling of the inter-ELM phase, using a new OEDGE capability for charge state-resolved carbon ion fluxes and a material mixing model, shows measured W erosion is well explained by C->W sputtering. Ion impact energies in the DIII-D divertor during ELMs, inferred from ratios of heat flux to ion flux, are 200-500 eV. Comparisons with TRIM.SP indicate C->W sputtering dominates W sourcing during ELMs. This is in contrast to JET where ion impact energies are 3-5 keV during ELMs, predicted by the "free streaming model," and D->W sputtering strongly contributes to W sourcing. Fast measurements of W erosion dynamics during ELMs agree well with TRIM.SP-based sputtering models assuming C/W surface concentrations of 0.5-0.8 and a 2% C^{2+} ion flux fraction. Core W accumulation and SOL W density measurements made during the DIII-D high-Z tile array mini-campaign correlate with ELM frequency and W source rate.

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