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Assessment of parallel ion heat flux in the SOL of Alcator C-Mod with implications for heat-flux limiters[1] D. BRUNNER, B. LABOMBARD, M. CHURCHILL, J. HUGHES, B. LIPSCHULTZ, R. OCHOUKOV, C. THEILER, J. WALK, D. WHYTE, MIT PSFC, T. ROGNLIEN, M. UMANSKY, LLNL — A systematic assessment of parallel ion heat flux in the Alcator C-Mod scrape-off layer is performed, revealing the role of kinetic effects. Experimental upstream ion-to-electron temperature ratios, as measured with charge exchange recombination spectroscopy and a reciprocating Langmuir probe near the separatrix, are compared to a simplified 1D, two-fluid model (benchmarked with UEDGE). At high collisionality with the divertor plasma nearly detached, the measured temperature ratio (~ 2) is matched by the fluid model. At low collisionality with the divertor sheath limited, the measured ratio (~ 4) is under-predicted by 2, suggesting that kinetic corrections are needed. Heat flux limiters are often used to approximate kinetic effects in fluid models; a coefficient of 0.21 for the free streaming heat flux is typical, informed by kinetic and fluid simulation comparisons. Using this correction brings modeled and measured temperature ratios into agreement at low and high collisionalities. This verifies the role of kinetic effects on ion heat transport and supports the coefficient of 0.21 as a first approximation. However, a more precise empirical prescription for heat flux limiter coefficients will require a more thorough examination of boundary ion temperature, both up- and down-stream.

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