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Isotope Mass Scaling of Turbulence and Transport*[1] GEORGE MCKEE, ZHENG YAN, Univ of Wisconsin, Madison, PUNIT GOHIL, TIM LUCE, General Atomics, TERRY RHODES, UCLA — The dependence of turbulence characteristics and transport scaling on the fuel ion mass has been investigated in a set of hydrogen ($A = 1$) and deuterium ($A = 2$) plasmas on DIII-D. Normalized energy confinement time ($B * \tau_E$) is two times lower in hydrogen (H) plasmas compare to similar deuterium (D) plasmas. Dimensionless parameters other than ion mass (A), including ρ^*, q_{95}, T_e/T_i, β_N, ν^*, and Mach number were maintained nearly fixed. Matched profiles of electron density, electron and ion temperature, and toroidal rotation were well matched. The normalized turbulence amplitude ($\tilde{n}/n$) is approximately twice as large in H as in D, which may partially explain the increased transport and reduced energy confinement time. Radial correlation lengths of low-wavenumber density turbulence in hydrogen are similar to or slightly larger than correlation lengths in the deuterium plasmas and generally scale with the ion gyroradius, which were maintained nearly fixed in this dimensionless scan. Predicting energy confinement in D-T burning plasmas requires an understanding of the large and beneficial isotope scaling of transport.

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