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Isotopic Dependence of Fine Scale Zonal Flows[1] T.S. HAHM, Princeton Plasma Physics Laboratory, P.O. Box 451, Princeton, NJ 08543, LU WANG, National Fusion Research Institute, Daejeon, Korea, E.S. YOON, Princeton Plasma Physics Laboratory, P.O. Box 451, Princeton, NJ 08543 — This work addresses the isotopic dependence of the fine scale zonal flow (ZF) dynamics which are generated from fine scale (shorter than ρ_i, but significantly larger than ρ_e) electron drift wave turbulence (DWT) which is related to either collisionless TEM or current driven drift waves (CDDW), or inverse cascade of ETG modes. We find that the fine scale zonal flows in deuterium (D) plasmas can be stronger than those of hydrogen (H) plasmas, and therefore lead to lower turbulence and transport and better confinement. We have analytically calculated the Rosenbluth-Hinton (RH) residual level of zonal flows, taking into account both ion and electron dynamics using bounce-kinetics. Since the average ion gyroradius is different for different ion species for the same temperature, a transition from the ion classical polarization shielding dominated regime to the electron neo-classical shielding dominated regime occurs at different values of $k_r\rho_e$ for different ion species. As a consequence, RH ZFs for D plasmas can be stronger than those for H plasmas for $k_r\rho_e$ around 0.01. Based on this observation, we conclude that a significant isotopic dependence of confinement can result from the fine scale zonal flows generated from fine scale DWT.

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