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Natural Fueling of a Tokamak Fusion Reactor WEIGANG WAN, SCOTT PARKER, YANG CHEN, FRANCIS PERKINS, Center for Integrated Plasma Studies, University of Colorado, Boulder, CO 80309 — A plausible natural fueling mechanism for tokamak fusion reactors is discussed. In H-mode plasmas dominated by ion-temperature gradient driven turbulence, cold deuterium and tritium ions near the edge naturally pinch radially inward towards the core. This may lower some of the pellet acceleration requirements on the pellet injection system on ITER. The natural fueling mechanism is shown using the three-dimensional toroidal electromagnetic gyrokinetic turbulence code GEM. Realistic Tokamak profiles relevant to ITER are tested. A quasi-linear theory is presented explaining the mechanism. Both a non-adiabatic electron response and the effects of toroidal geometry are found to be favorable for natural fueling. Additionally, it is shown that helium ash diffuses radially outward as the cold fuel moves radially inward.

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