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Response of Ion and Electron Temperatures, Electron Density and Toroidal Rotation to Electron Cyclotron Heating in JT-60U

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Temporal and spatial responses of the electron and ion temperatures (T_e and T_i), the electron density (n_e), and the toroidal rotation velocity (V_ϕ) with electron cyclotron heating (ECH) have been clarified for the first time with fast measurements in positive shear (PS) H-mode plasmas, weak shear (WS) plasmas with internal transport barriers (ITBs) and reversed shear (RS) plasmas with ITBs on JT-60U. We have found that: (i) Ion temperature inside the steep T_i gradient decreases with ECH after the T_e increase in PS and WS plasmas. The T_i reduction can be avoided with a large V_ϕ shear (dV_ϕ/dr) that easily forms in RS plasmas. (ii) Electron density with peaked n_e profile decreases with ECH after the T_e increase. (iii) Counter intrinsic rotation is generated after the T_e increase and increases with the T_e increase. Time scale of the V_ϕ change is much longer than that of the T_e increase [1]. The observations in the n_e , T_i and V_ϕ in PS plasmas are consistently explained by theoretical models and gyrokinetic (GK) calculations.

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