Decorrelation of Electron Temperature, Ion Temperature and Rotation Responses in Perturbative Cold Pulse Experiments in Alcator C-Mod Plasmas

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In perturbative cold pulse transport experiments at Alcator C-Mod, ion temperature responses appear to be qualitatively different than the electron temperature responses. Ion non-local responses, defined as core temperature rises in response to edge cooling, appear even when there is no corresponding electron non-local response (see Figure 1). These ion non-local responses occur on a slower timescale than the electron temperature responses, and persist past the LOC/SOC transition. In the ion toroidal rotation velocity channel, there appears to be only very weak perturbation across the entire profile in response to cold pulses. This work builds on previous results with a systematic multi-channel analysis comparing electron temperature and density, ion temperature and toroidal rotation rate, and impurity density responses to cold pulse and sawtooth perturbations. The time and spatially resolved ion channel data come from the Alcator C-Mod x-ray imaging crystal spectrometer (XICS). Experimental results will also be compared with simulation results from TRANSP.

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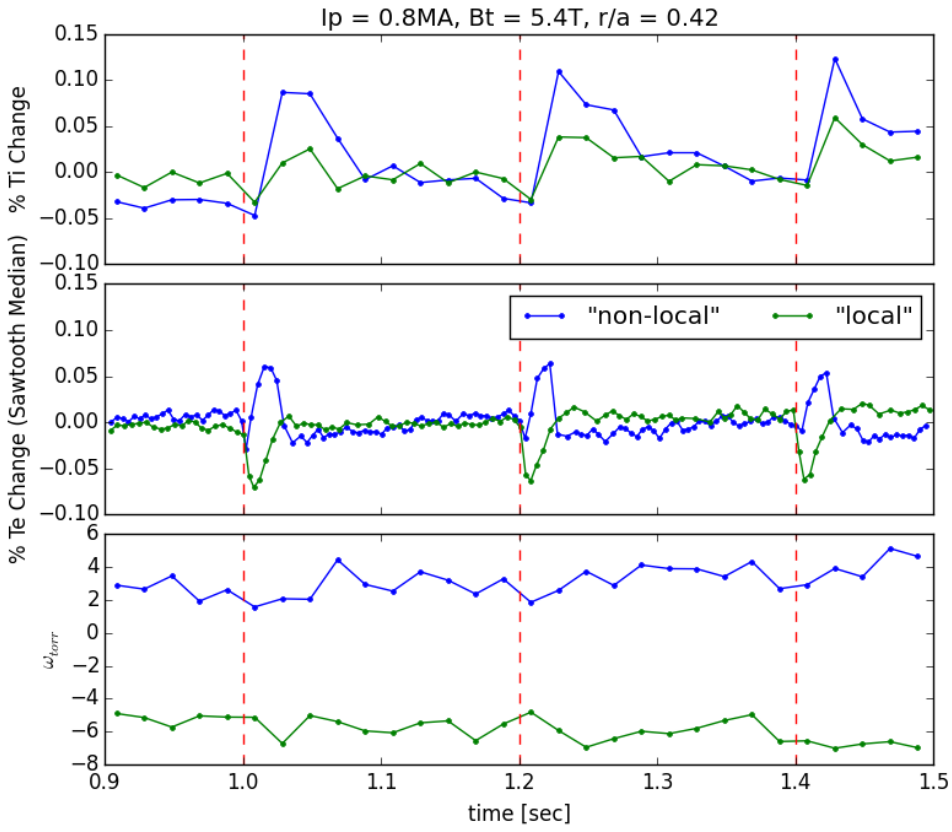

Figure 1: The "non-local" responses come from shot 1120106020, and has a line-integrated electron density of 0.368×10^{20} m^{-3}, median $T_i = 1.24$ keV and $T_e = 1.76$ keV at $r/a = 0.42$, and co-current core toroidal rotation. The "local" responses come from shot 1120106012, and has a line-integrated electron density of 0.627×10^{20} m^{-3}, median $T_i = 1.34$ keV and $T_e = .449$ keV at $r/a = 0.42$, and counter-current core toroidal rotation. The red dashed lines indicate cold pulse injection times.