Relationship between ELM size and transport speed through the scrape-off layer in NSTX

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Edge localized modes (ELMs) are of concern for future devices because they damage plasma facing components, due to high particle and heat fluxes. ELMs are believed to release particles and energy into a narrow poloidal layer near the outer midplane, where the magnetic field is weakest and the ballooning instability is strongest. Here we characterize transport of the ELM particle fluxes through the scrape-off layer (SOL), the region of open field lines just outside the magnetic separatrix. One way to quantify this is by measuring the in-out delay, the difference in time between when the ELM particle flux reaches the outer and inner diverter strike points. This measure is correlated with the average speed of the ELM through the SOL. We compare these speeds to various measures of the ELM magnitude, e.g. increase of D_α emission and a decrease in line-averaged plasma density. We find that as the size of an ELM increases, the average speed with which it travels through the SOL tends to increase, qualitatively consistent with an expectation that larger ELMs release hotter particles into the SOL, yielding faster SOL transport rates.