Edge impurity dynamics during an ELM cycle on DIII-D

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Abstract. Using high spatial and temporal resolution spectroscopy, direct measurements of the impurity dynamics during an edge localized mode (ELM) cycle have revealed rich details of both the ELM event and the inter-ELM period. The increased transport associated with the ELM event is observed to affect all the particle species (electrons, ions, and impurities) in a similar manner over a wide range in plasma conditions. The density perturbation (and hence convective energy loss) is found to be insensitive to edge collisionality while the temperature perturbation (and hence conductive energy loss) decreases as the edge collisionality increases. Analysis of the response of the profiles to the ELM indicates that the initial response to the ELM is a rapid (<0.5 ms) decrease in the impurity density in the high gradient region in the edge coincident with a brief increase in the temperature and rotation velocity, which then drop on a slightly longer time scale (~1 ms) than the initial density decrease. Transport is then observed to continually improve as the E_r shear increases during the inter-ELM period. Analysis suggests that this correlation in conjunction with the loss of E_r shear at the ELM event

may be the underlying reason for the decrease in the conductive loss as the edge collisonality is increased.