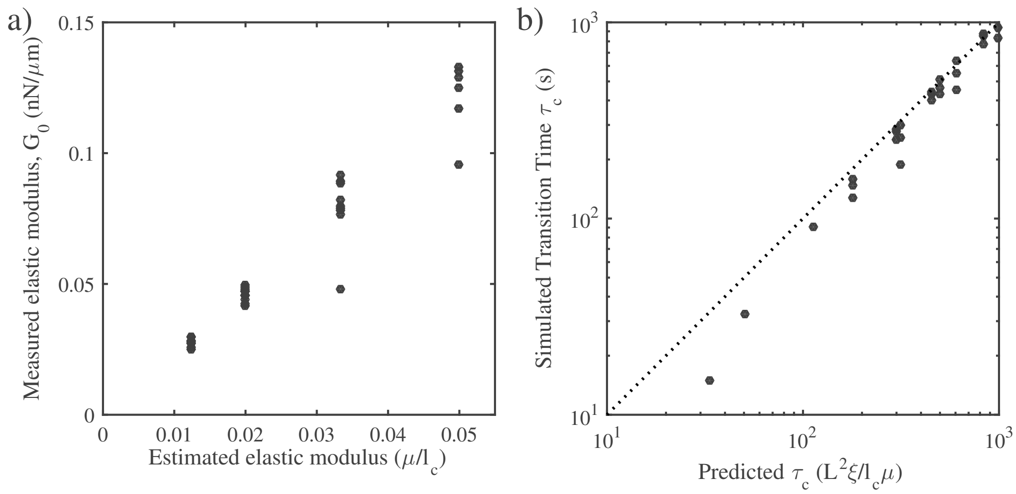

Figure 1. Filament recycling rescues network tearing and modulates effective viscosity. **a)** Examples of $20 \times 12\mu m$ network under 0.001 $nN/\mu m$ extensional stress with recycling ($\tau_r = 10s$) and without, ($\tau_r = \infty$). Both images are taken when the patches had reached a net strain of 0.4. The network with recycling doesn't appear to change shape because its components have been recycled to remain in the original domain. Network parameters: $L = 3\,\mu m$, $l_c = 0.5\,\mu m$, $\xi = 10\,nN \cdot s$. **b)** Strain buildup for networks with parameters as in a) in the presence of different filament recycling rates. Dotted line indicates the strain state at which the snapshots in panel a) were taken. Note that the strain rate for $\tau_r = 1000$ is essentially identical to that of $\tau_r = \infty$, indicating that recycling does not govern the relaxation rate if the recycling time is above a threshold.

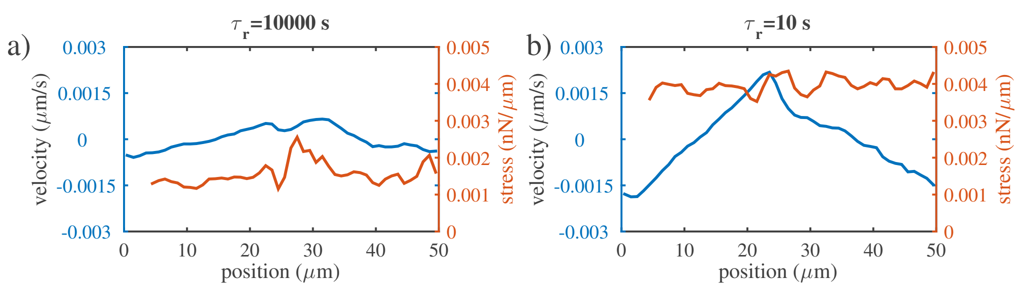

Figure 2. Filament recycling rescues network tearing and modulates effective viscosity. **a)** Examples of $20 \times 12\mu m$ network under 0.001 $nN/\mu m$ extensional stress with recycling ($\tau_r = 10s$) and without, ($\tau_r = \infty$). Both images are taken when the patches had reached a net strain of 0.4. The network with recycling doesn't appear to change shape because its components have been recycled to remain in the original domain. Network parameters: $L = 3\,\mu m$, $l_c = 0.5\,\mu m$, $\xi = 10\,nN \cdot s$. **b)** Strain buildup for networks with parameters as in a) in the presence of different filament recycling rates. Dotted line indicates the strain state at which the snapshots in panel a) were taken. Note that the strain rate for $\tau_r = 1000$ is essentially identical to that of $\tau_r = \infty$, indicating that recycling does not govern the relaxation rate if the recycling time is above a threshold.