

Movie 1: movie corresponding to Fig. 1(a), showing the flow field in active turbulence. Velocity field is coloured

by the magnitude of the rms-velocity urms. White circles denote +1/2 defects with the attached lines indicating their orientation pointing from head-to-tail and purple

trefoils denote -1/2 defects. Time between every frame is 50 simulation timesteps. Movie 2: movie corresponding to Fig. 1(d), showing the director field in active

turbulence. Director field is coloured by the magnitude of the splay-bend order parameter $SS_{\text{splay-Bend}} = q_{ij}q_{ij}$. White circles denote +1/2 defects with the attached lines

indicating their orientation pointing from head-to-tail and purple trefoils denote -1/2 defects. Time between every frame is 50 simulation timesteps. Movie 3: movie

corresponding to Fig. 1(b), showing the flow field in the laning state. Velocity field is coloured by the magnitude of the rms-velocity urms. White circles denote +1/2

defects with the attached lines indicating their orientation pointing from head-to-tail and purple trefoils denote -1/2 defects. Time between every frame is 50

simulation timesteps. Movie 4: movie corresponding to Fig. 1(e), showing the director field in the laning state. Director field is coloured by the magnitude of the splaybend

order parameter $SS_{\text{splay-Bend}} = q_{ij}q_{ij}$. White circles denote +1/2 defects with the attached lines indicating their orientation pointing from head-to-tail and purple

trefoils denote -1/2 defects. Time between every frame is 50 simulation timesteps. Movie 5: movie corresponding to Fig. 5(a), showing the director field in the scarring

state for low activity. Defect pairs are bound, but the -1/2 defect is not dragged along with the +1/2 defect resulting in long scars. Director field is coloured by the

magnitude of the splay-bend order parameter $SS_{\text{splay-Bend}} = q_{ij}q_{ij}$. White circles denote +1/2 defects with the attached lines indicating their orientation pointing from

head-to-tail and purple trefoils denote -1/2 defects. Time between every frame is 1000 simulation timesteps. Movie 6: movie corresponding to Fig. 5(b), showing the

director field in the scarring state for medium activity. Defect pairs remain tightly bound. However, the -1/2 defect remains some distance from the +1/2 defect.

Director field is coloured by the magnitude of the splay-bend order parameter $SS_{\text{splay-Bend}} = q_{ij}q_{ij}$. White circles denote +1/2 defects with the attached lines indicating

their orientation pointing from head-to-tail and purple trefoils denote -1/2 defects. Time between every frame is 1000 simulation timesteps. Movie 7: movie

corresponding to Fig. 5(c), showing the director field in the scarring state for high activity. Defect pairs remain tightly bound, and many pairs are formed. Director field

is coloured by the magnitude of the splay-bend order parameter $SS_{\text{splay-Bend}} = q_{ij}q_{ij}$. White circles denote +1/2 defects with the attached lines indicating their orientation

pointing from head-to-tail and purple trefoils denote -1/2 defects. Time between every frame is 1000 simulation timesteps. Movie 8: movie corresponding to Fig. 5(d),

showing propagation of a defect pair and the creation of a new one. Red (blue) arrows show the $+1/2$ defect velocity direction (orientation). Purple trefoils denote the $-1/2$ defects. Black lines show the director field. Time between every frame is 10 simulation timesteps. See DOI: [10.1039/c9sm01963d](https://doi.org/10.1039/c9sm01963d)