



**Fig S5. The collectivity ( $\kappa$ ) of the top 50 slowest ANM modes where four of which are the discussed functional motions in ribosome.**

The collectivity ( $\kappa$ ) [13] quantifies the amount of global motion in each ANM mode. The 30S ratcheting motion (mode 25) and the L1 stalk closing motion (modes 27 and 28) are found to be highly collective but not the local 30S head swiveling (mode 32).