**Supplementary File 1.** Cohesin-DNA interaction parameters in gripping and slipping states.

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| Name | Description | Value (Gripping) | Value (Slipping) |
| *L*p | DNA persistence length | 50 nm | no change |
| *D* | DNA segment length | 5 nm | no change |
| *N* | Number of DNA segments | 45 - 70 | no change |
| *LA* | Smc1/3 head-to-elbow distance | 30 nm | no change |
| *UA* | Smc1/3 elbow-to-hinge distance | 20 nm | no change |
| *HA* | Equilibrium Smc head-to-head distance | 4 nm | 14 nm |
| $ξ$ (See Eq. 4) | Head-to-head additional stiffness factor | 5 – 50 | no change |
| *K*hinge | Parameter that characterizes stiffness of head-to-hinge interaction | 0.5 pN/nm | no change |
| $$θ$$ | Equilibrium angle between head-to-elbow and elbow-to-hinge cohesin segments | 0 or 180 | 0 |
| $α$ (See Eq. 5) | Stiffness of the slipping interaction between DNA and Smc3 | 5 pN/nm | no change |
| $γ$ (See Eq. 5) | Stiffness of the gripping interaction between DNA and Smc3 | 5 pN/nm | 0 |
| $δ$ (See Eq. 5) | Stiffness of the interaction between DNA and the hinge | 5 pN/nm | no change |