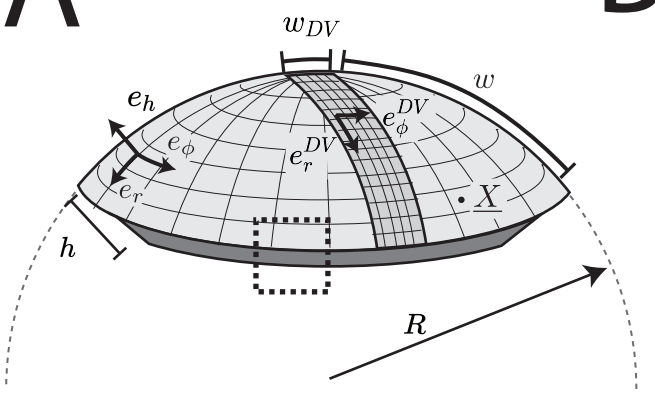
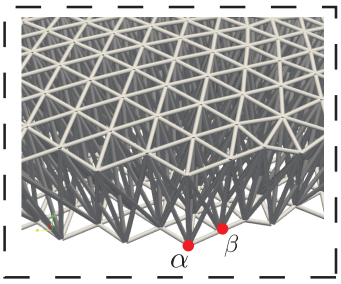
A

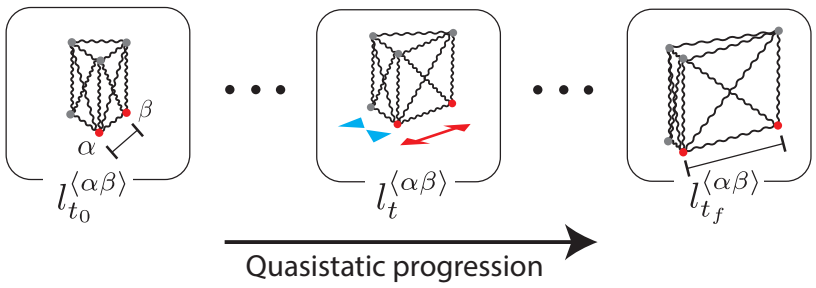


B



$$l_{t_0}^{\langle\alpha\beta\rangle} = \sqrt{\left(\Delta X_i^{\langle\alpha\beta\rangle}\right)^2}$$

$$l_{t_f}^{\langle\alpha\beta\rangle} = \sqrt{\left(\lambda_{ij}^{\langle\alpha\beta\rangle}\Delta X_i^{\langle\alpha\beta\rangle}\right)^2}$$



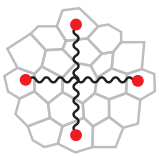
C

$$\underline{\underline{\lambda}} = \lambda\tilde{\lambda}\,(e_r \otimes e_r) + \lambda/\tilde{\lambda}\,(e_\phi \otimes e_\phi) + \lambda_H\,(e_h \otimes e_h)$$

C1

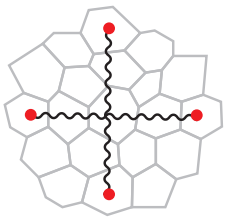
λ : Cell Area Changes

Initial State



$A(\underline{X}, t_0)$

Final State



$A(\underline{X}, t_f)$

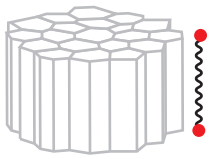
$\underline{X}$: Position
t_0 : Initial stage
t_f : Final stage
A : Mean cell area

$$\lambda = \sqrt{\frac{A(\underline{X}, t_f)}{A(\underline{X}, t_0)}}$$

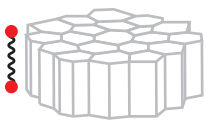
C2

λ_H : Cell Thickness Change

Initial State



Final State



H : Cell Height

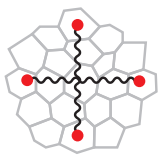
$$\lambda_H = \frac{H(\underline{X}, t_f)}{H(\underline{X}, t_0)}$$

C3

$$\tilde{\lambda} = \tilde{\lambda}_Q\tilde{\lambda}_R$$

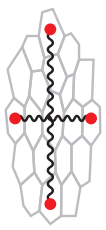
$\tilde{\lambda}_Q$: Cell Elongation

Initial State



$|Q|(\underline{X}, t_0)$

Final State



$|Q|(\underline{X}, t_f)$

$|Q|$: Mean cell elongation

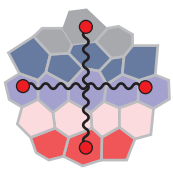
$$\tilde{\lambda}_Q = \frac{\exp\left(|Q|(\underline{X}, t_f)\right)}{\exp\left(|Q|(\underline{X}, t_0)\right)}$$

C4

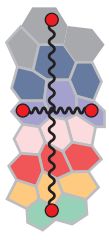
$$\tilde{\lambda} = \tilde{\lambda}_Q\tilde{\lambda}_R$$

$\tilde{\lambda}_R$: Cell Rearrangements

Initial State



Final State



N : Cumulative Cell Number
k : Topological Ring Number

$$\tilde{\lambda}_R = 1 + \Delta_N\Delta_t k(\underline{X})$$