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Fibril-based, geometrical microtubule - kinetochore attachments¹ ZSOLT BERTALAN, ISI Foundation, CATERINA LA PORTA, Department of Biosciences, University of Milano, HELDER MAIATO, Instituto de Biologia Molecular e Celular and Faculty of Medicine, University of Porto, STEFANO ZAPPERI, CNR IENI — Mechanical factors involved in regulating the stability of microtubulekinetochore attachments during cell division are poorly understood. Various aspects of these attachments are essential for proper chromosome segregation. We introduce and simulate a mechanical model of microtubule-kinetochore interactions in which the stability of the attachment is due to the geometrical conformations of curling protofilaments entangled in kinethochore fibrils. The main load of the simulations are done in two dimensions due to the geometric shape of the protofilament curl. However, since the microtubule-kinetochore fibril entanglement is inherently a three dimensional problem, we also model and test the attachment in 3D. The model allows us to reproduce with good accuracy in vitro experimental measurements of the detachment times of yeast kinetochores from MTs under external pulling forces. Numerical simulations also suggest a purely geometrical mechanism that does not require changes in chemical affinities to control the switch between stable and unstable attachments.

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