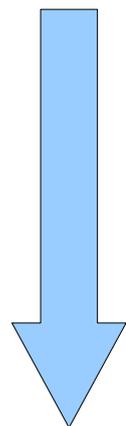


ダイヤカット円筒の剛性特性

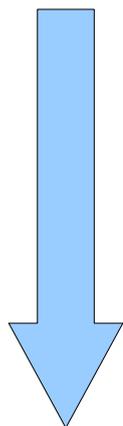
秋田大学
刈屋 栄仁

ダイヤカット円筒

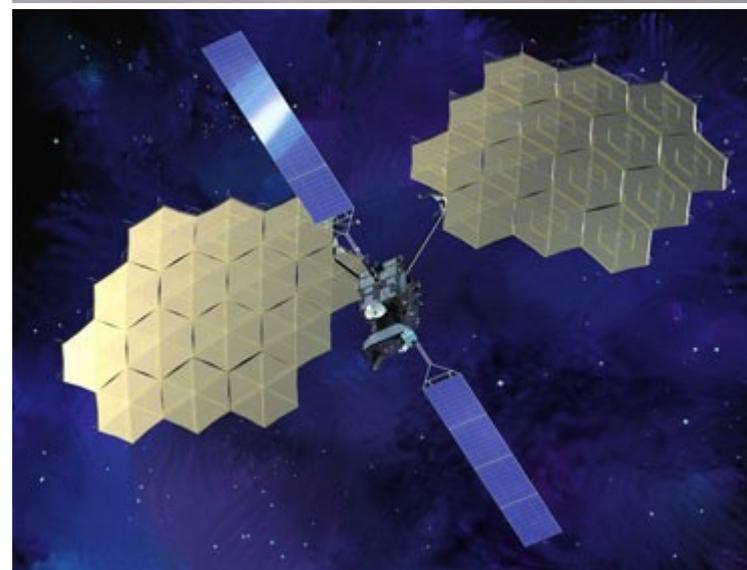


折紙工学の応用

薄い材料で高強度をえる

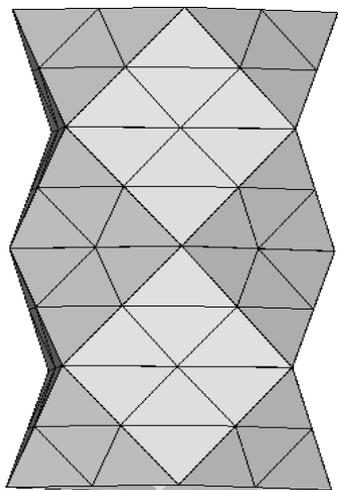


周方向・高さ方向パターン数の変動で
どのような剛性特性を示すか

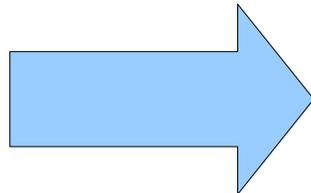


提供:JAXA

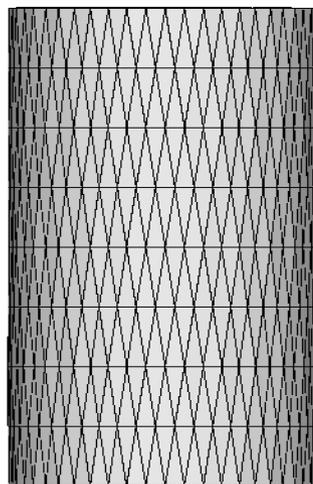
解析モデル



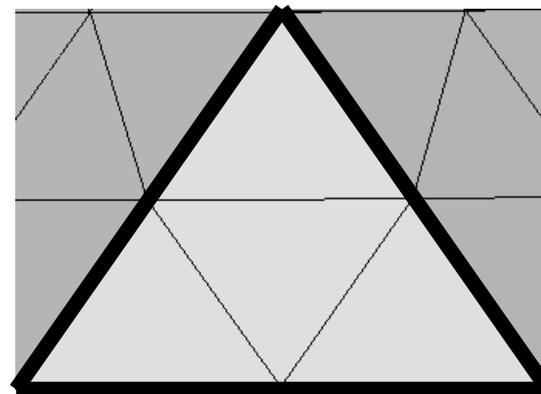
周方向
2~25パターン



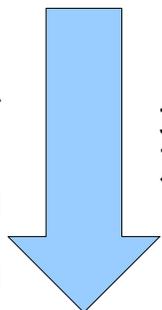
増加



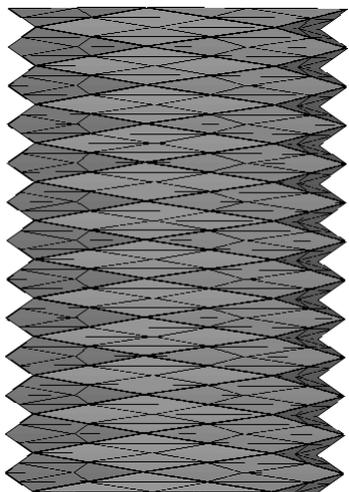
三角形1パターン
6節点3角形シェル要素



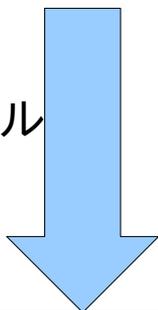
高さ方向
2~25パターン



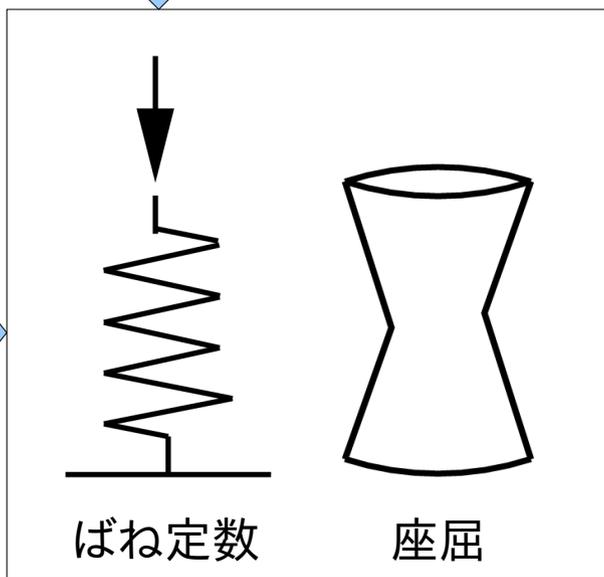
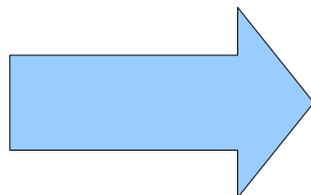
増加



有限要素解析ツール
CalculiX



数値解析

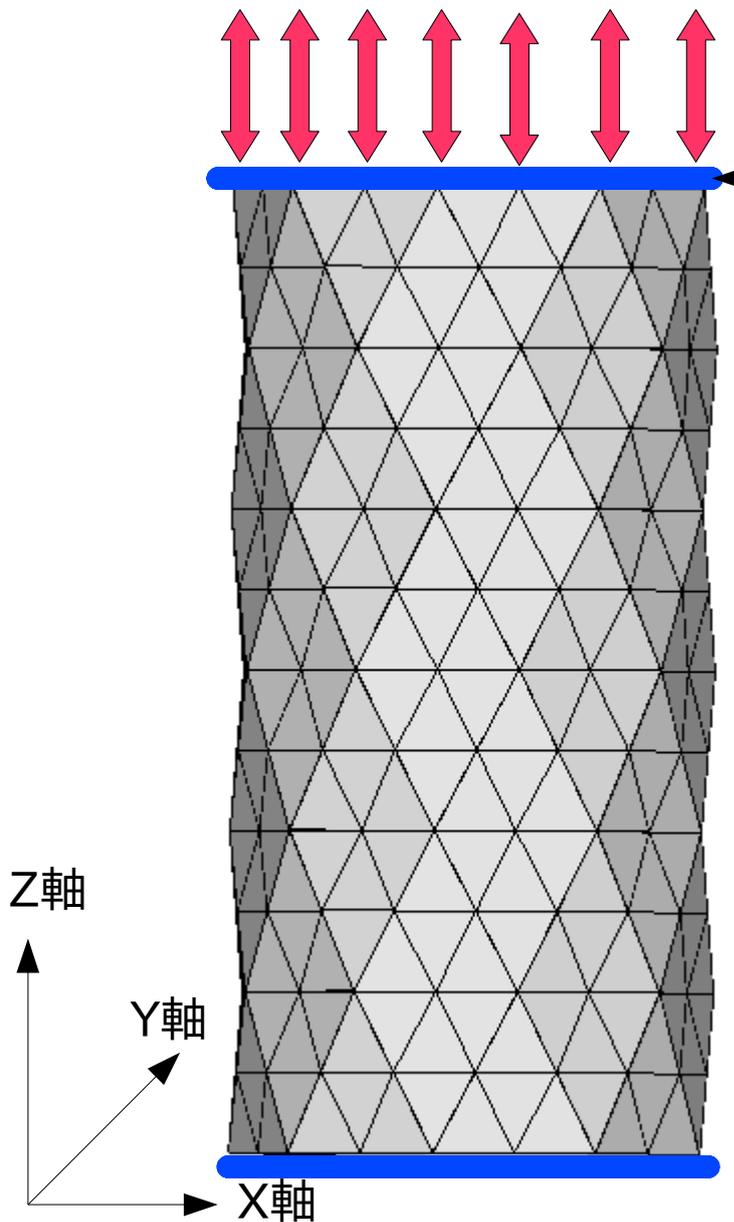


円筒サイズ

半径	3cm
高さ	12cm
厚さ	0.2cm
ヤング率	69GPa

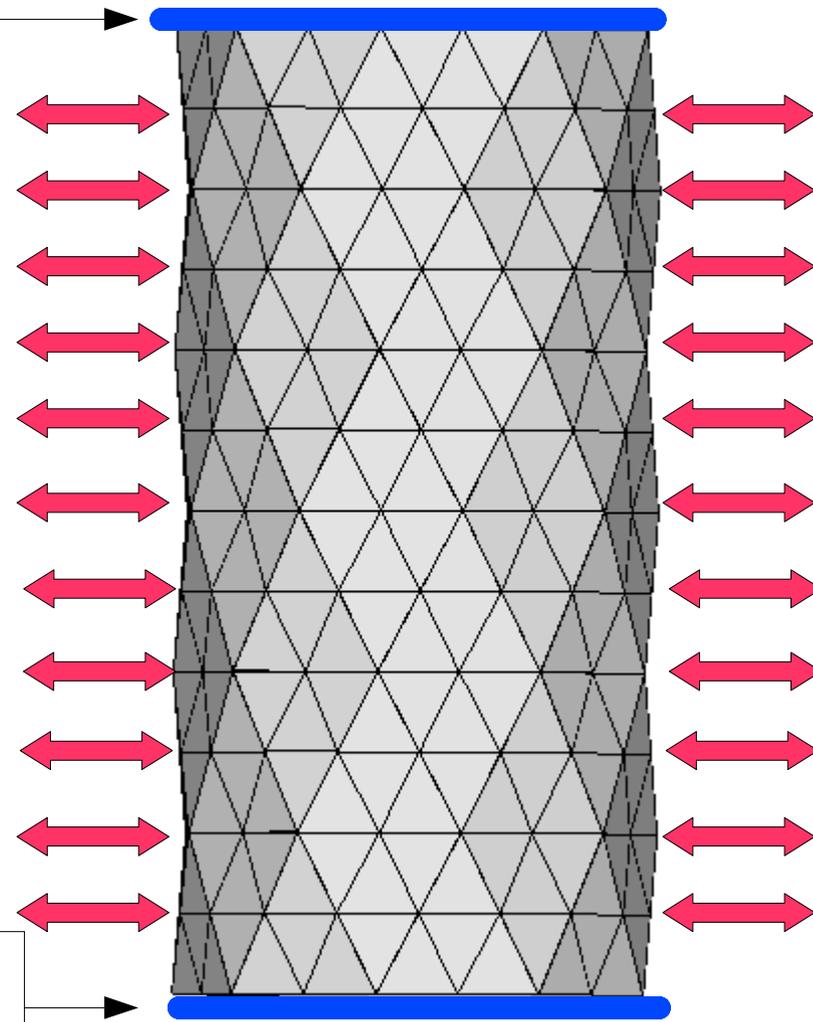
解析方法

軸方向圧縮・引張時

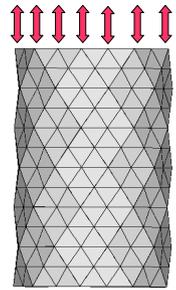


上端開口部
横方向固定

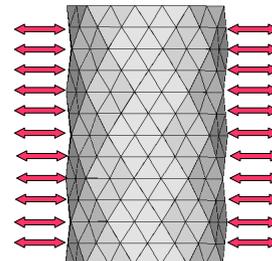
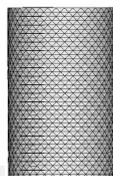
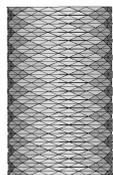
円筒中心線方向圧縮・引張時



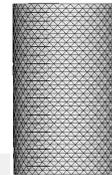
下端開口部
全固定



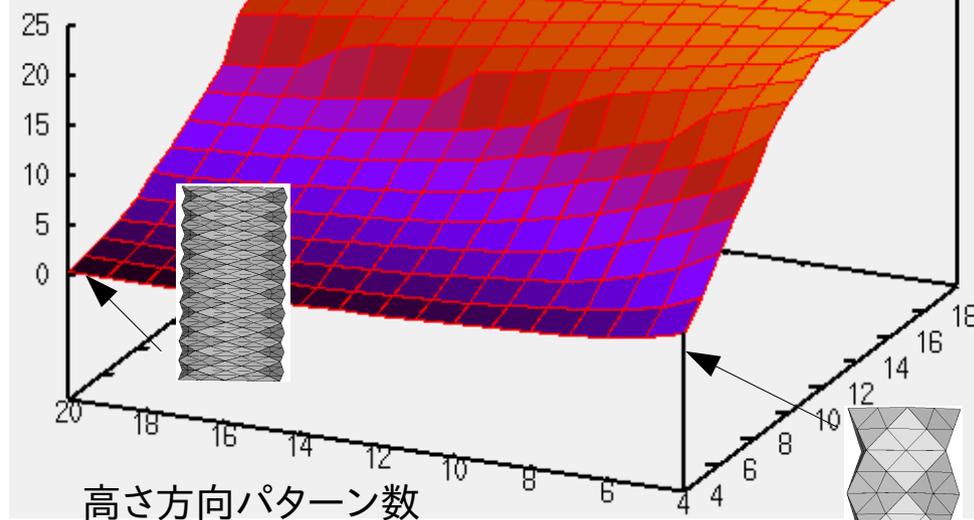
の時



の時

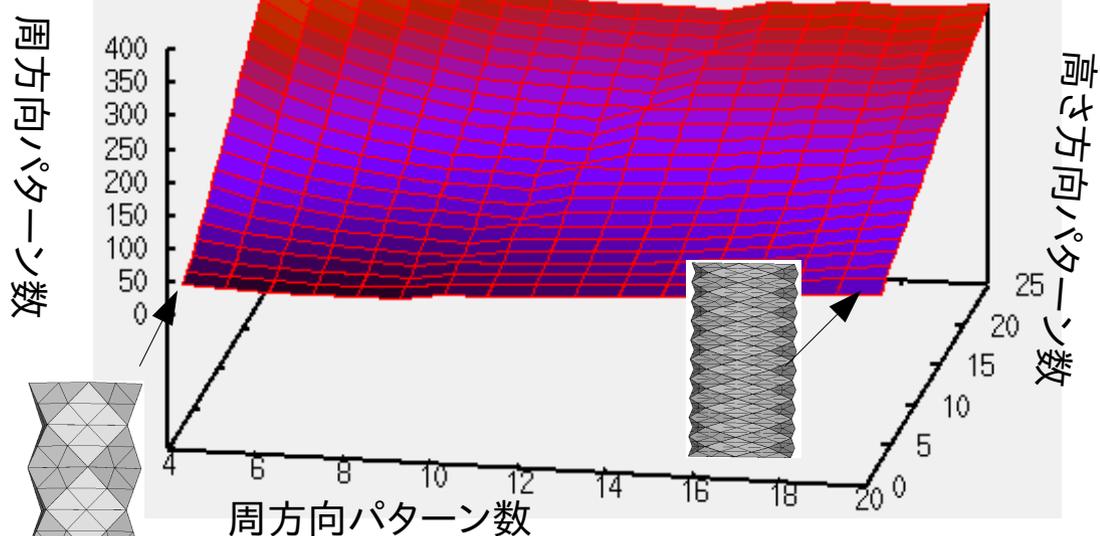


ばね定数



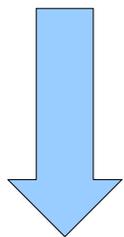
周方向パターン数

ばね定数



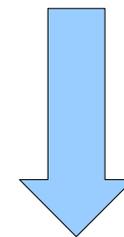
高さ方向パターン数

軸方向圧縮・引張

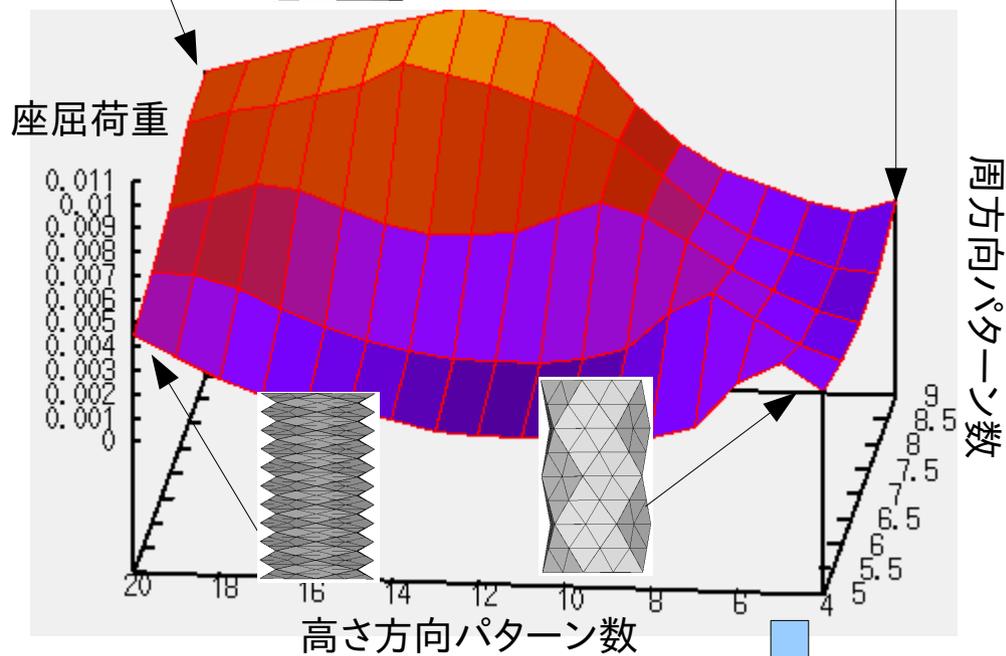
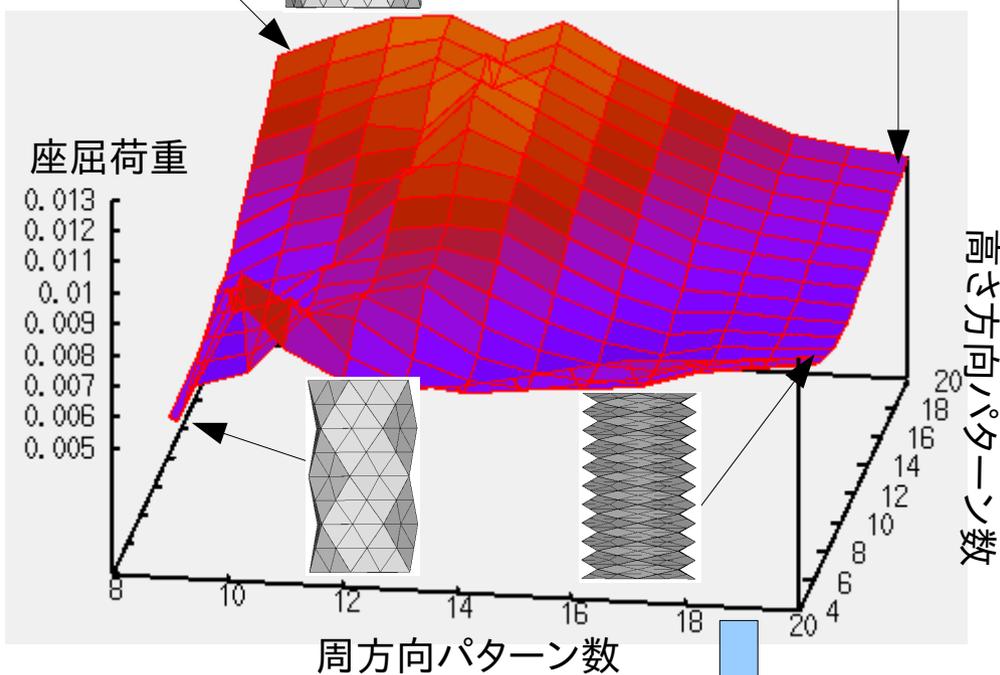
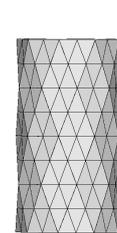
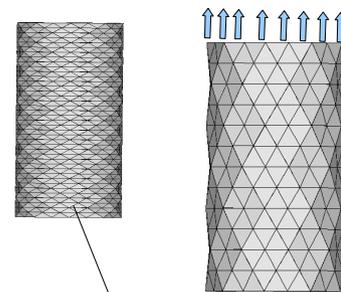
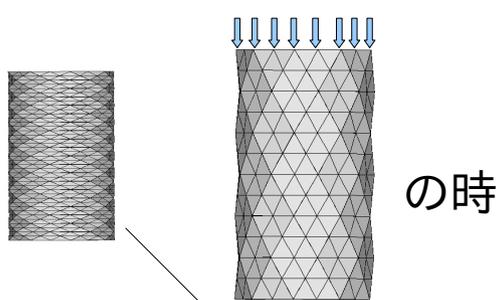


周方向増加で硬くなる
高さ方向増加あまり変化しない

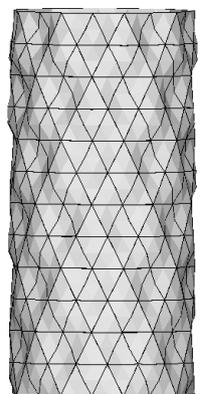
円筒中心方向圧縮・引張



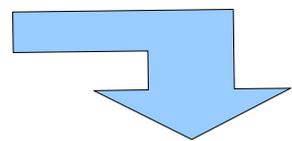
高さ方向増加で硬くなる
高さ方向増加あまり変化しない



座屈モード

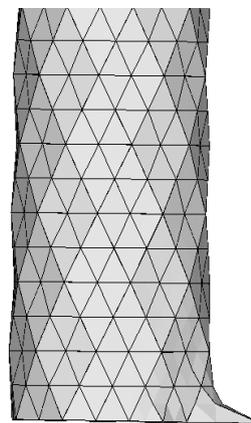


座屈荷重が強くなる組合せが存在

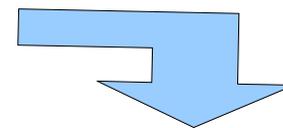


三角形1パターンごとに座屈

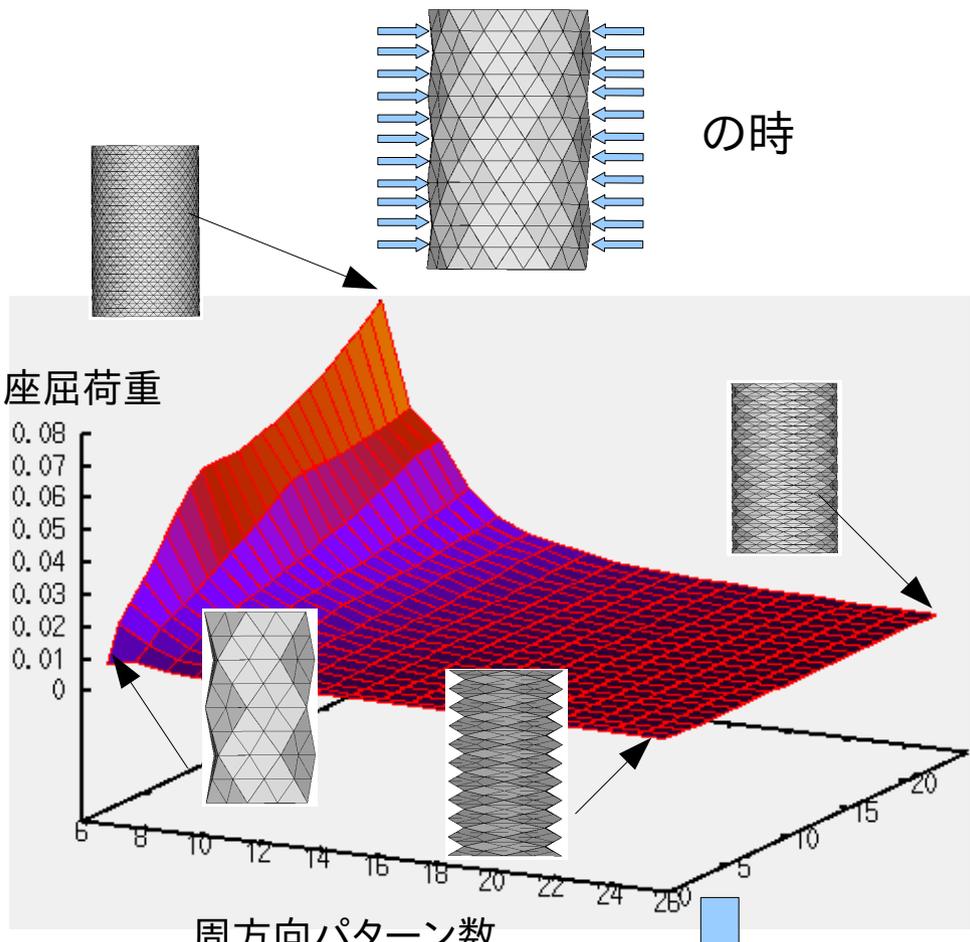
座屈モード



座屈しないパターンが多く存在
座屈荷重が強くなる組合せ存在

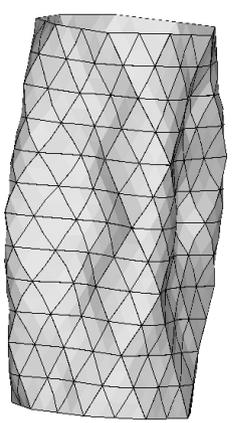


下端開口部の一部に局部座屈
拘束条件で現れた可能性有り



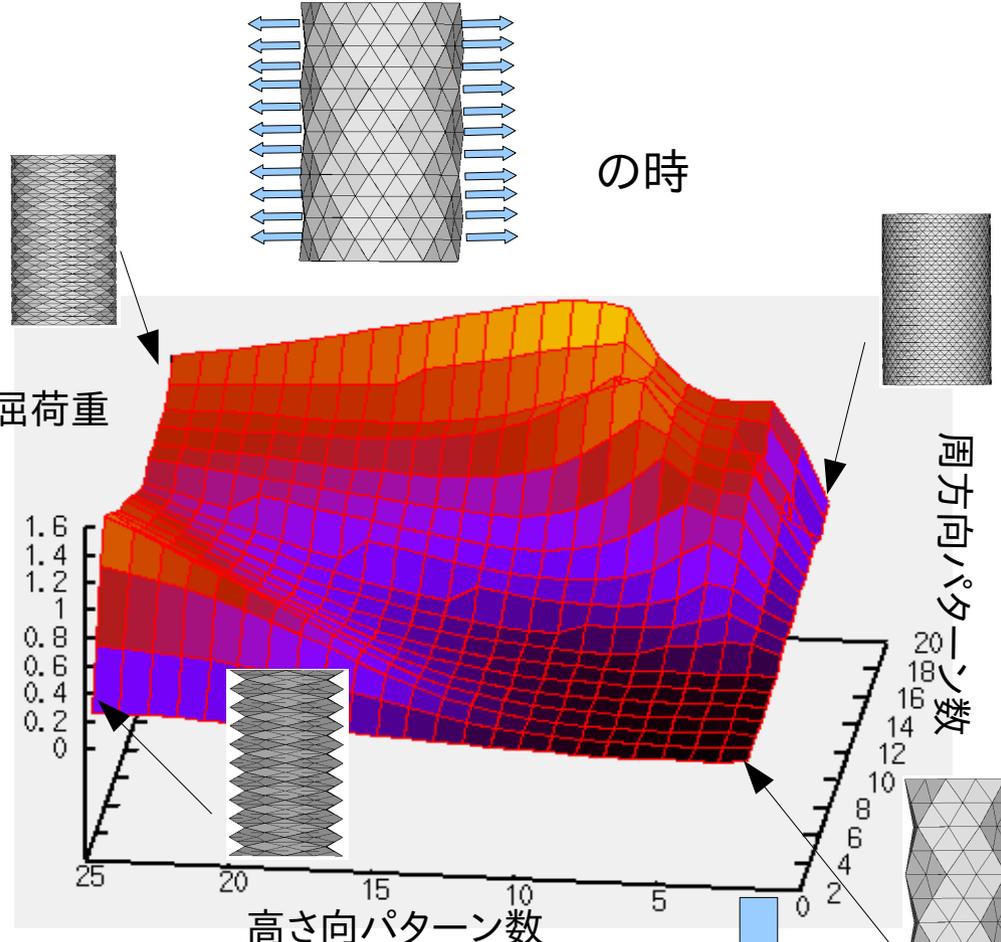
の時

座屈モード



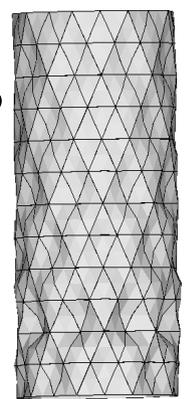
高さ方向に一次・三次の座屈

周方向が少なく
高さ方向が多い時硬くなる



の時

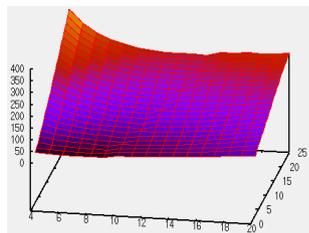
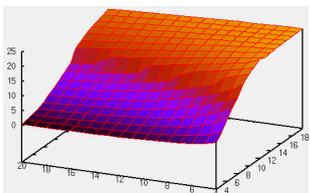
座屈モード



三角形1パターンごとに1半端座屈

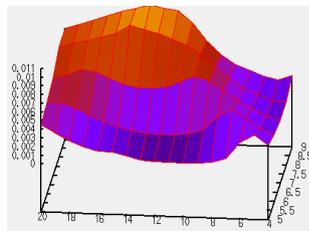
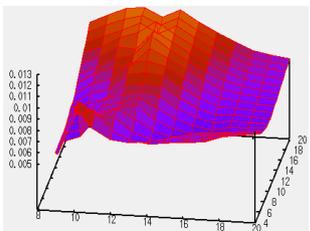
座屈荷重が高くなる組合せが存在

ばね定数

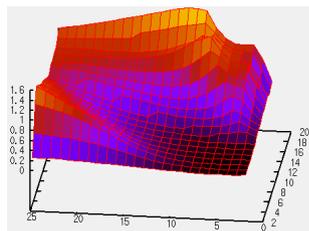
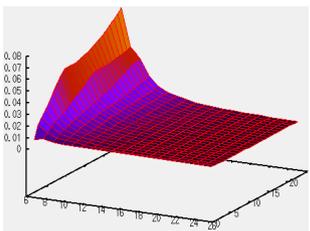


単調な変化

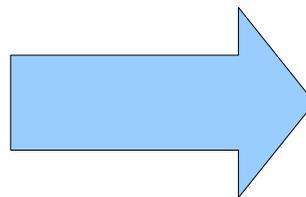
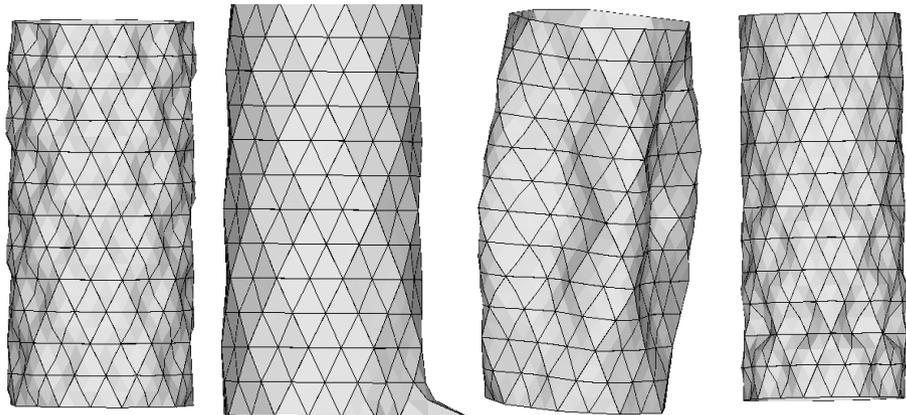
座屈荷重



パターン数・载荷条件
に影響

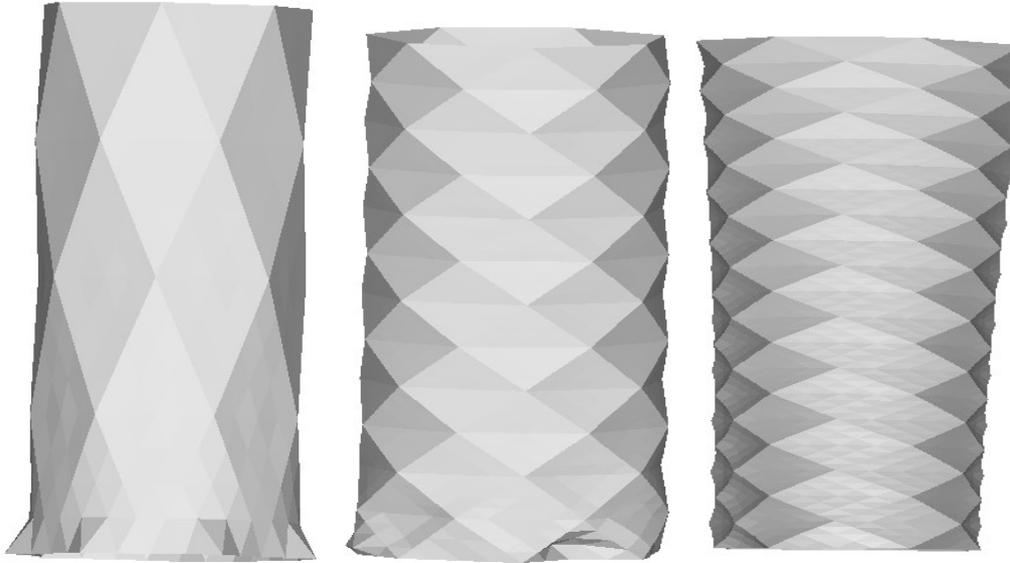


座屈モード

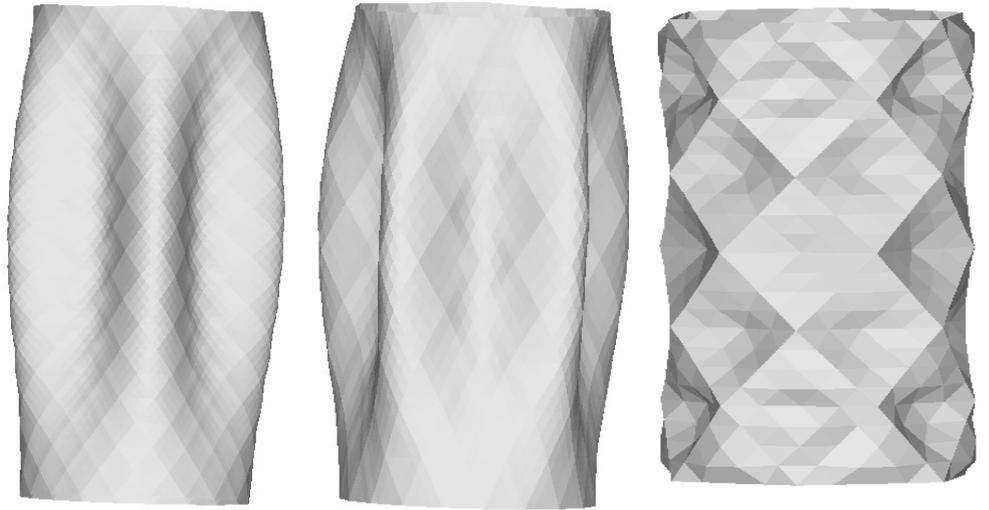


パターン数・载荷条件
に影響

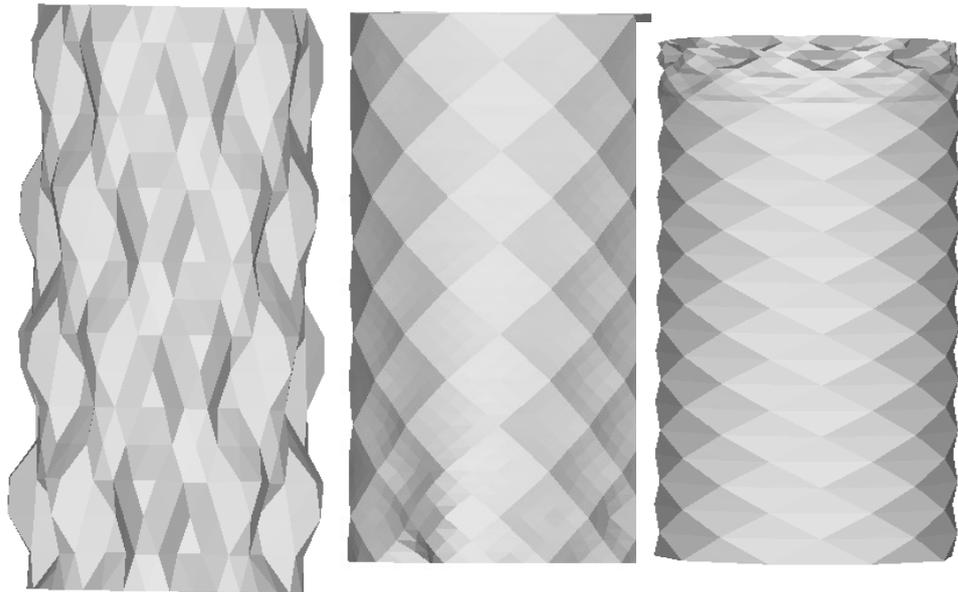
軸圧縮の座屈モード



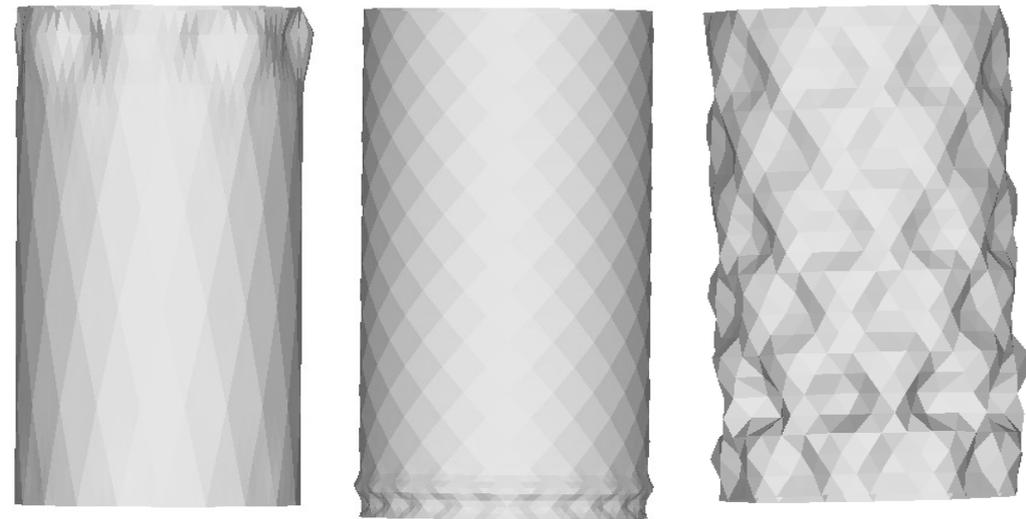
円筒中心方向圧縮座屈モード



軸引張時の座屈モード



円筒中心方向引張座屈モード



実際の座屈のしかた

