



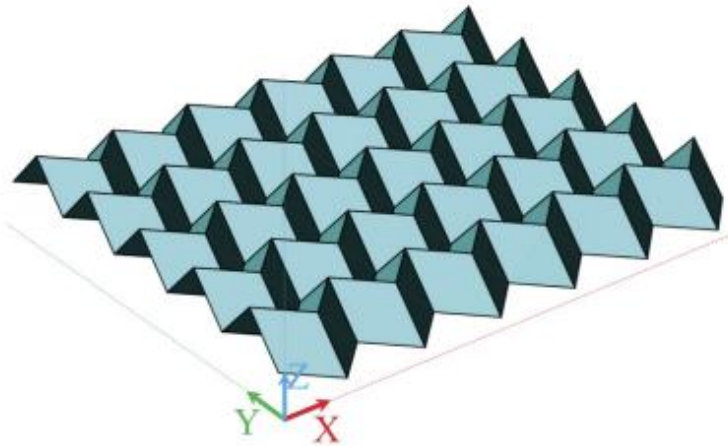
Volume optimisation of origami bellows for deployable space habitats

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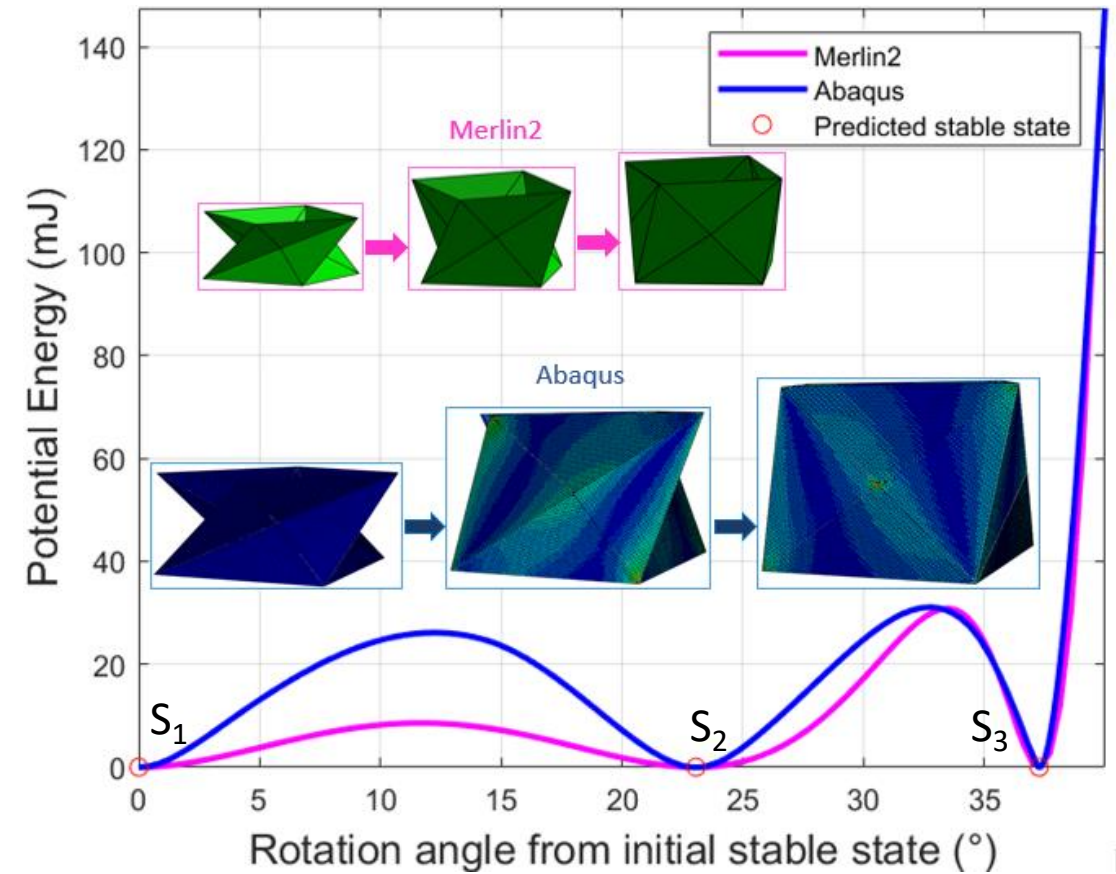
Origami Bellows

multiple stable configurations – non-rigid foldability

Miura-ori

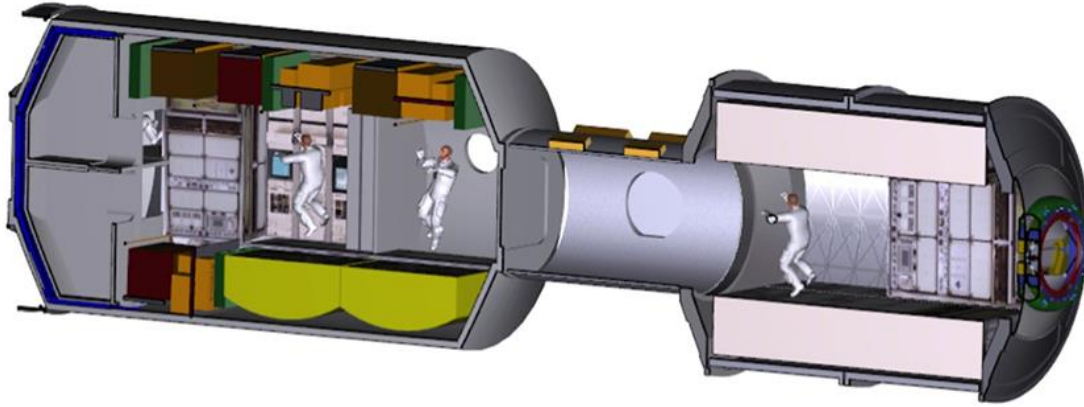


Kresling



Space Habitats

1



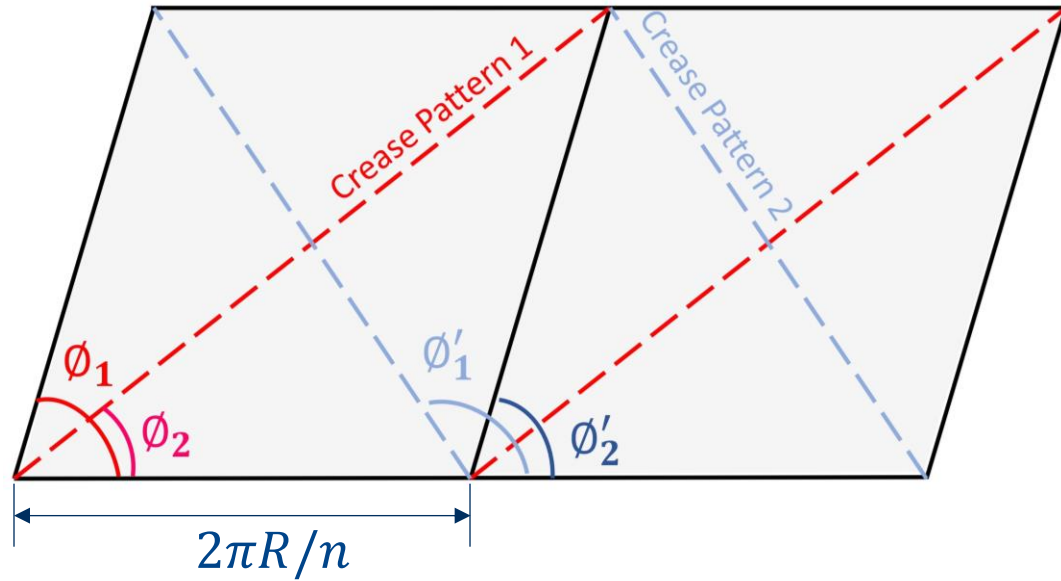
3



2

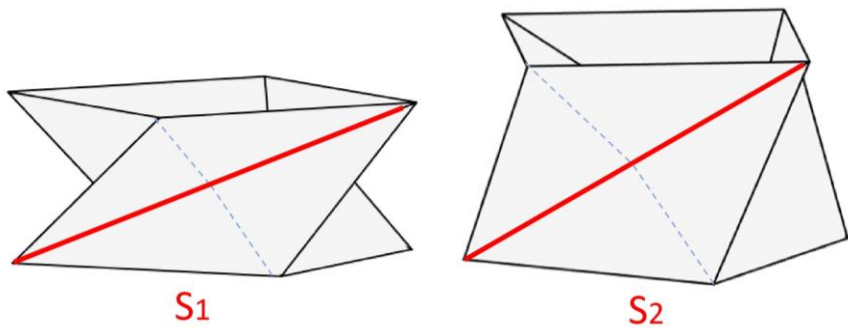


Geometry of Tristable Kresling



sector angles
 (ϕ_1, ϕ_2)
 radius R
 unit cells n
 layers m

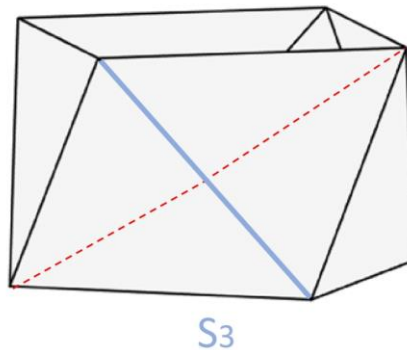
Crease Pattern 1



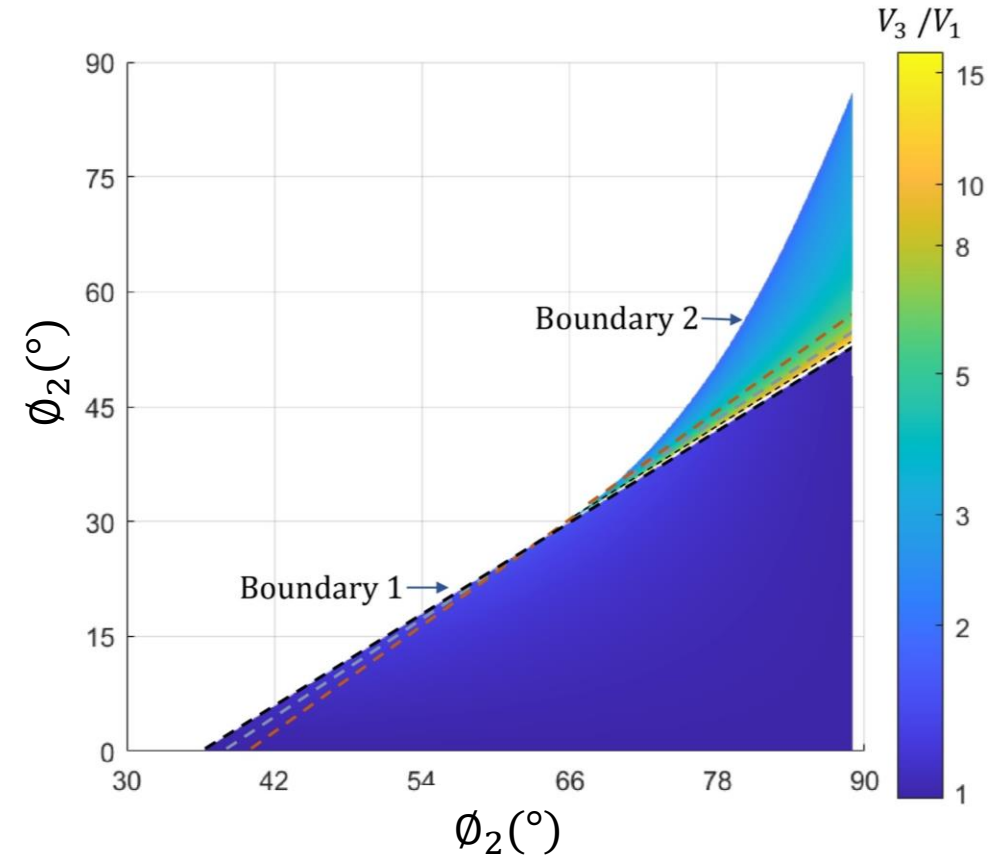
S1

S2

Crease Pattern 2



S3



volume increases monotonically
 during deployment – inflation

Optimisation of Inflatable Origami Space Habitats

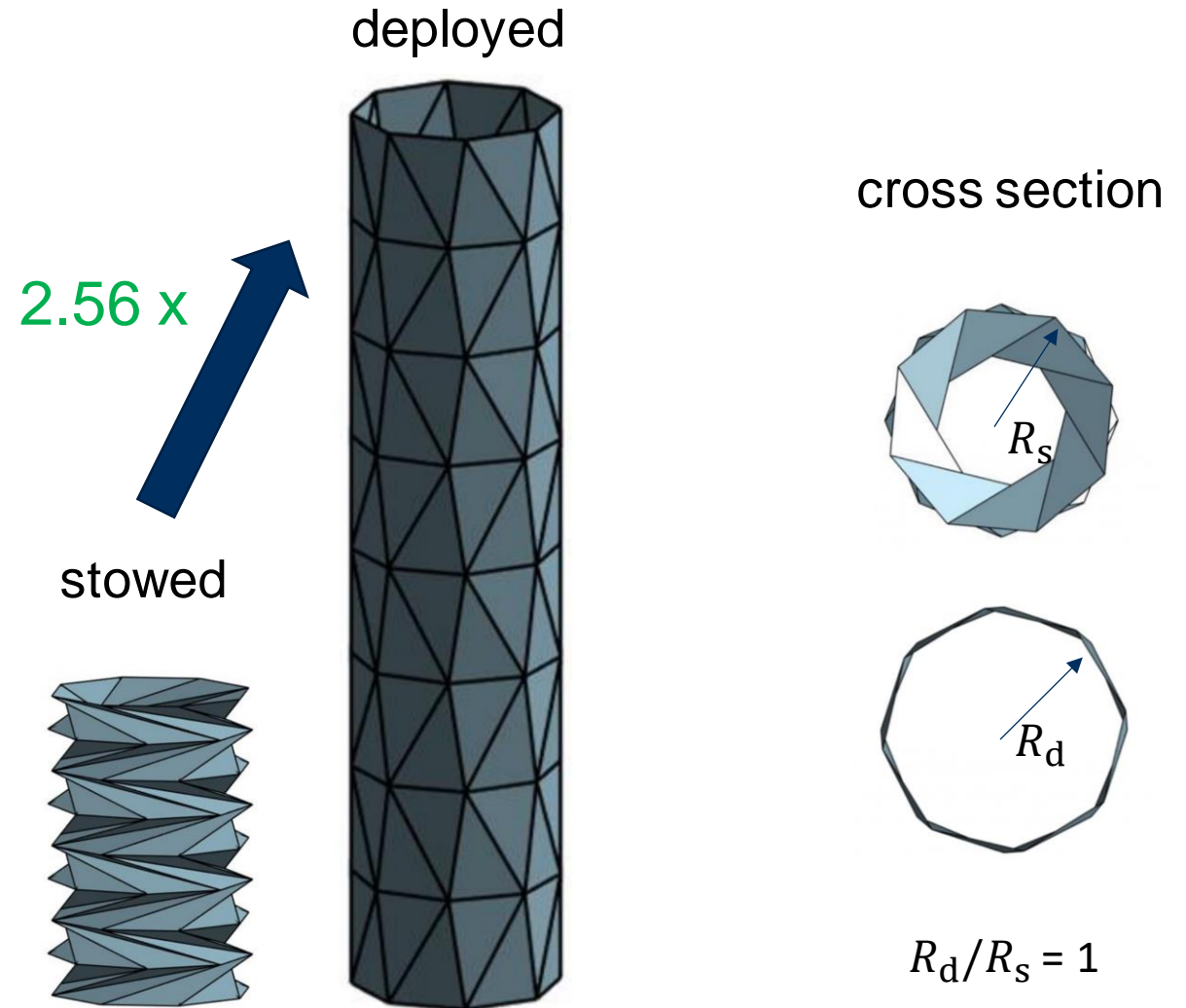
SpaceX Falcon 9 – payload fairing provides upper limit for stowed module dimensions

Particle Swarm Optimisation

maximize V_d/V_f

V_d : effective deployed volume

V_f : volume of fairing



Conclusions and Future Work

➤ Conclusions

Origami bellows have high potential for space habitats:

- internal volume increases between different stable states
- multi-stable origami bellows offer significant volume increases

➤ Future Work

- structural mechanics, manufacturing details (e.g. panel thickness, design of bulkhead of Miura-ori pattern) will be considered





Thanks for listening.
Welcome any questions.

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