

Wavy surface

Contact area

- Compression of a sinusoidal surface

$$z = B \cos(2\pi x/\lambda) \cos(2\pi y/\lambda)$$

- Asymptotic at light contact, Hertz solution

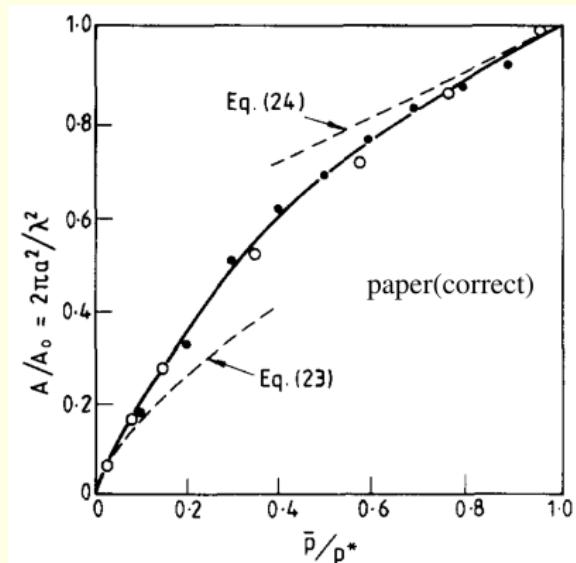
$$A/A_0 = \pi \left(\frac{3}{8\pi} \frac{p}{p^*} \right)^{2/3}$$

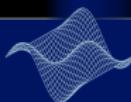
- Asymptotic near full contact, crack analogy [1]

$$1 - A/A_0 = \frac{3}{2\pi} \left(1 - \frac{p}{p^*} \right)$$

- Experimental [1] and Numerical [1,2] results

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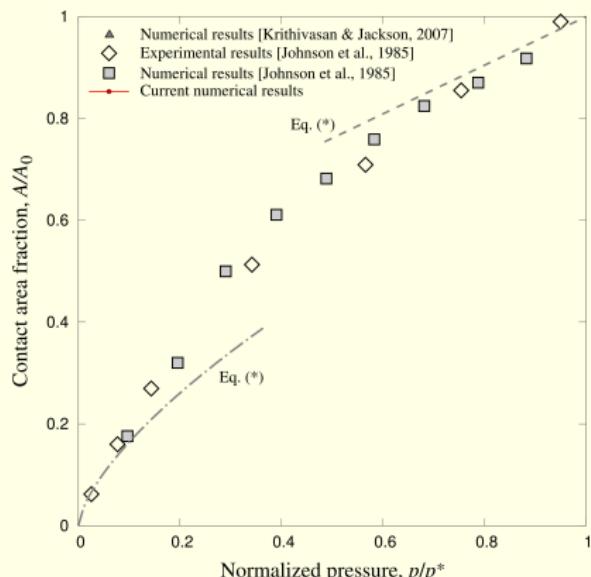
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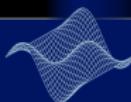
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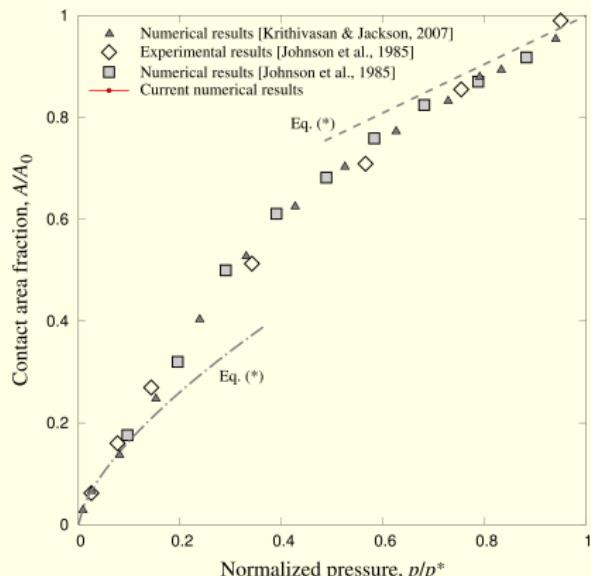
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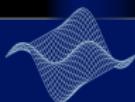
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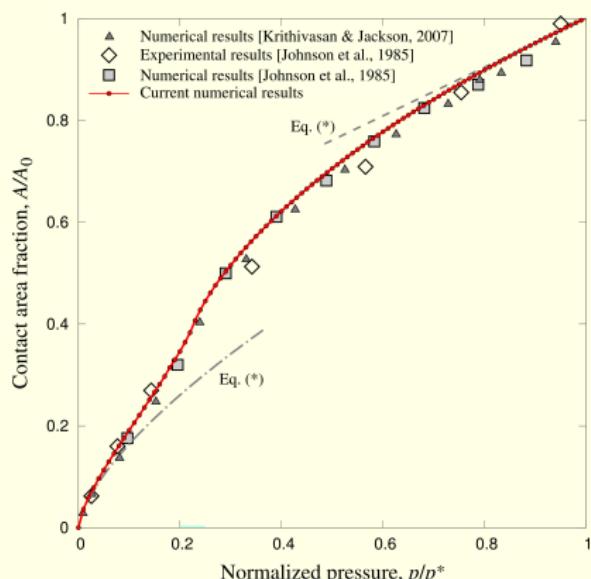
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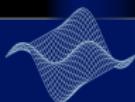
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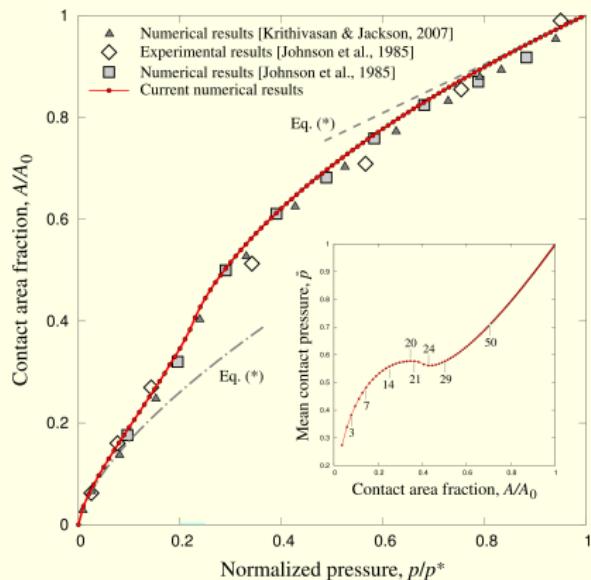
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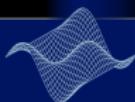
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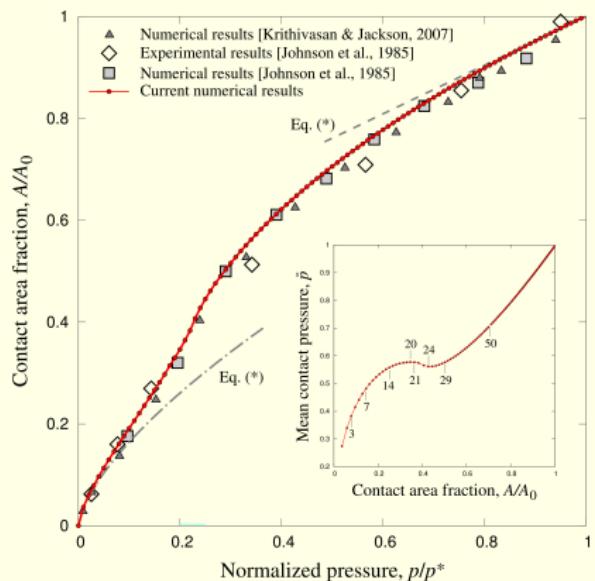
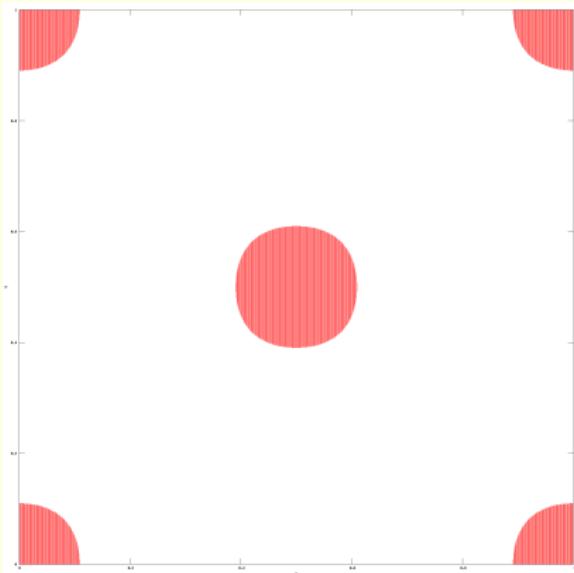
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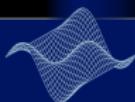


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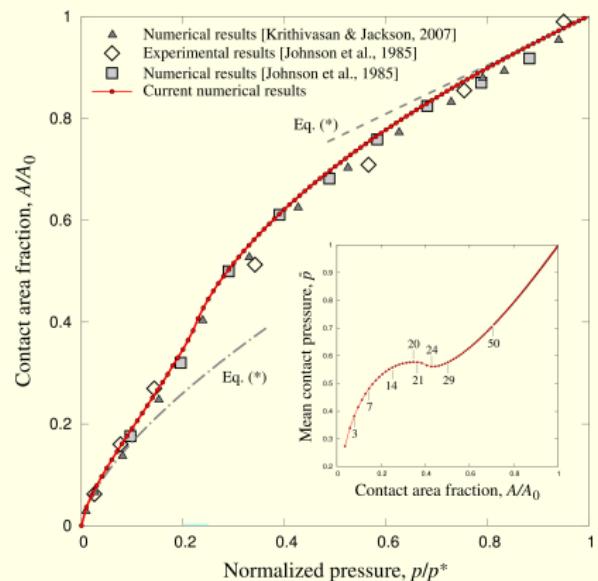
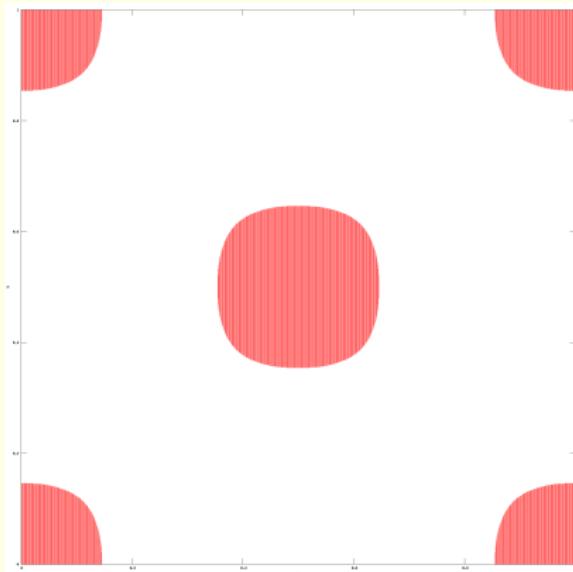


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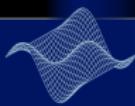
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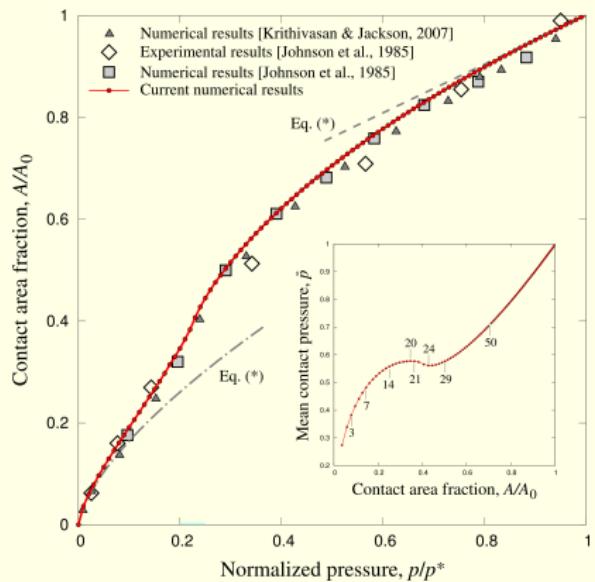
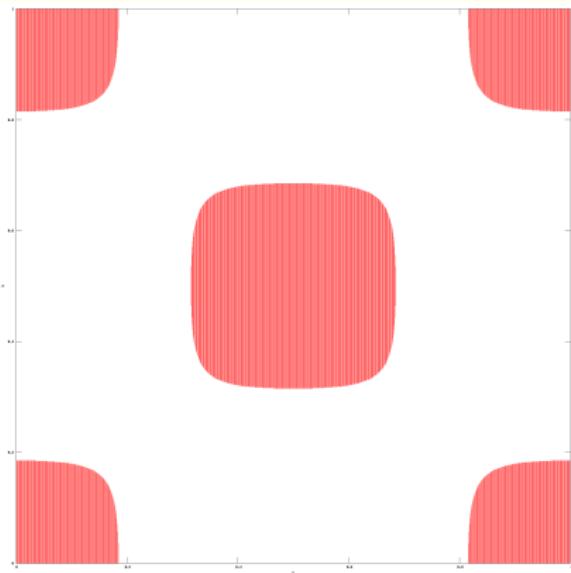
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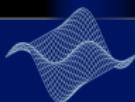


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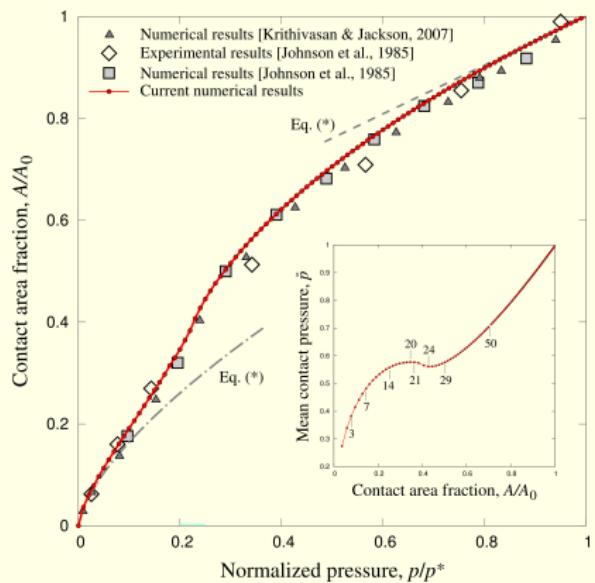
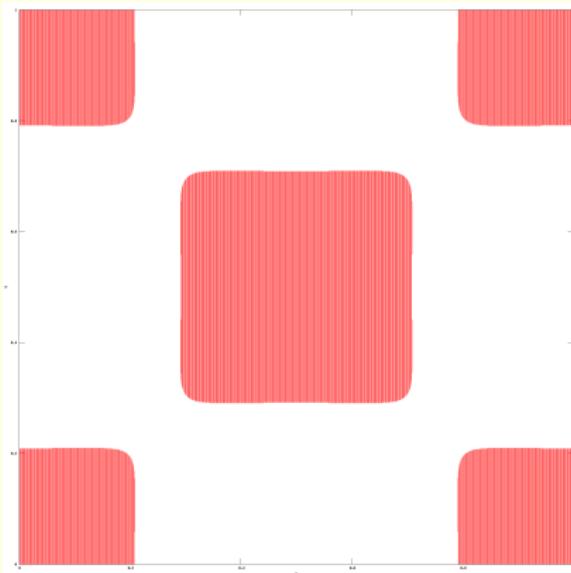


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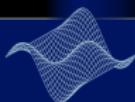


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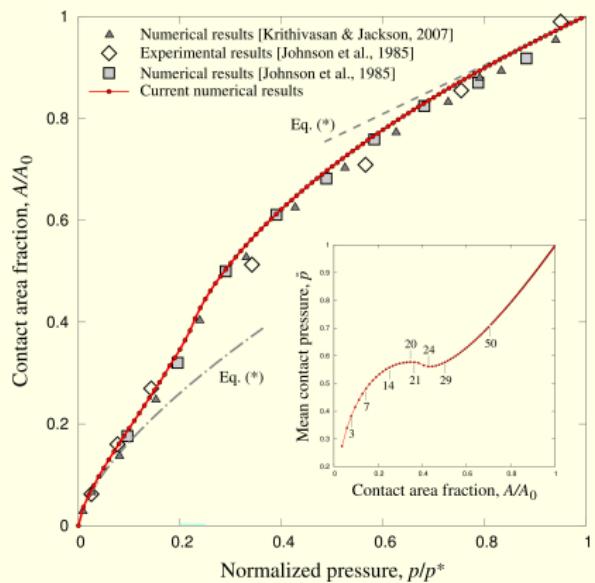
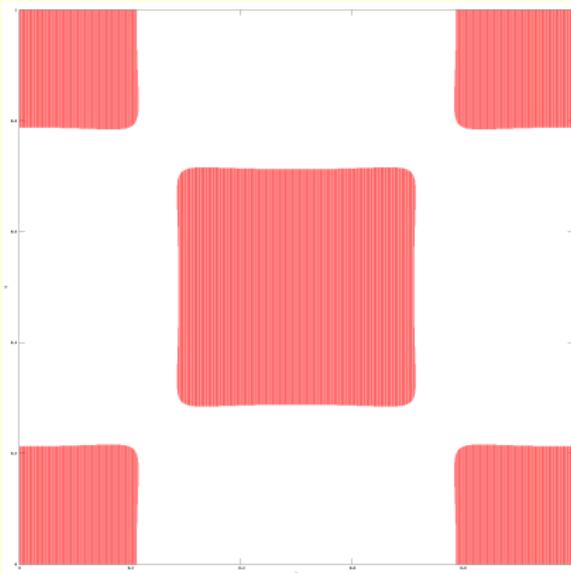


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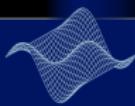


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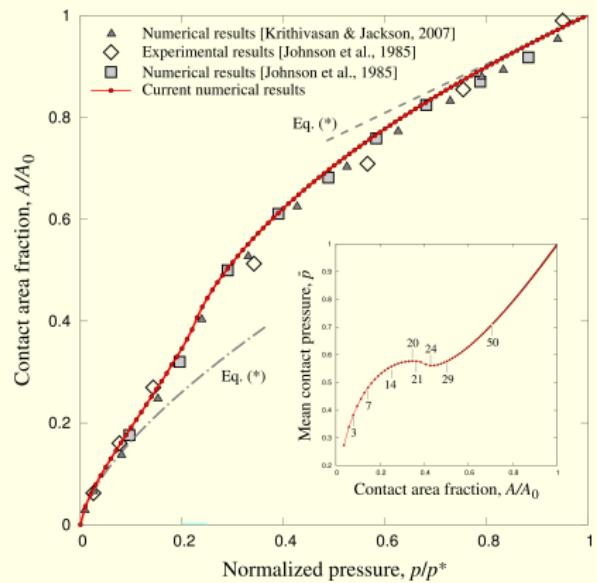
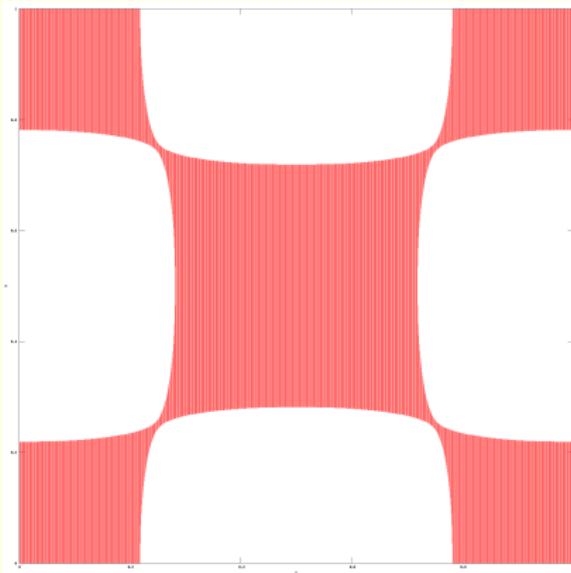


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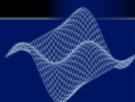


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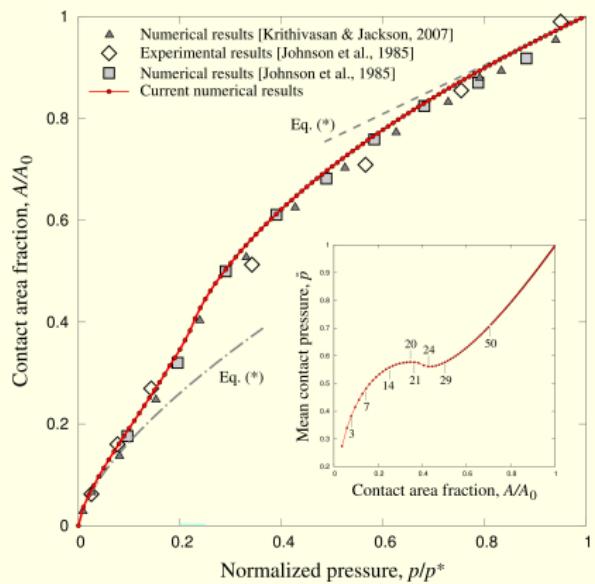
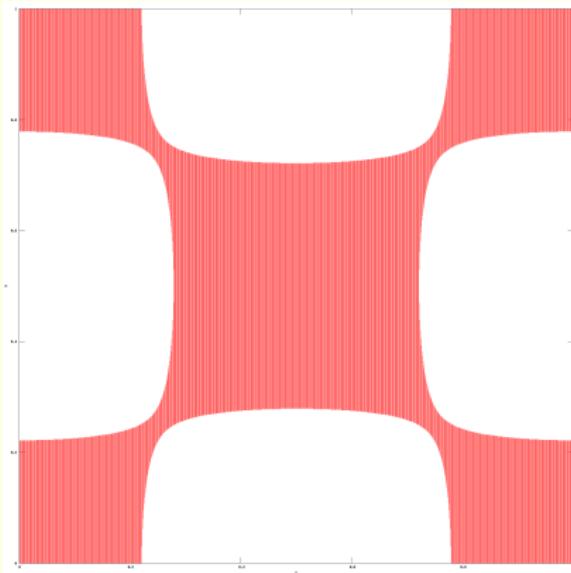


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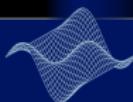


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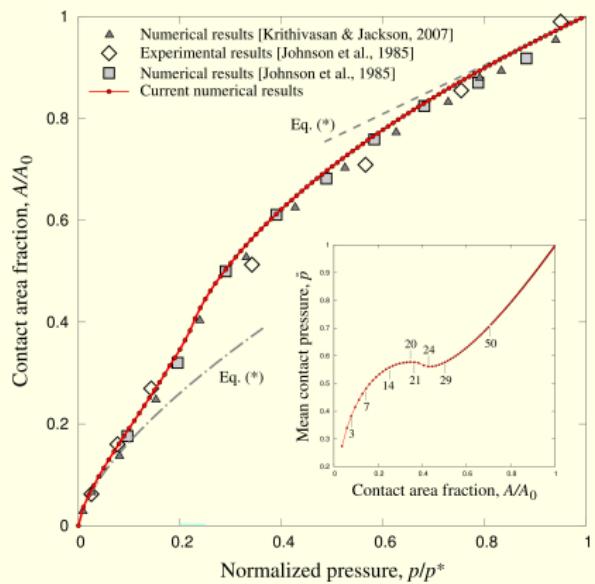
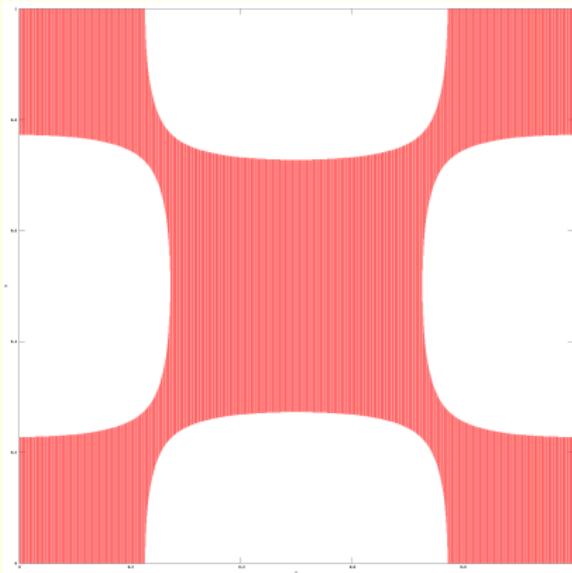


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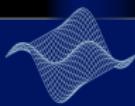


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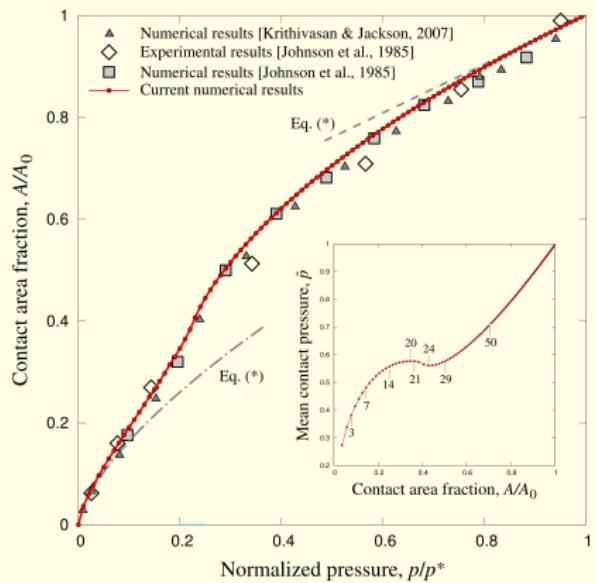
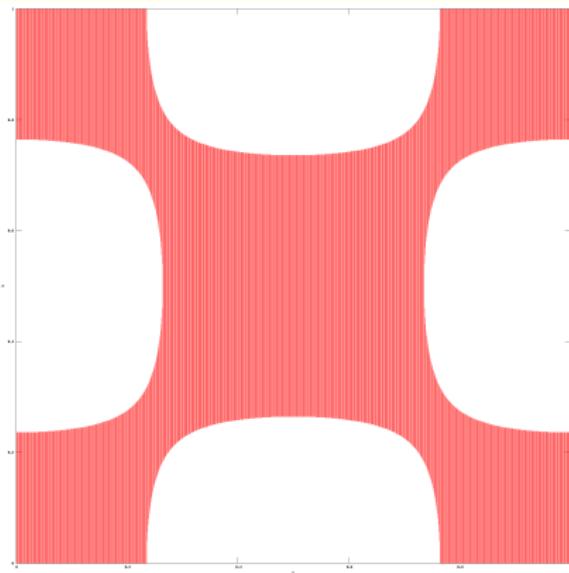


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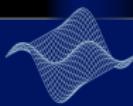


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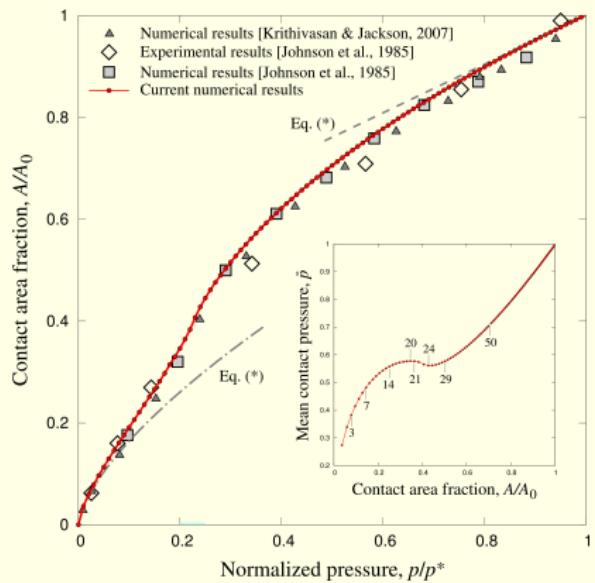
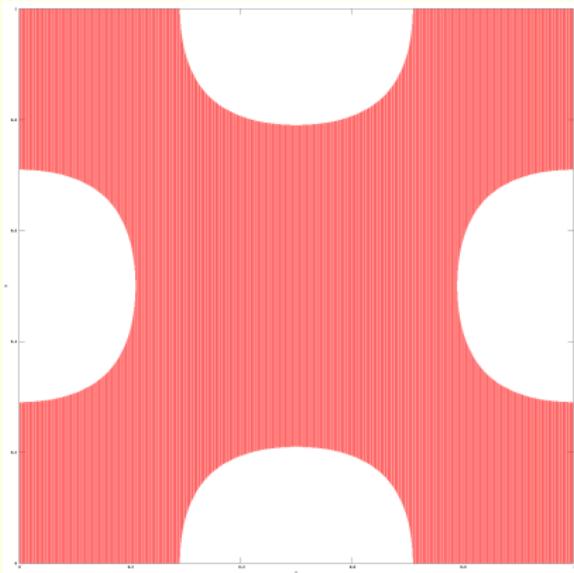


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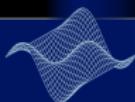


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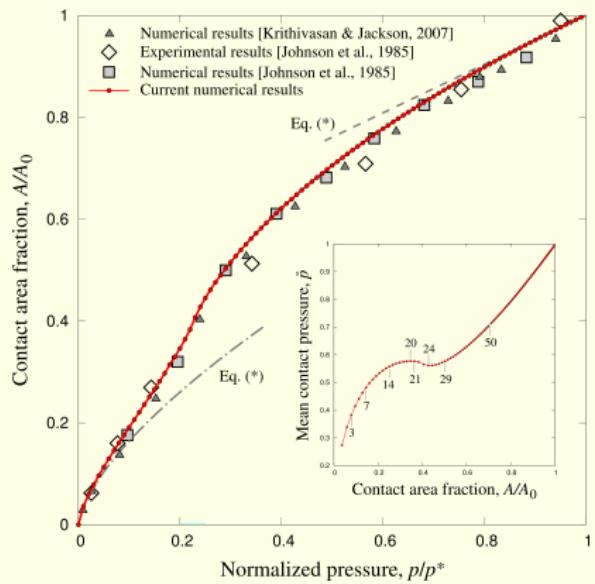
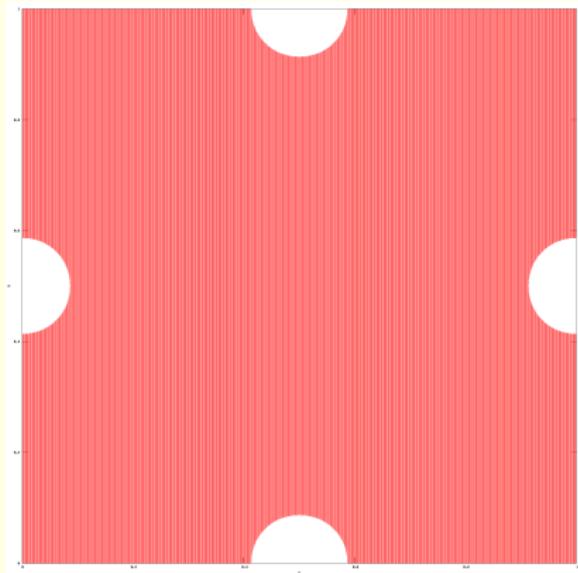


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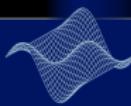


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Probability density of contact pressure

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$$P(p) = 2p/p_{\max}^2$$

- At full contact, pdf of pressure \sim pdf of surface

$$P(\bar{p}) = \frac{4}{\pi^2} \frac{F\left(\arccos(\bar{p}-1), 1/\sqrt{2\bar{p}-\bar{p}^2}\right)}{\sqrt{2\bar{p}-\bar{p}^2}},$$

where $\bar{p} = p/p^*$ and $F(l, k)$ is the incomplete elliptic integral of the 1st kind.

- Simulations

