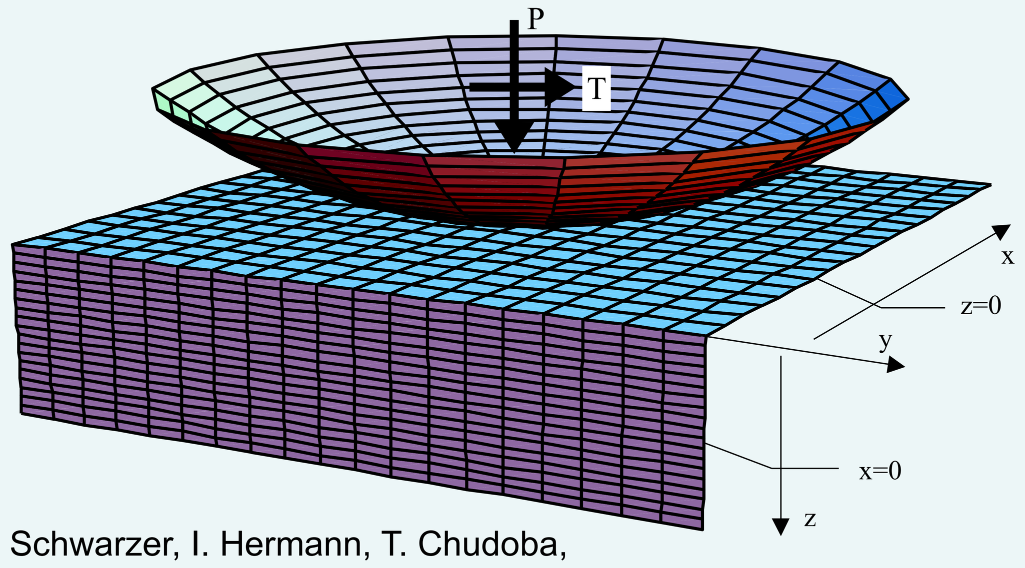
SIO in Examples

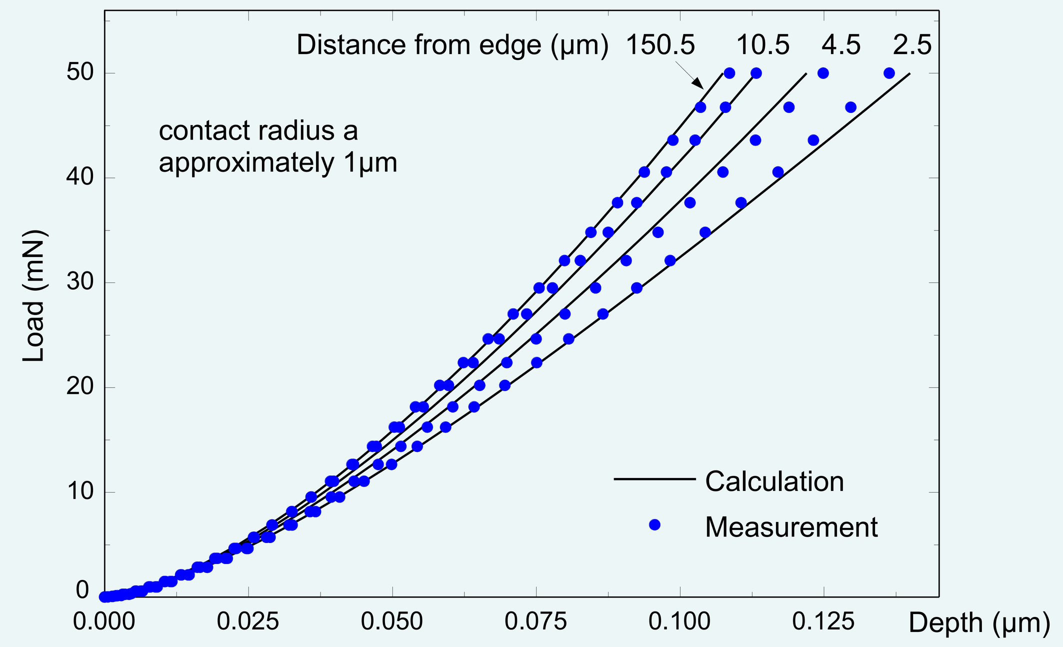
Application Examples in a few of our Scopes of Application

Saxonian Institute of Surface Mechanics

Indentation Measurement Close to an Edge



N. Schwarzer, I. Hermann, T. Chudoba, F. Richter: "Contact Modelling in the Vicinity of an Edge", Surface and Coatings Technology 146-147 (2001) 371-377



Monolithic Case

→ apparently no model problems when $\frac{edge\,distance}{a} > 10$

Is this always true? NO!

Yes → normal displacement

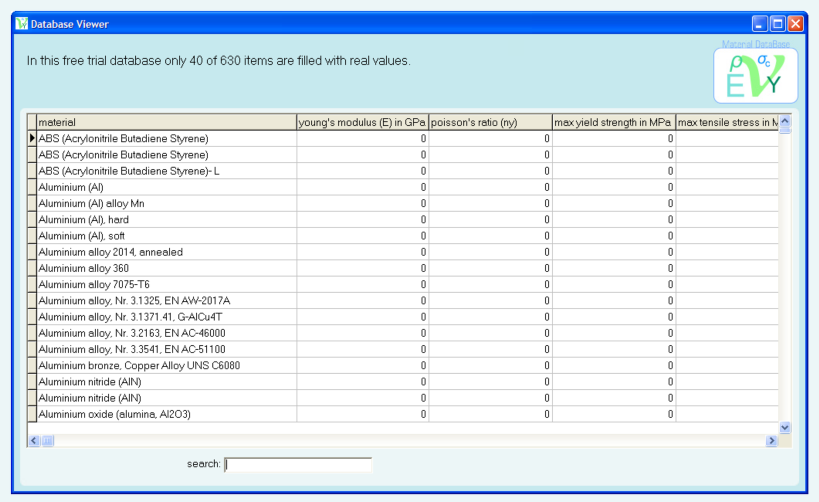
No → rest of the elastic field

This is the mathematical basis for proper dimensioning of FE models.

Try for free online at www.siomec.de/services

Find out more: talk E2-3-7 and talk E2-3-9 or SIO-CD in your delegate pack or at booth #14

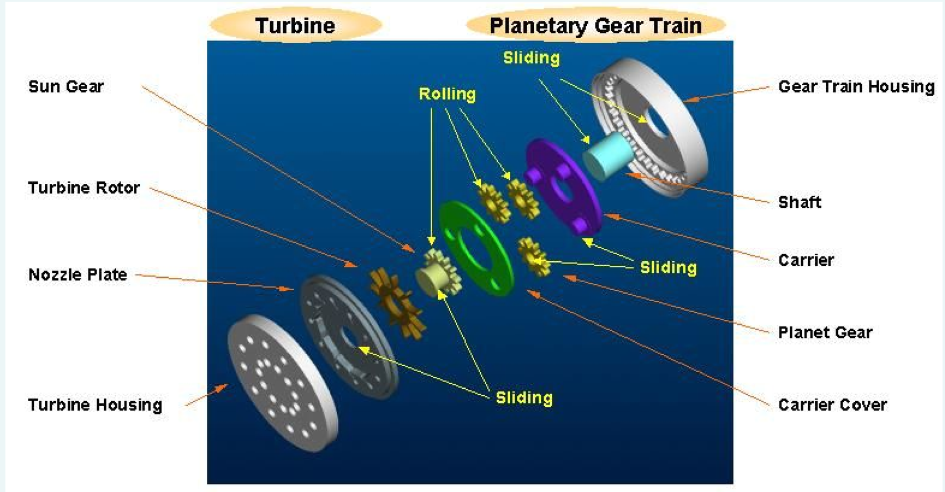
Comprehensive Material Database



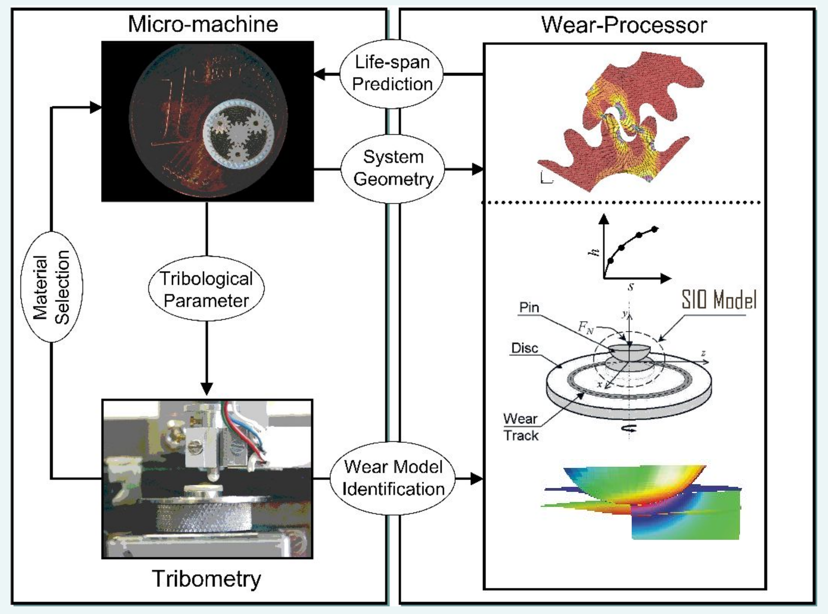
Yield strength, Critical tensile stress, Young's modulus, Poisson's ratio, thermal expansion coefficient … of more than 600 materials

Try for free: www.siomec.de/database

Wear modelling → basis for life time predictions

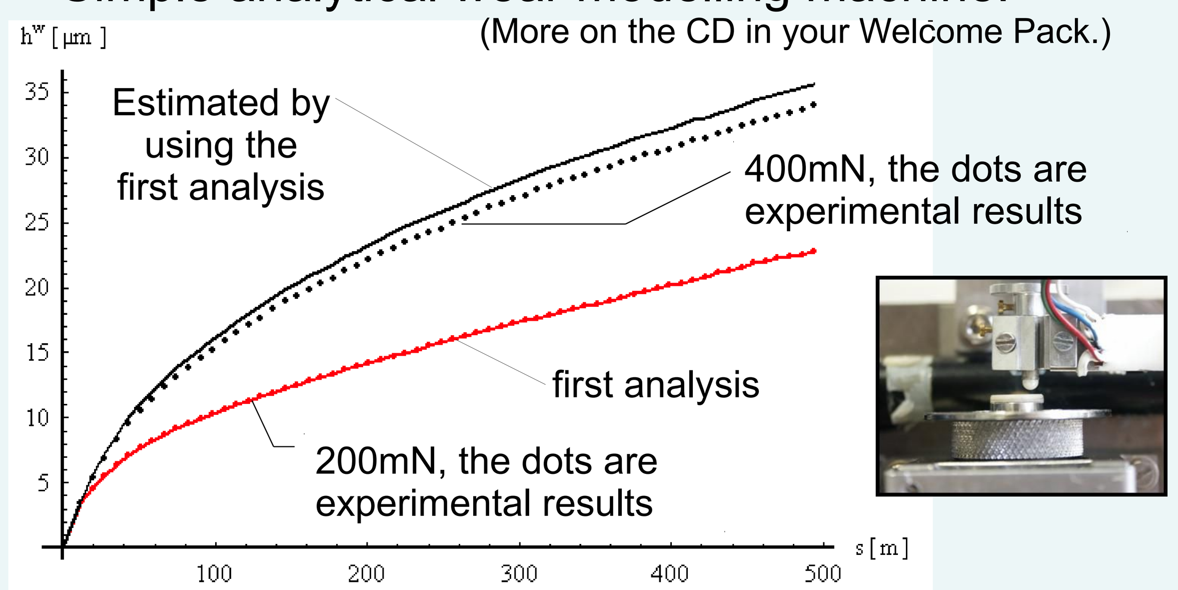


The life time of quite a lot of equipment is mainly limited by wear occurring wherever one finds shearing loads (rolling, sliding, viscous fluids friction etc.)

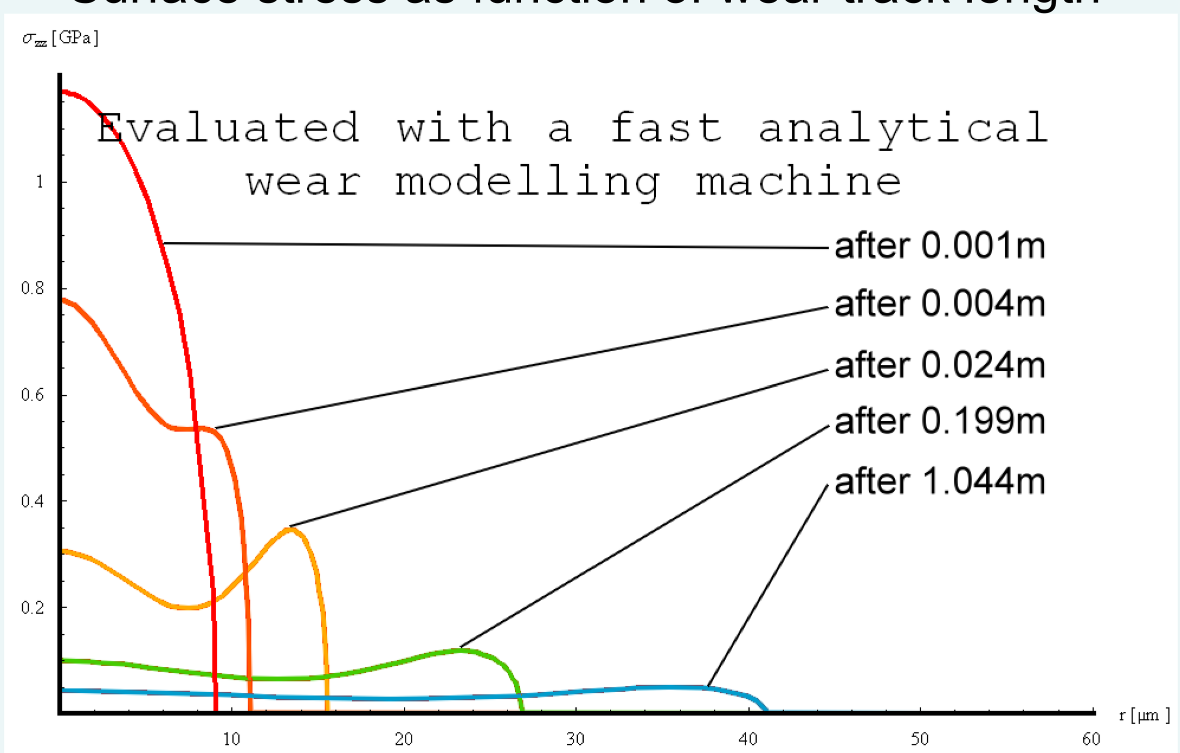


Simple analytical wear modelling machine:

(More on the CD in your Welcome Pack.)



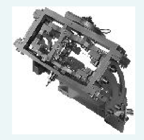
Surface stress as function of wear track length



More details: talk E2-3-7 and try it for free on www.siomec.de/services

Next generation of surface testers

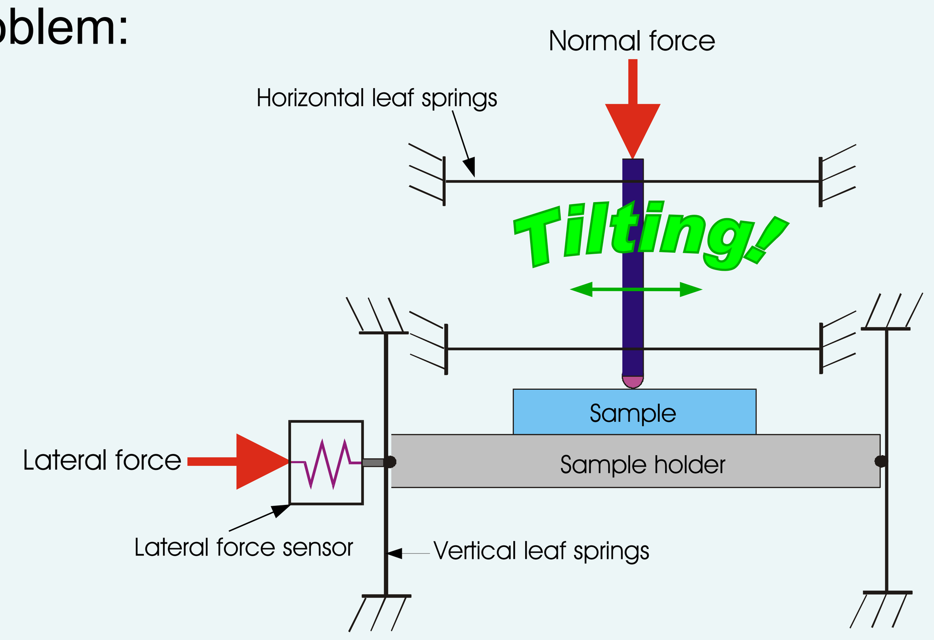
Additional loading components like lateral and rotating loads

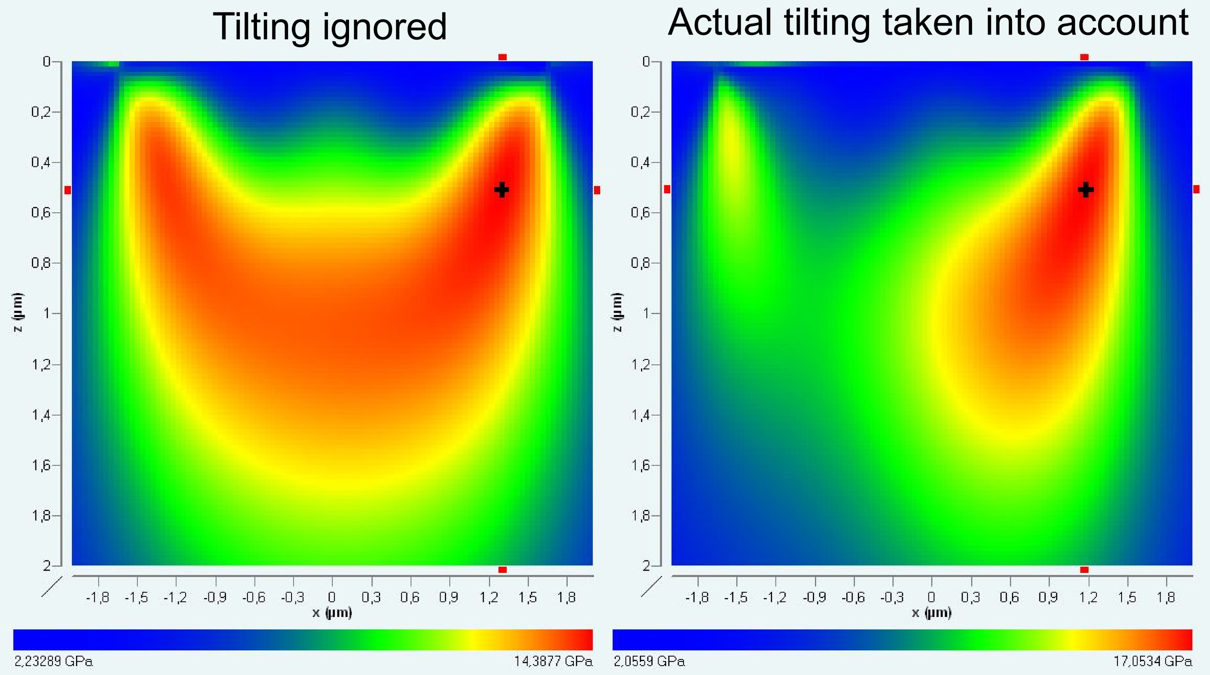


➔ They allow:

- Intrinsic stress measurement (see CD in your welcome pack or URL below)
- Detection and quantification of anisotropic material properties
- Realistic experimental simulation of practical loading situations

Problem:





Actual tilting angle in an experiment was **only 0.082°**, but caused a completely different stress distribution and an **18% higher maximum of von Mises stress**.

→ The tilting effect should not be ignored!

Evaluation of **complex contact situations**

with sliding, rotating, oscillating indenters and taking many side effects like tilting into account will be a breeze if you use our premium software **FilmDoctor®**.

It calculates complete stress distributions in a blink due to the used **cutting-edge universal analytical models**.

Try for free (time-unlimited):

- www.siomec.de/FilmDoctor
- CD in your delegate pack

Or watch our presentations:

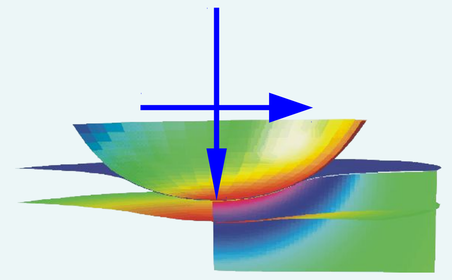
- booth #14
- talk E2-3-7 and F1-2-8

Measuring intrinsic stress with indenter methods

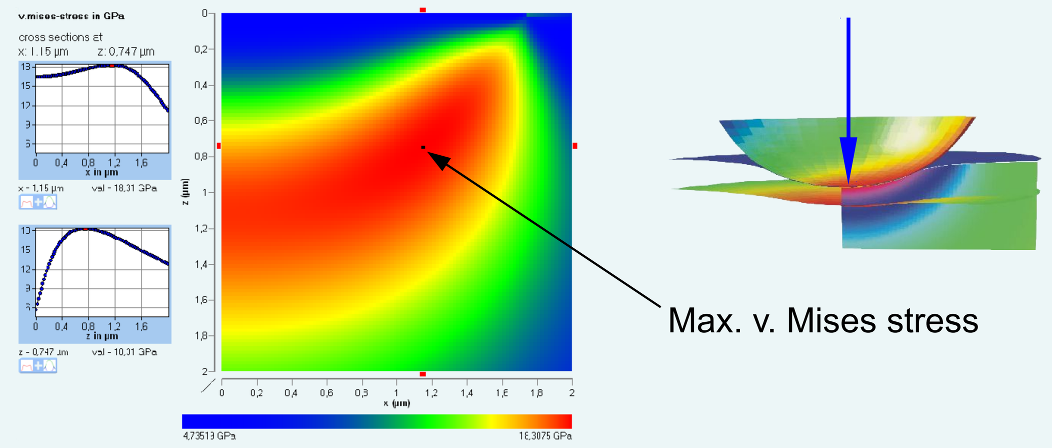
$$\sigma_{rr}^{f} = \frac{-\sigma_{xx}^{L} - \sigma_{yy}^{L} + 2\sigma_{zz}^{L} \pm \sqrt{4\sigma_{M}^{crit\,2} - 3\left(\left(\sigma_{xx}^{L} - \sigma_{yy}^{L}\right)^{2} + 3\left(\tau_{xy}^{L\,2} + \tau_{xz}^{L\,2} + \tau_{yz}^{L\,2}\right)\right)}}{2}$$

Two unknowns require two linear independent measurements:

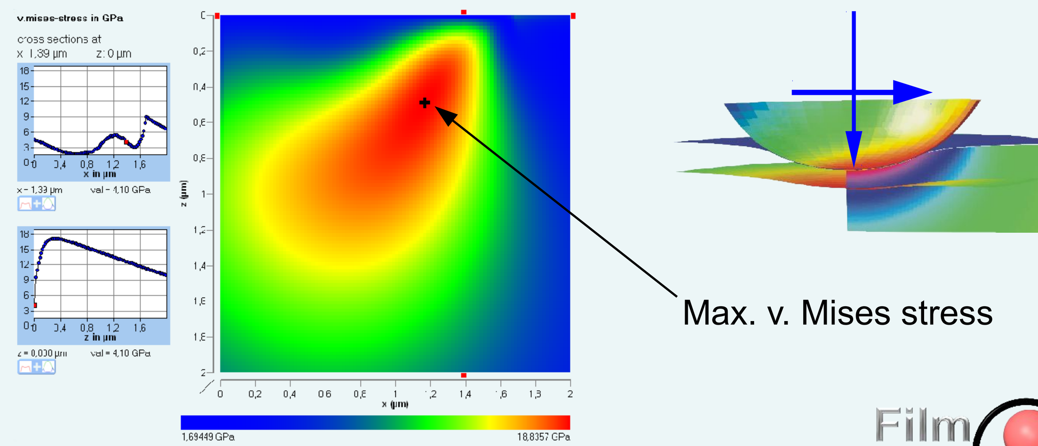
1. Normal Indentation
2. Additional Lateral Load



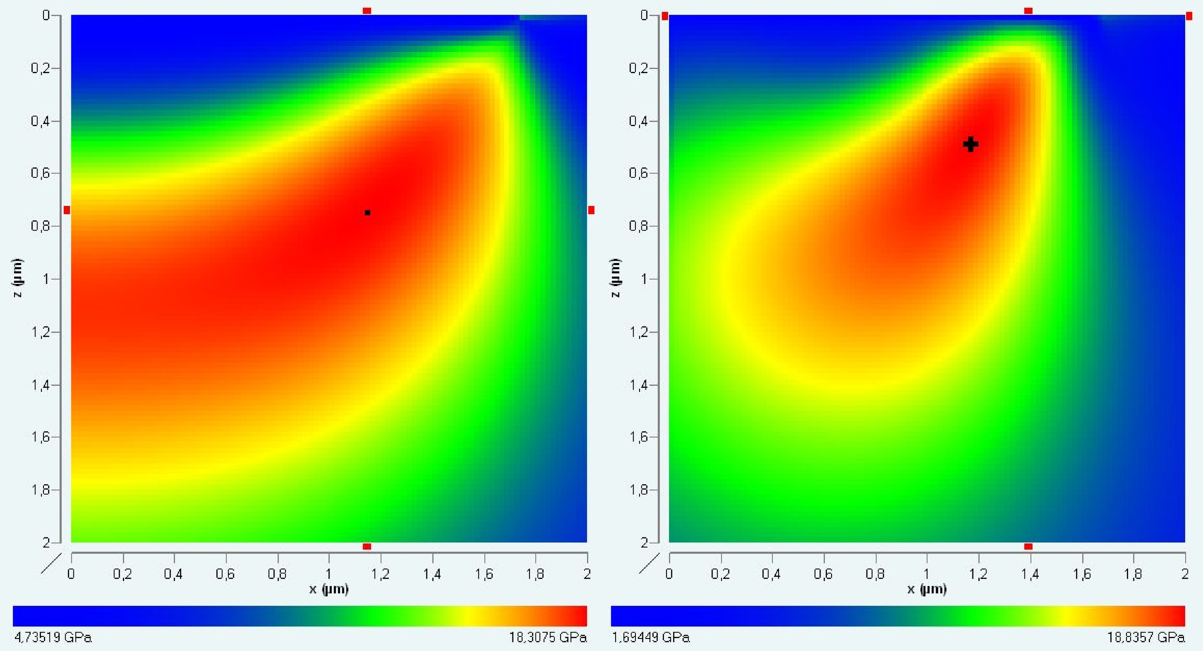
1st step: Normal Indentation



2nd step: Additional Lateral Load



3rd step: Analysis with FilmDoctor®:



Pure yield strength: 16.6GPa

Intrinsic Stress: -2.03GPa

Full story: www.siomec.de/pub/2007/001

Blow by blow account: www.siomec.de/doc/2007/002

www.siomec.de