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http://www.mpg.de http://www.mpie.de http://edoc.mpg.de

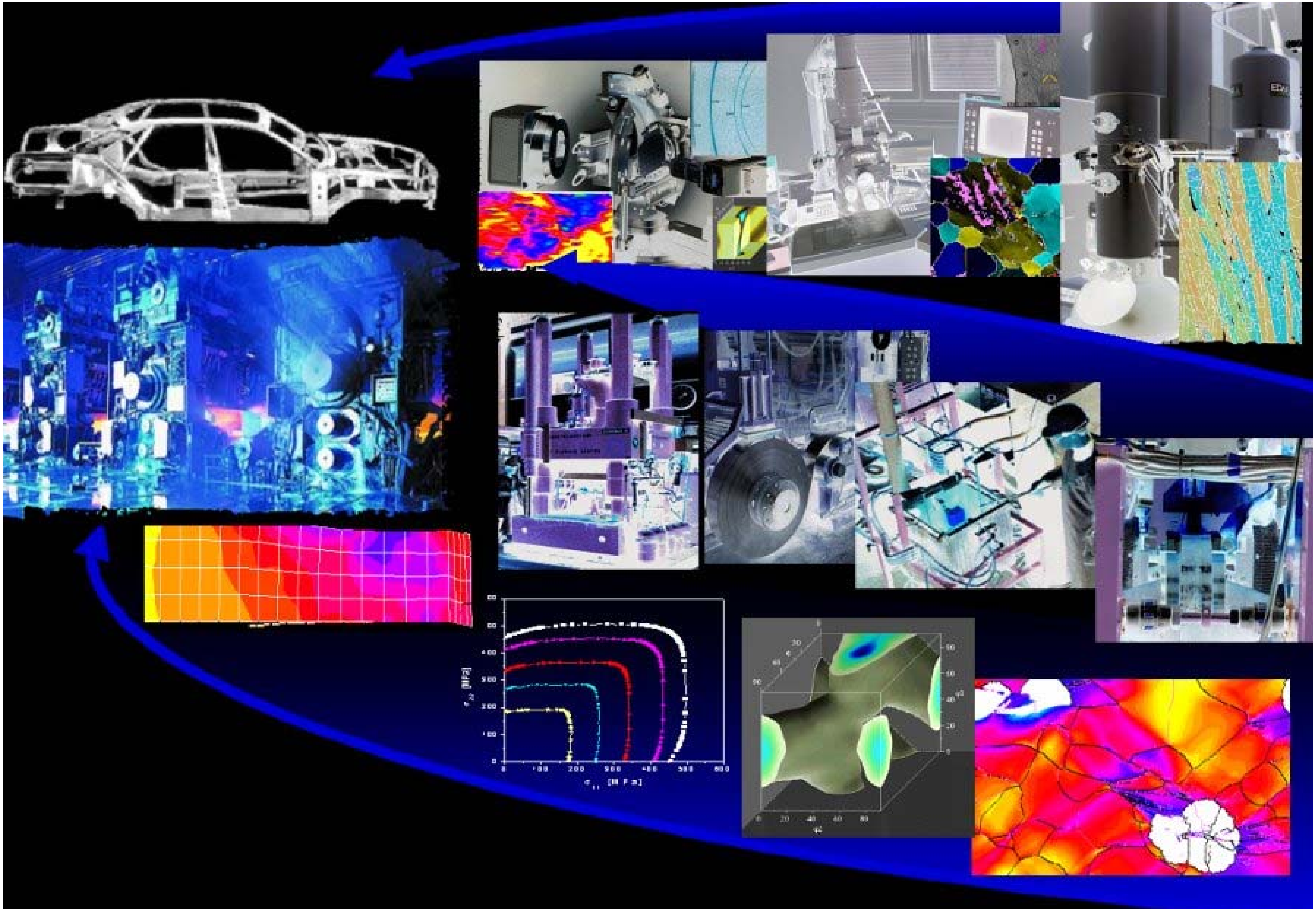
Anisotropie, Textur, Umformtechnik

Lecture Notes - Vorlesung

Anisotropie, Textur, Umformtechnik

VORLESUNG

- konventionelle Methoden – Fließortkonzepte
- neue Methode – Texturkomponenten in Kristall-Plastizitäts FE
- Beispiele – Näpfchenziehversuch
- Experimente – Texturen und Blechprüfung



überall ähnliche
mechanische Eigenschaften ?

überall bekannte Texturen
mit guten Tiefzieheigenschaften ?

Vorhersage der Textur-
änderungen ?

Verläßliche Vorhersage
von Hot Spots (Fehler) ?

Verläßliche Werkzeug-
optimierung?

Vorhersage des lokalen
Springback ?

überall ähnliche
Blechstärke ?

überall bekannte n-Werte
mit guten Streckzieheigen-
schaften ?

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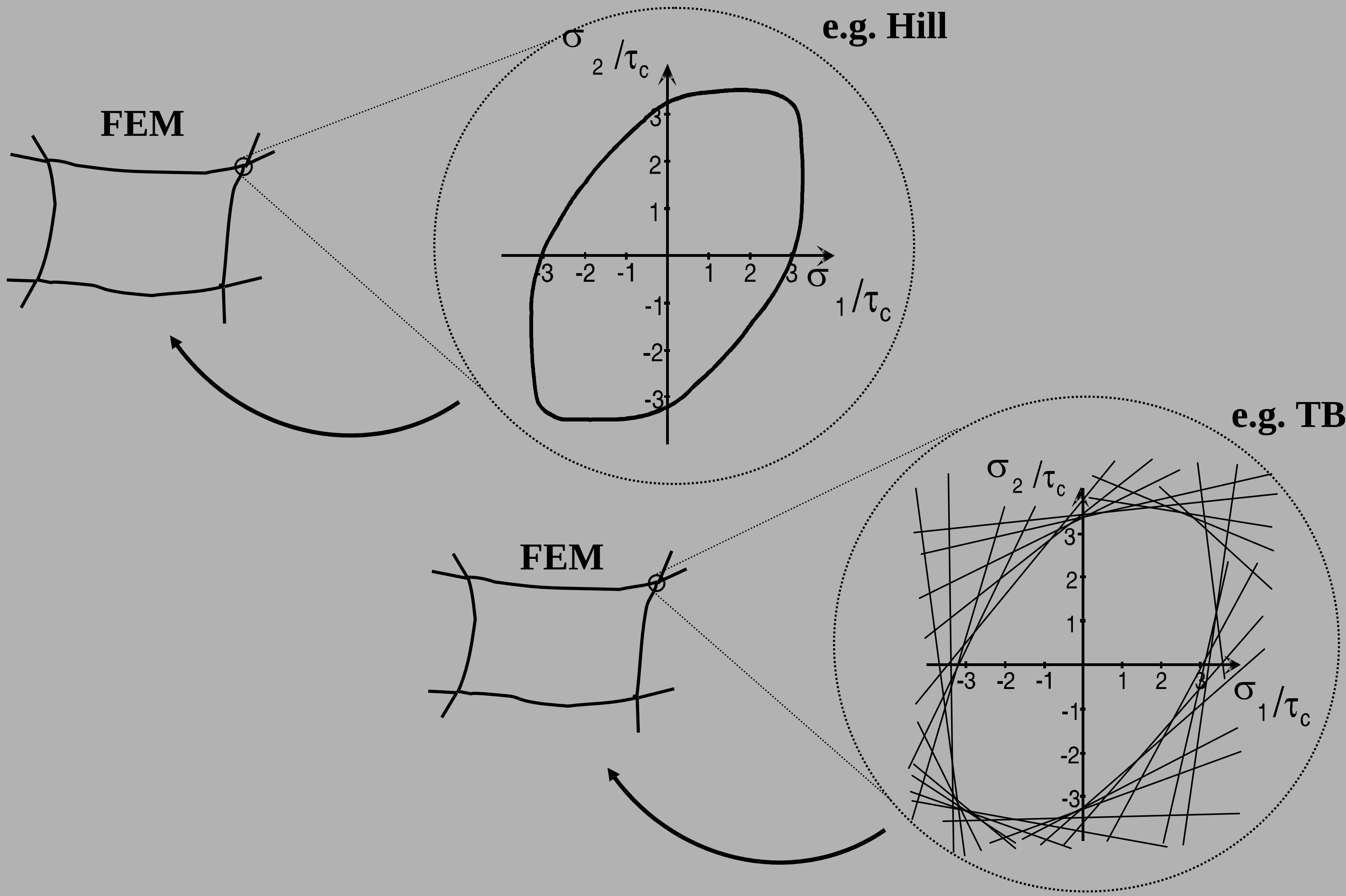
4000 Jahre Anisotropie–Engineering



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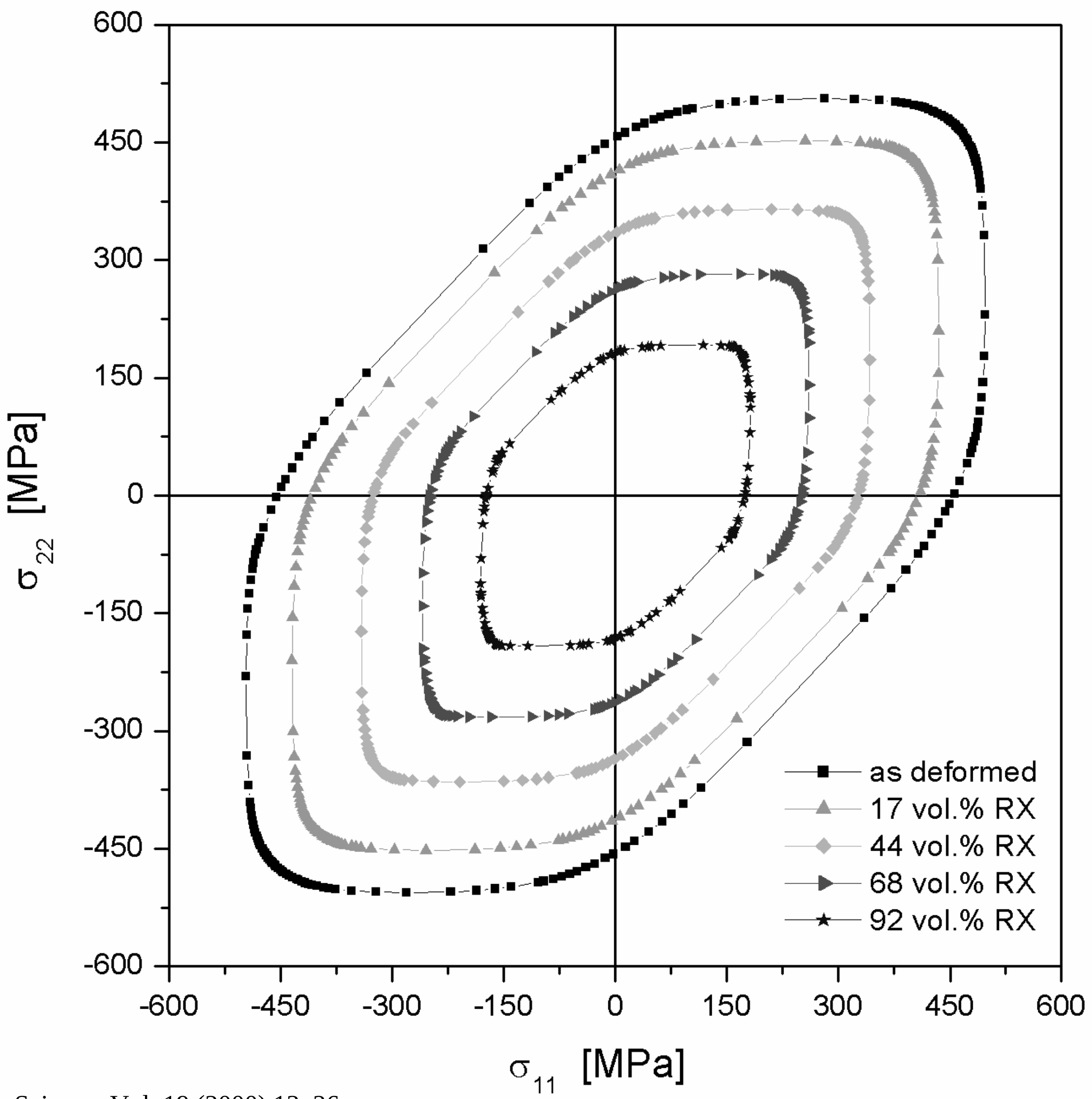
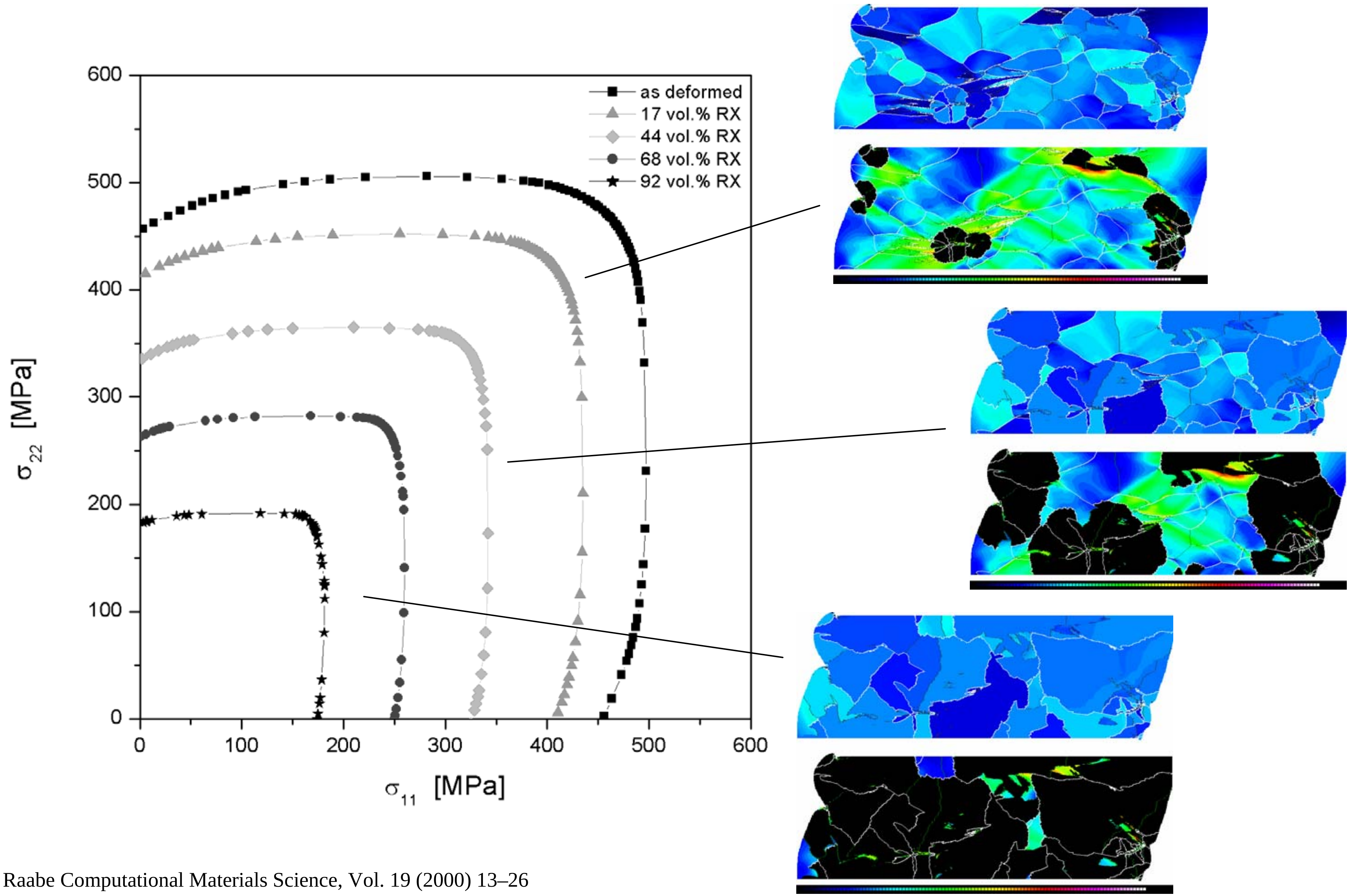
Anisotropie-Engineering – konventionelle Methoden



D. Raabe Computational Materials Science, Vol. 19 (2000) 13–26

Anisotropie-Engineering –
Fließort aus Textur und lokaler Festigkeit



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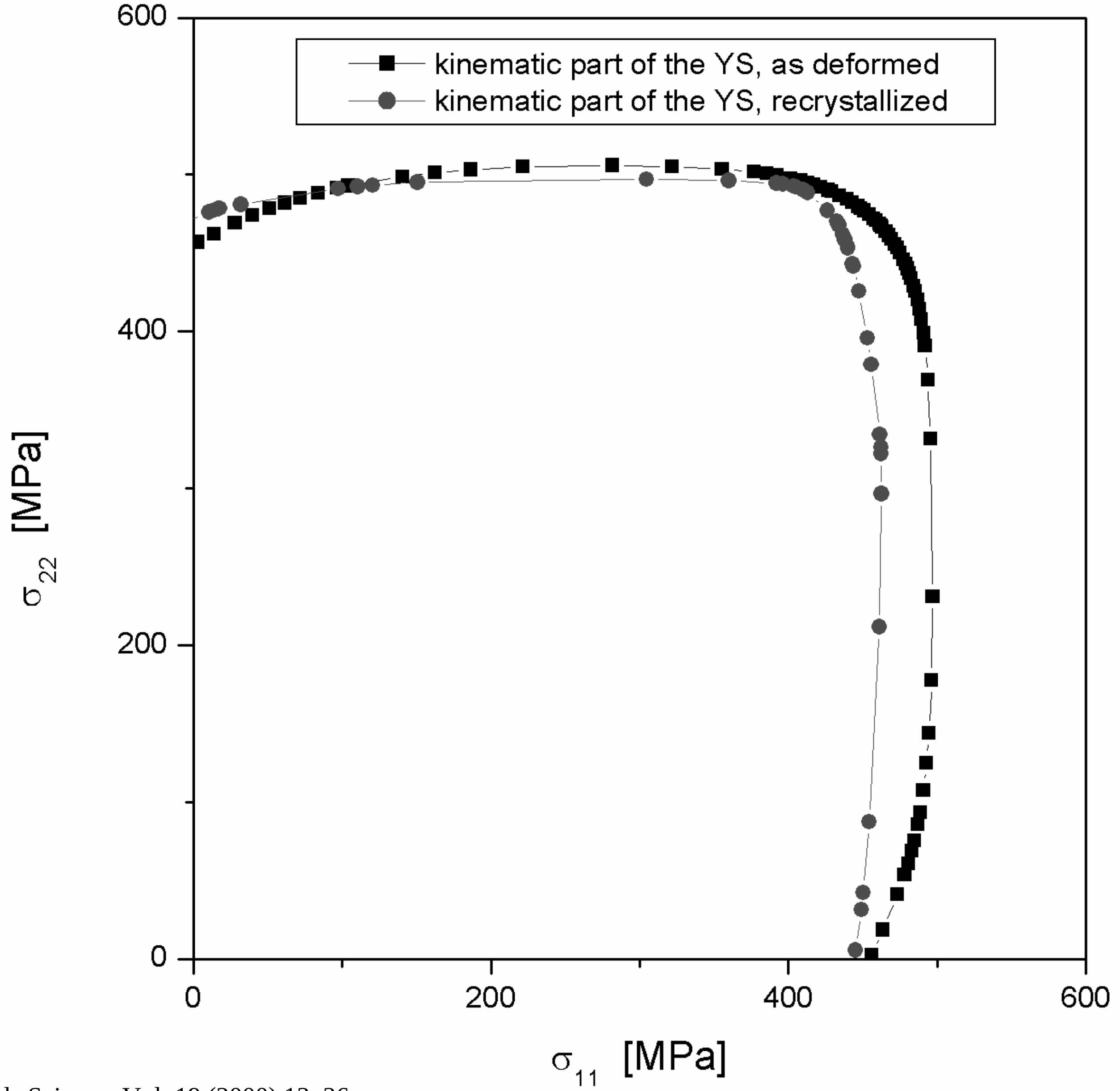
Anisotropie-Engineering – Fließort aus Textur und lokaler Festigkeit



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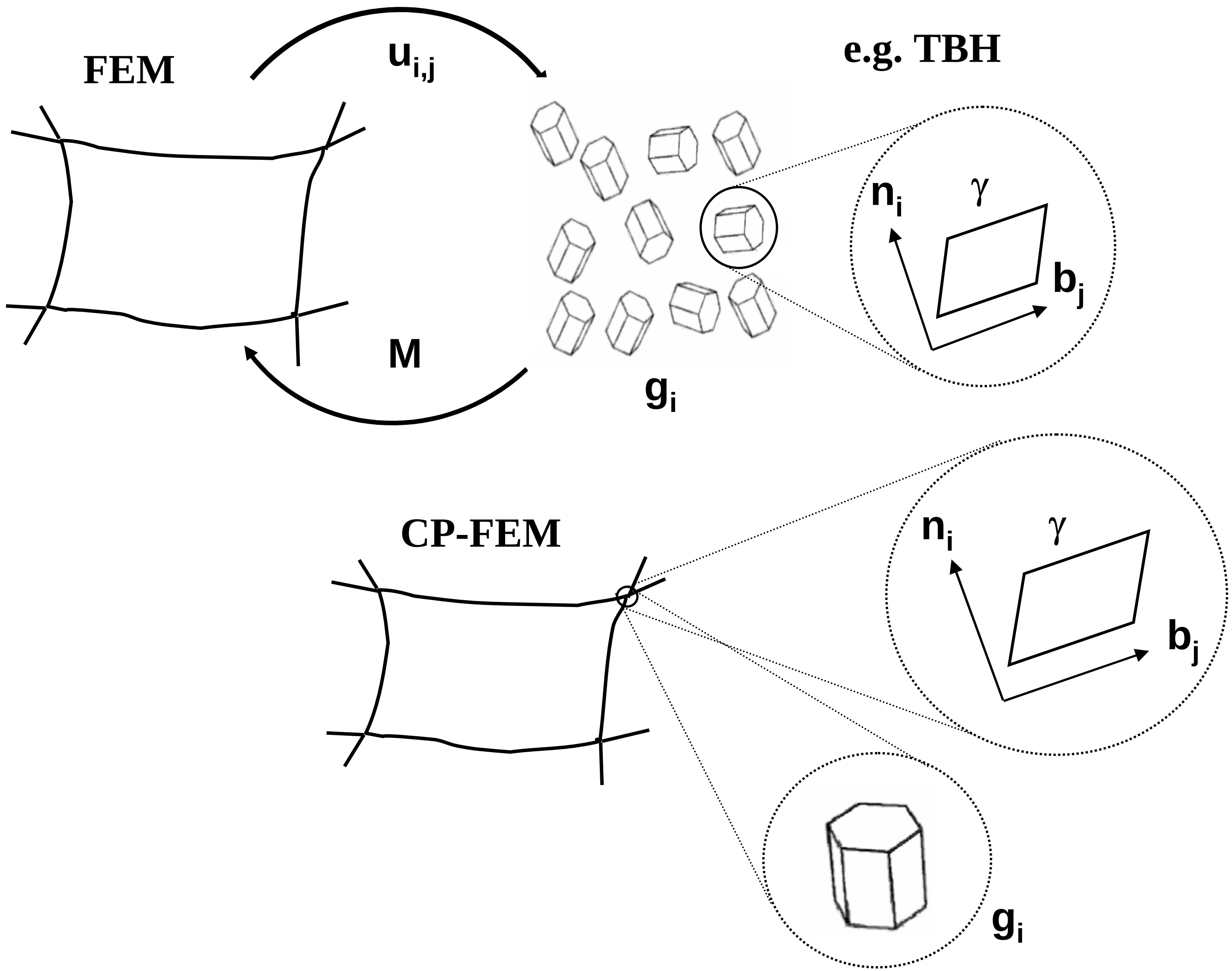
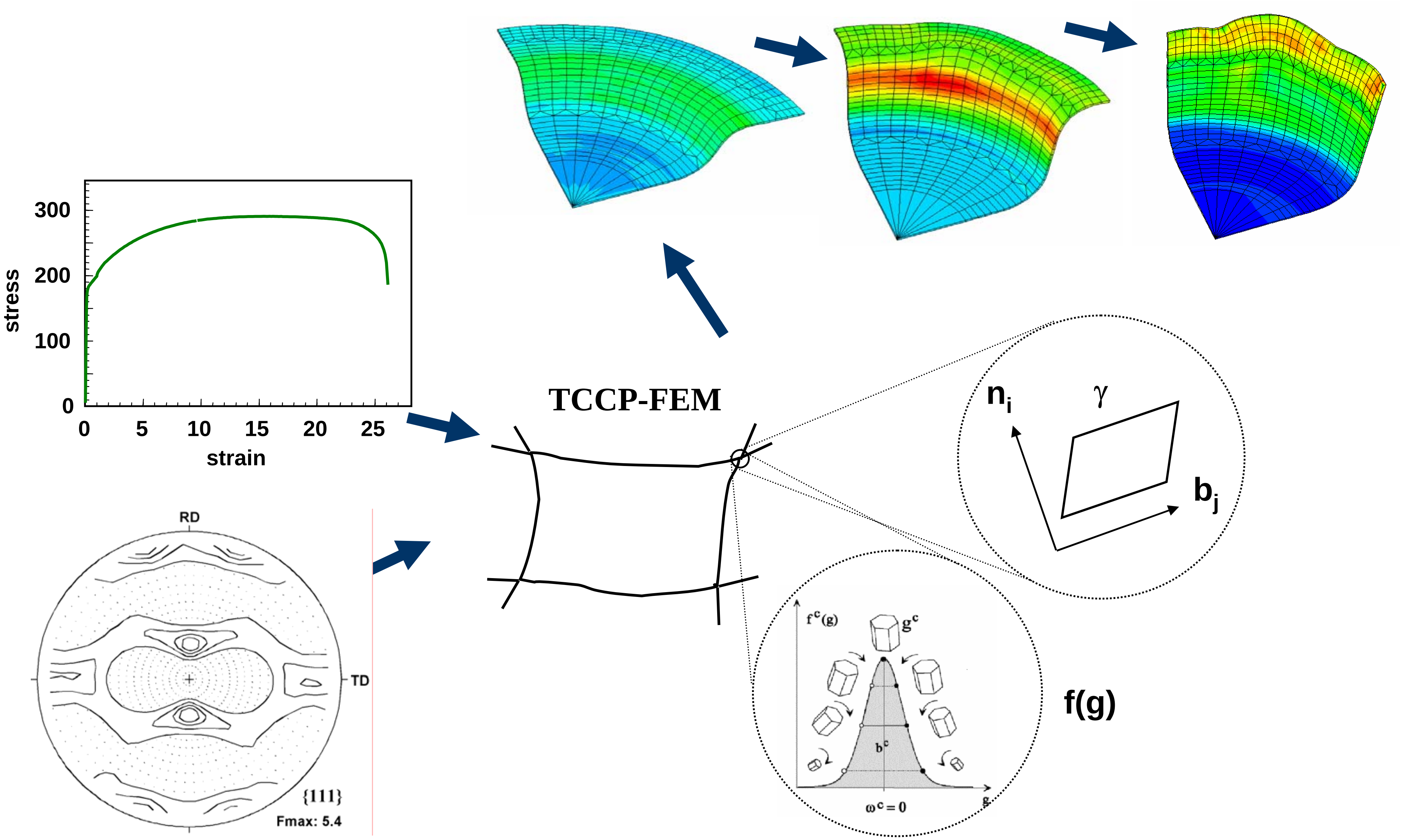


Anisotropie-Engineering –
konventionelle Methoden



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Anisotropie-Engineering mit der Texturkomponenten–Finite–Elemente–Methode

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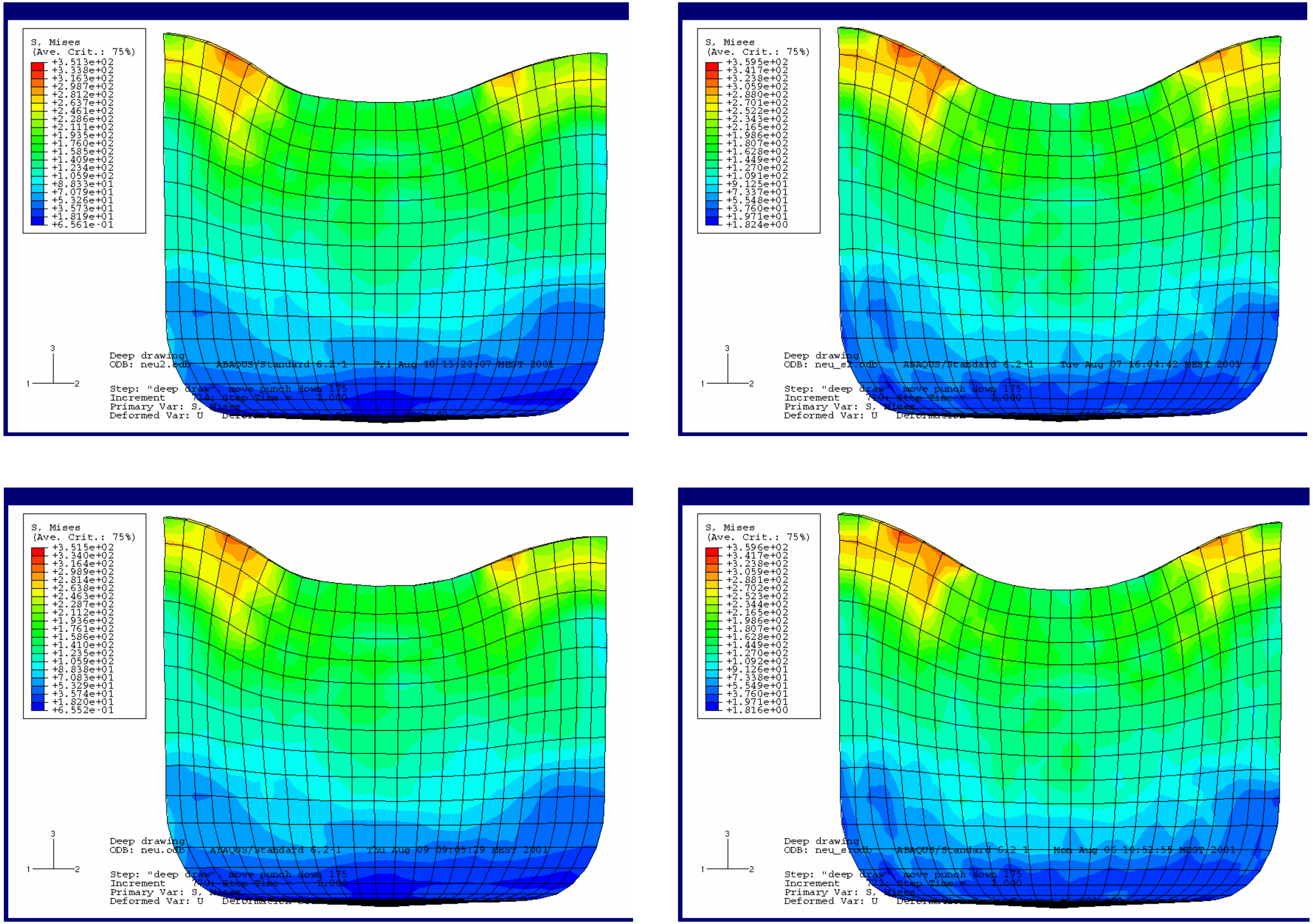
- Z. Zhao, F. Roters, W. Mao, D. Raabe: Adv. Eng. Mater. 3 (2001) p.984/990 „Introduction of A Texture Component Crystal Plasticity Finite Element Method for Industry-Scale Anisotropy Simulations”
- D. Raabe, P. Klose, B. Engl, K.-P. Imlau, F. Friedel, F. Roters: Advanced Engineering Materials 4 (2002) 169-180 „Concepts for integrating plastic anisotropy into metal forming simulations”
- D. Raabe, Z. Zhao, W. Mao: Acta Materialia 50 (2002) 4379–4394 „On the dependence of in-grain subdivision and deformation texture of aluminium on grain interaction”
- D. Raabe and F. Roters: International Journal of Plasticity 20 (2004) p. 339-361„Using texture components in crystal plasticity finite element simulations”

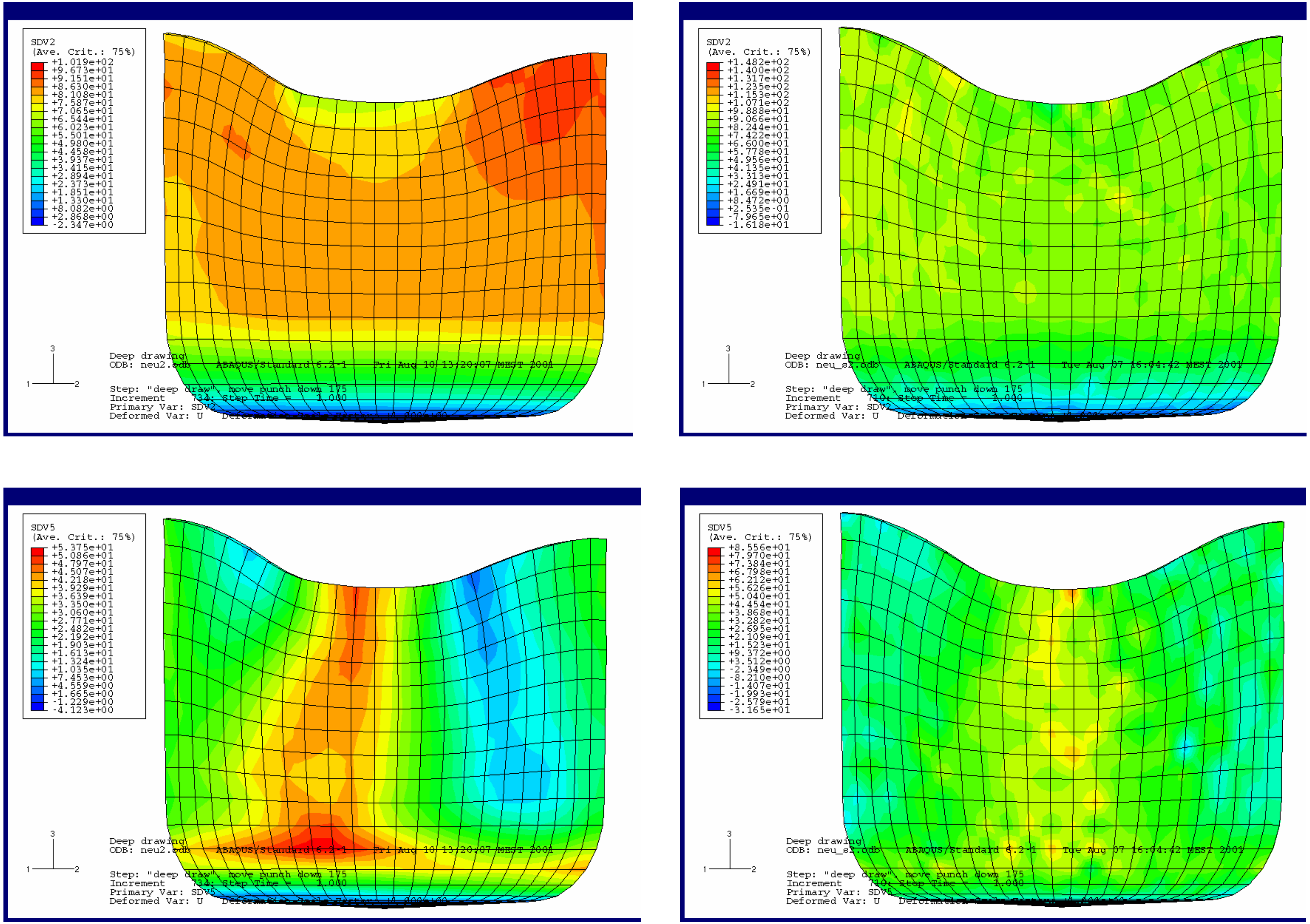
0° scatterwitdh   10° scatterwitdh

unsym

sym



	0° scatterwitdh	10° scatterwitdh
PHI		
misori		



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0° scatterwitdh | 10° scatterwitdh

PHI

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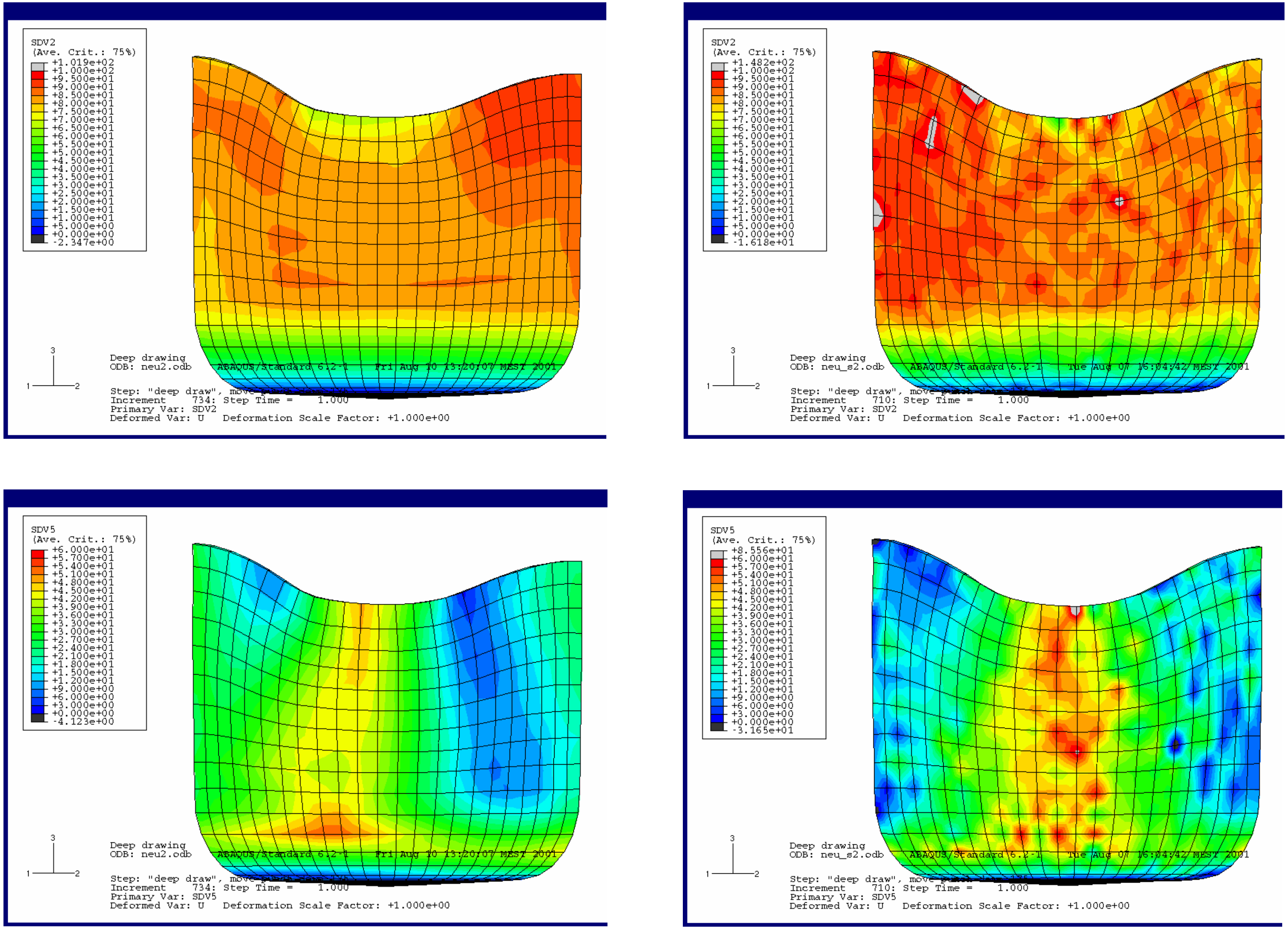

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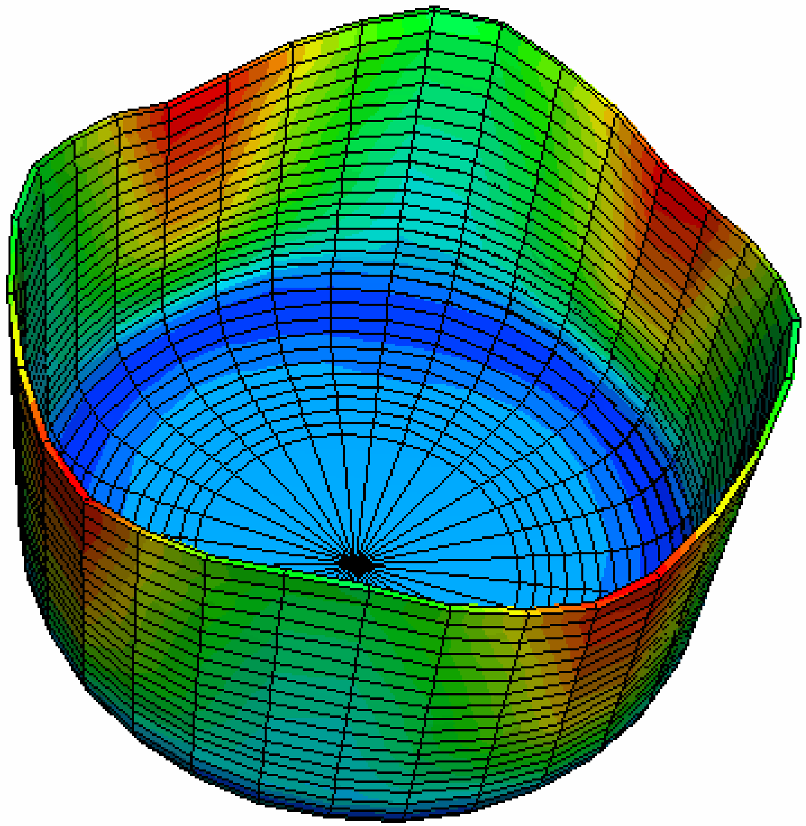

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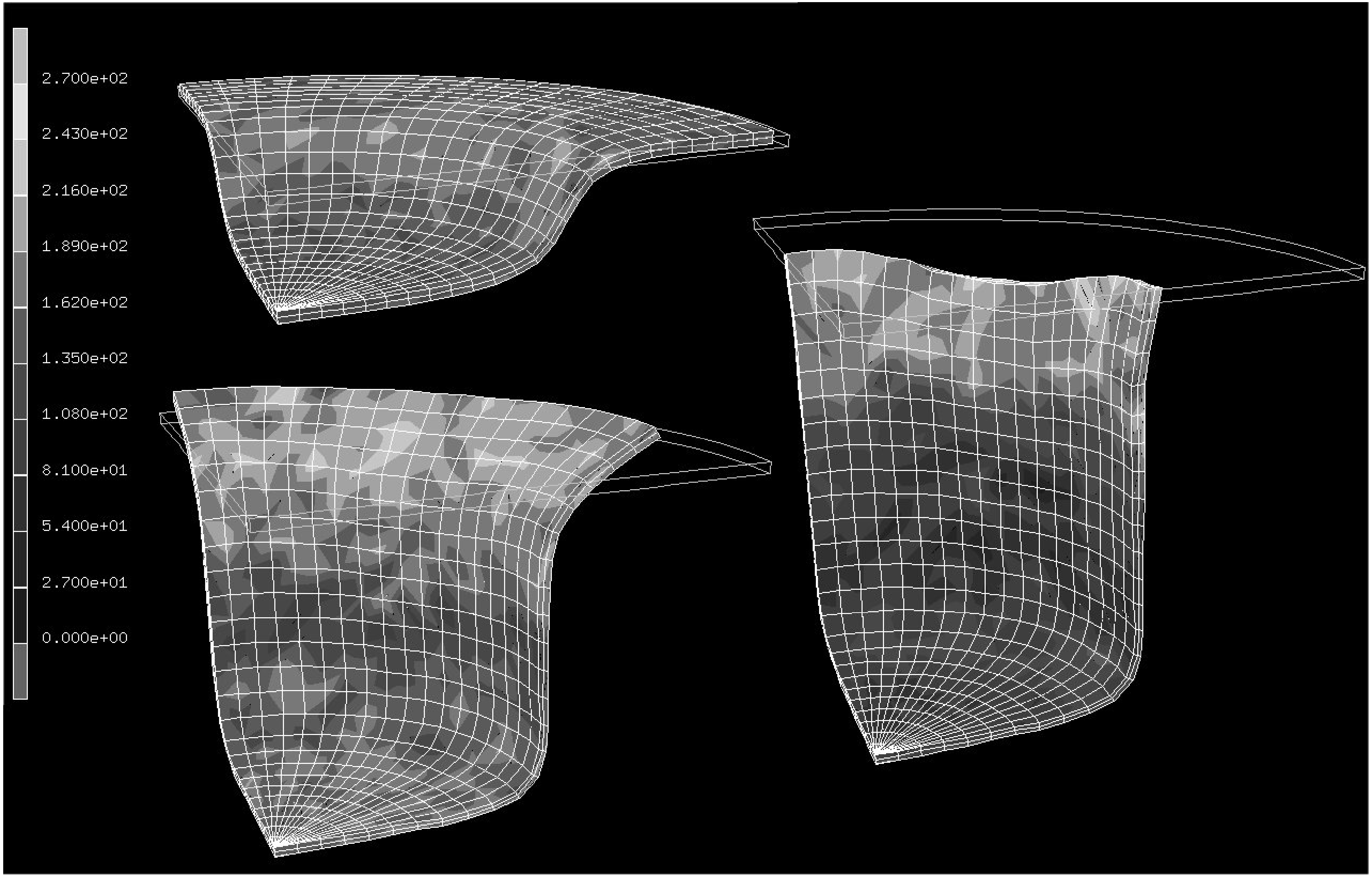

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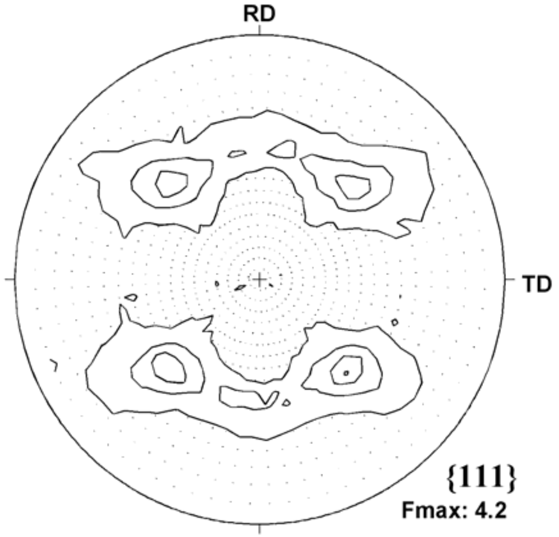

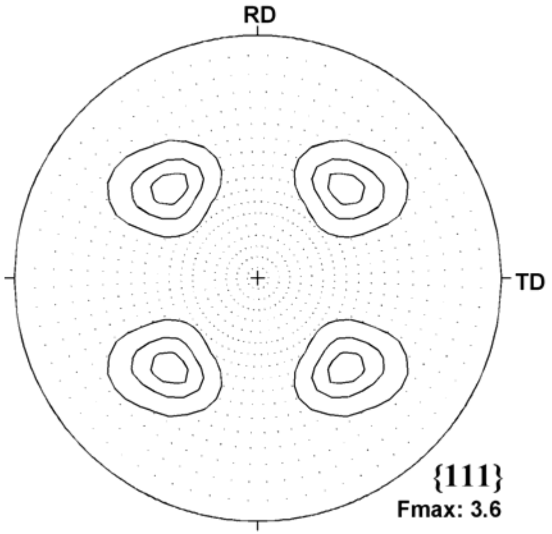

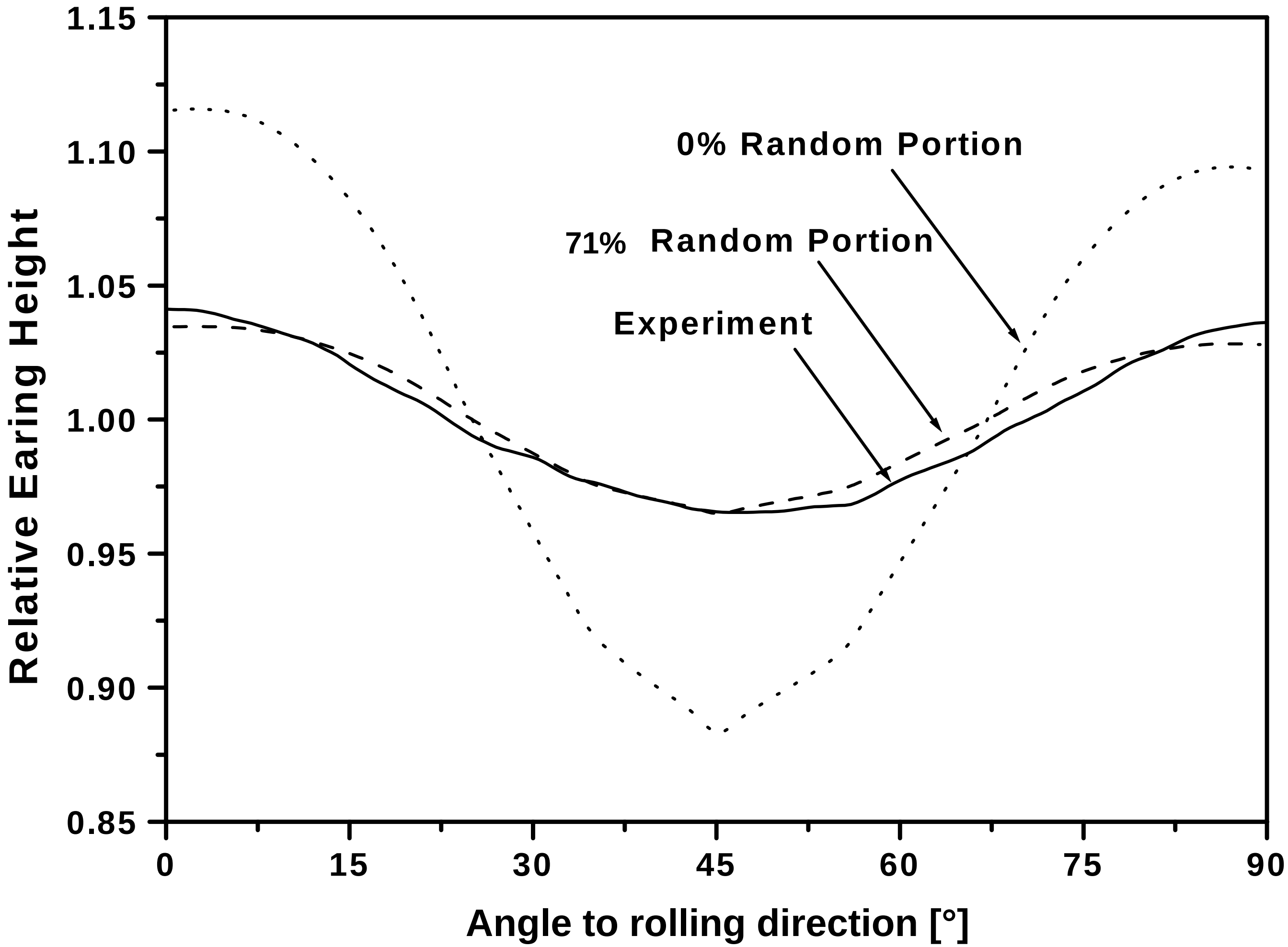

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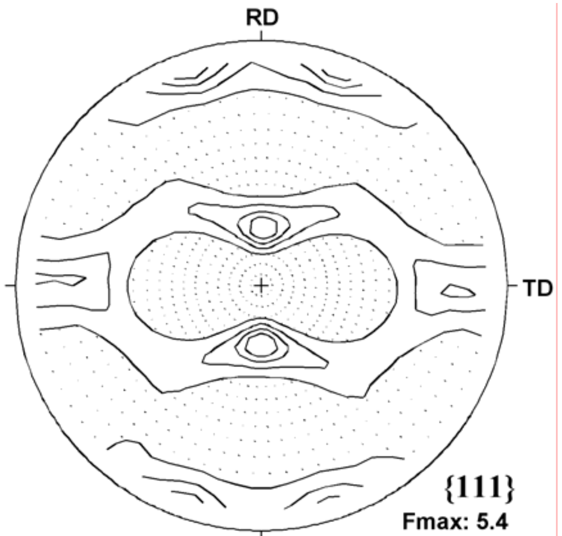

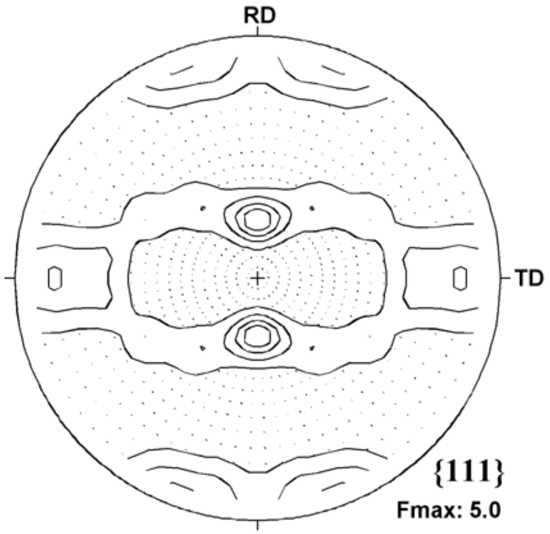

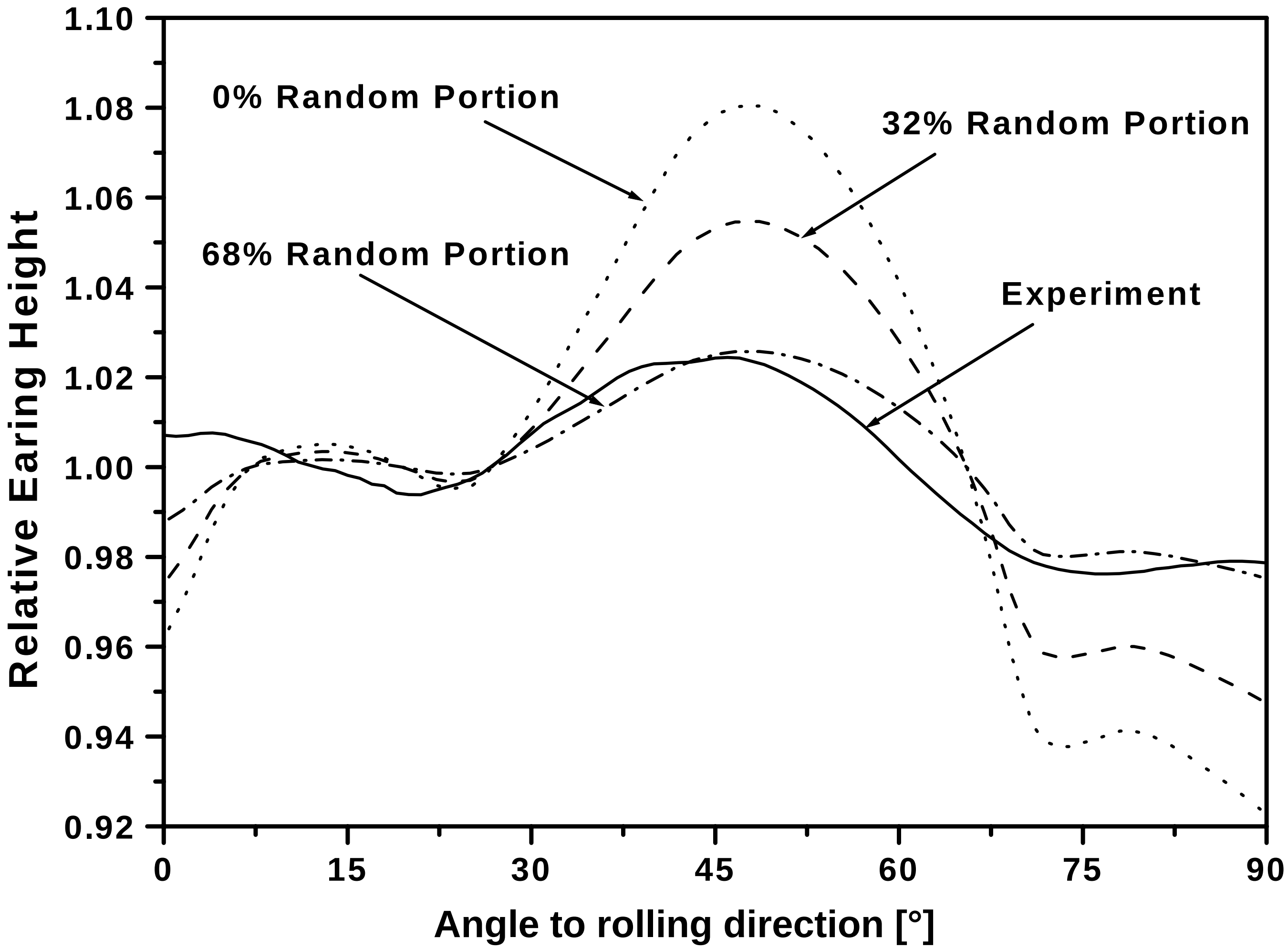

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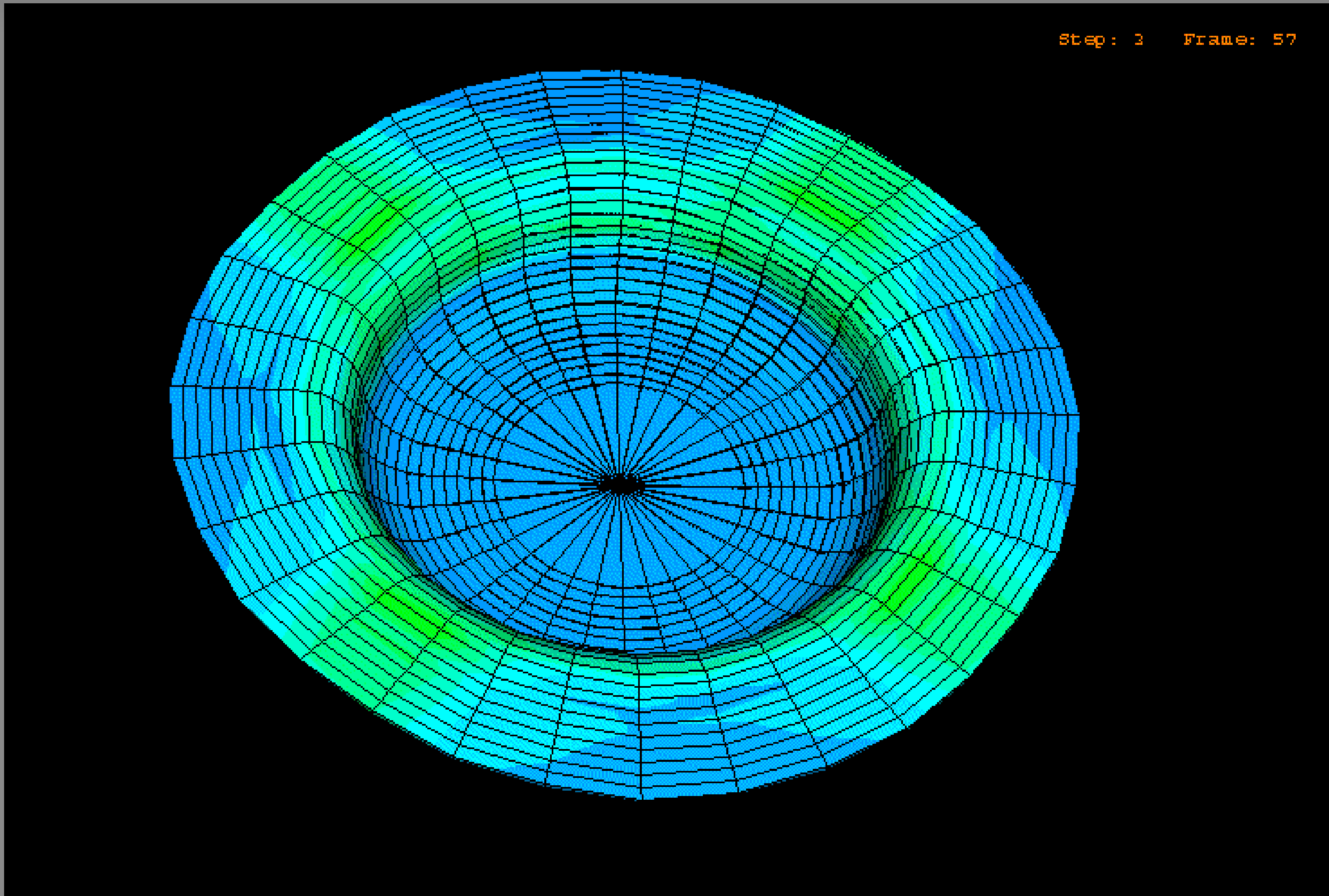

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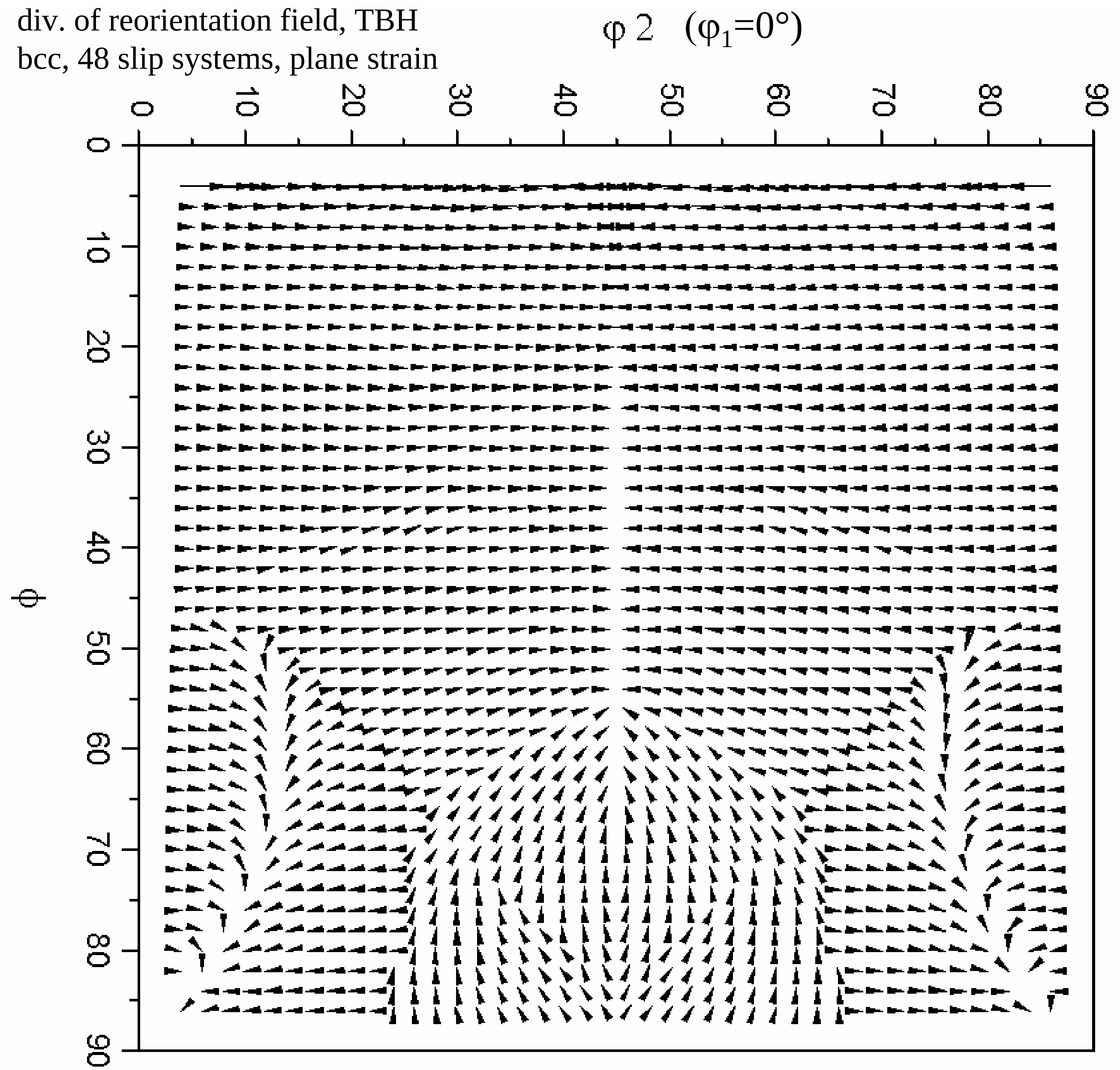

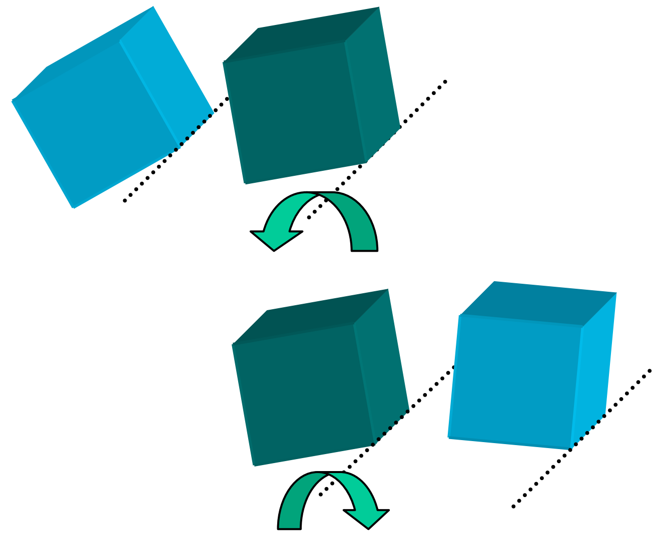

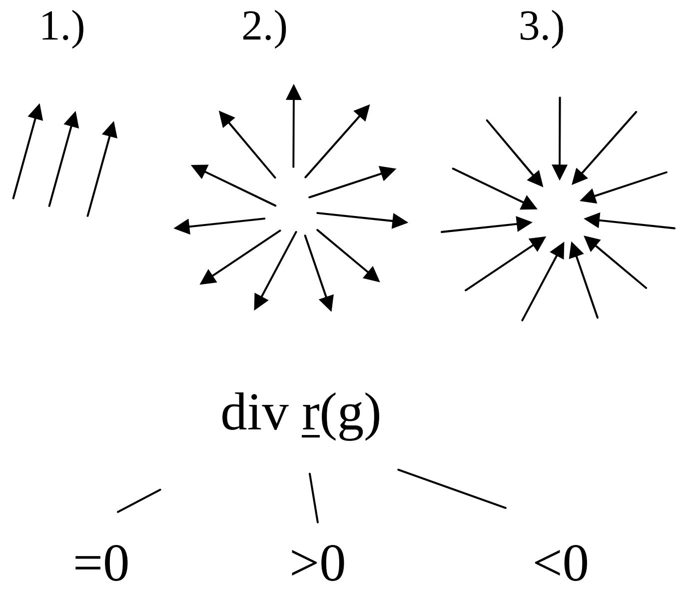

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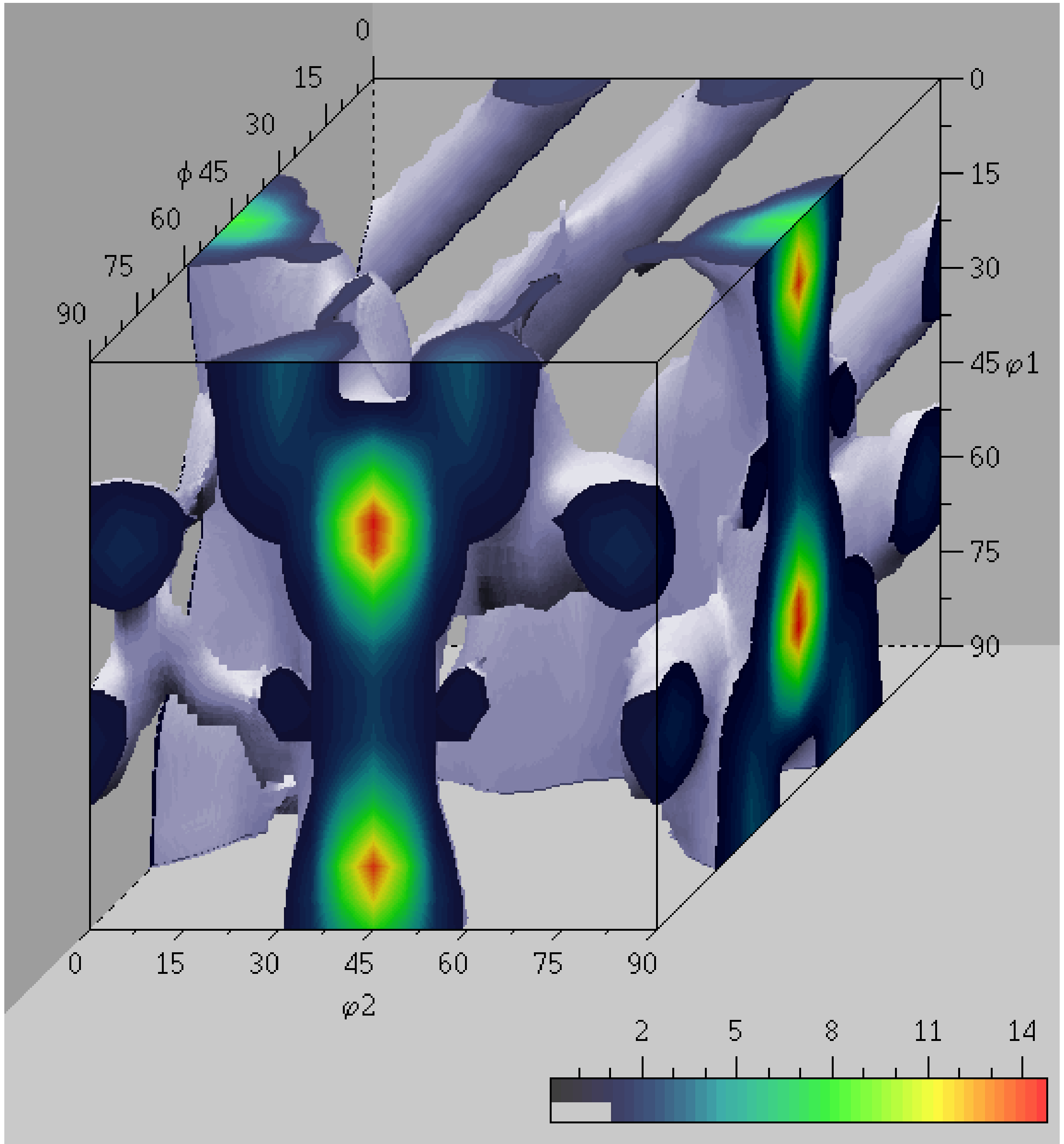
Divergenzbetrachtung - wie drehen Texturkomponenten ?



div. of reorientation field
TBH
bcc
48 slip systems
plane strain

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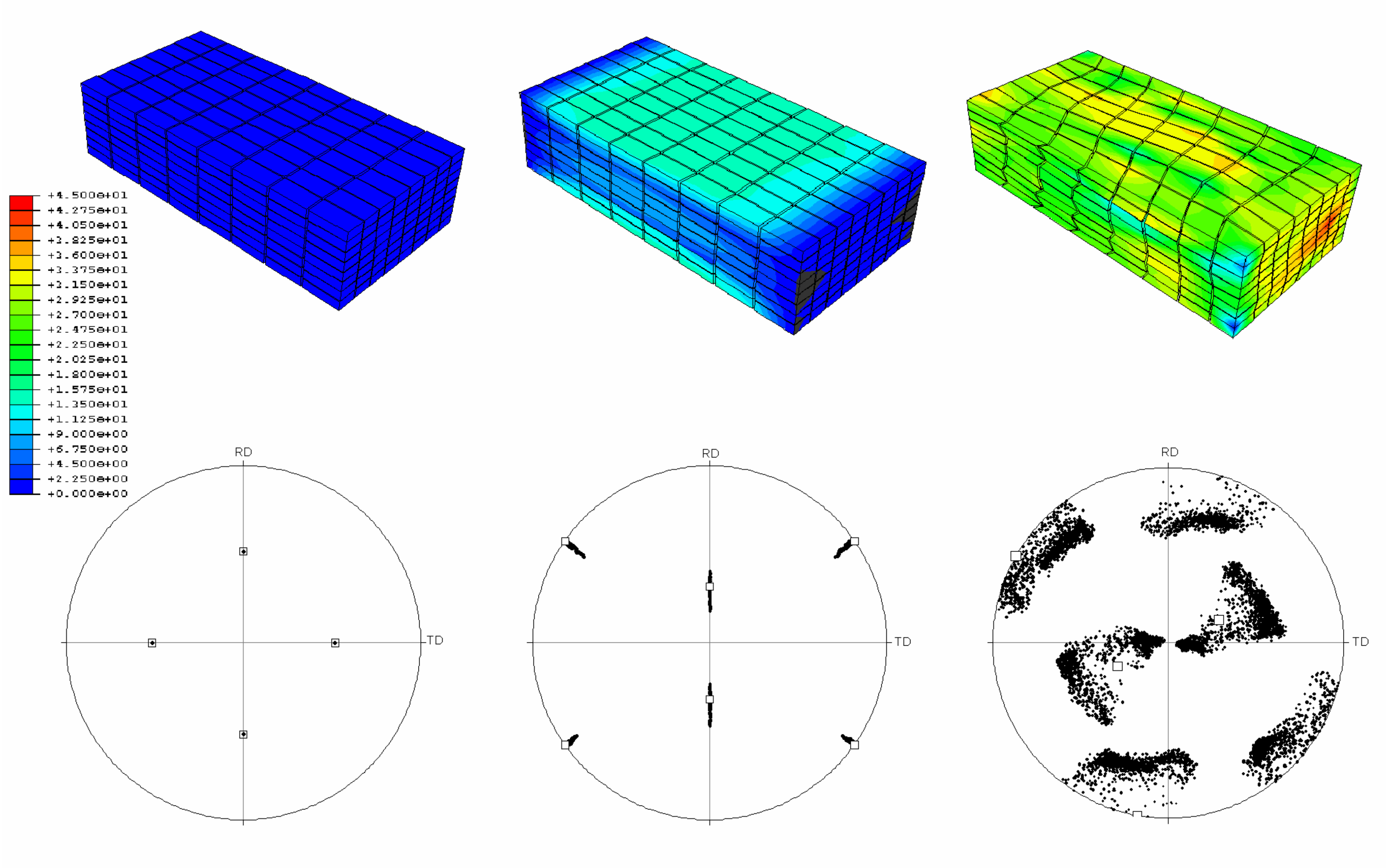
Divergenzbetrachtung -
wie drehen Texturkomponenten ?



RCube **Goss** **RZ_{bcc}**

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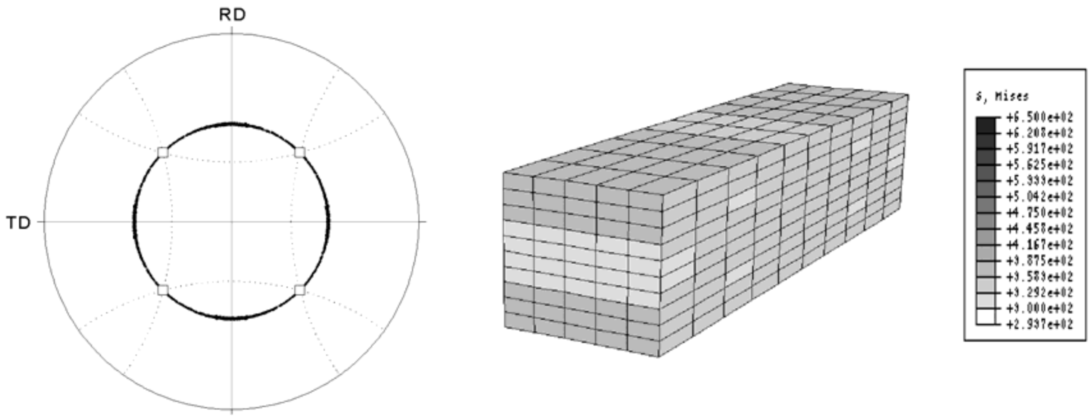
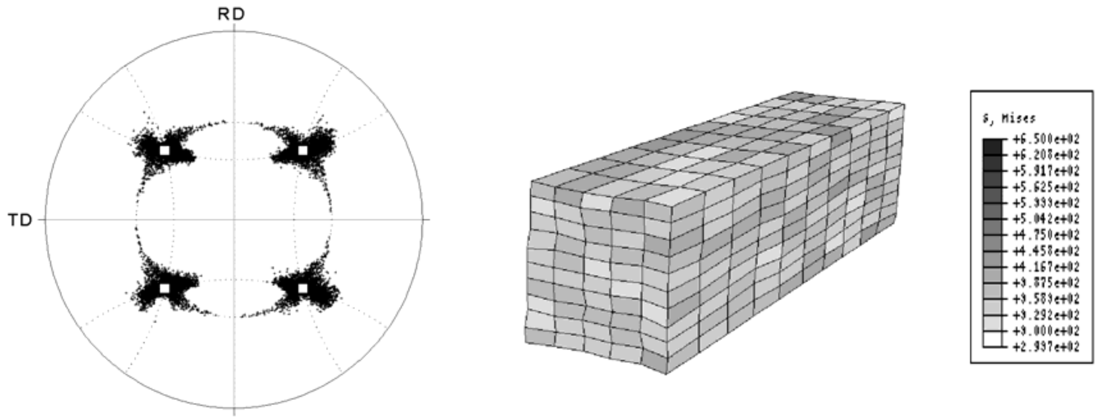
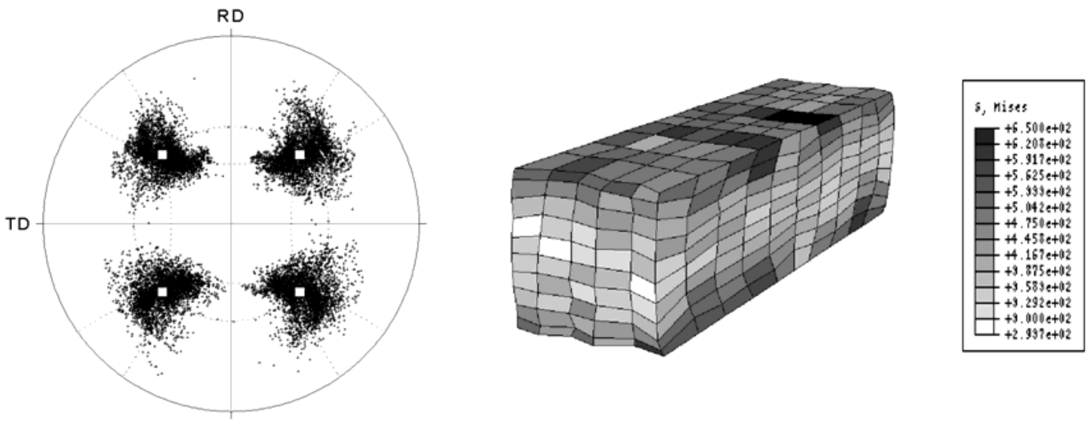
Divergenzbetrachtung -
wie drehen Texturkomponenten ?



Exact cube
friction μ=0.1
on top /bottom surfaces
50% reduced in thickness



cube with 2.5° scatter
friction μ=0.1
on top /bottom surfaces
50% reduced in thickness



cube with 2.5° scatter
friction μ=0.3
on top /bottom surfaces
50% reduced in thickness

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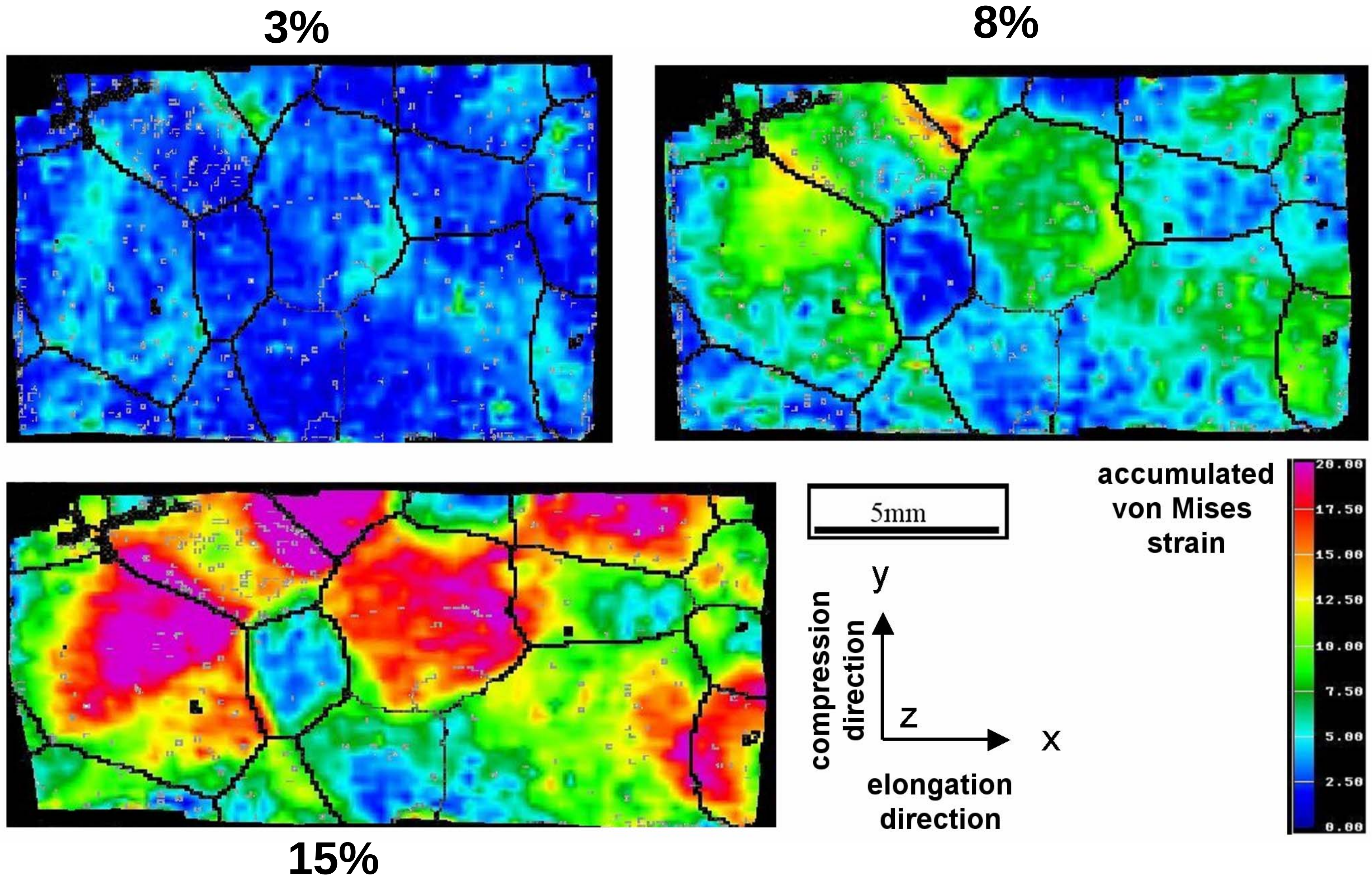
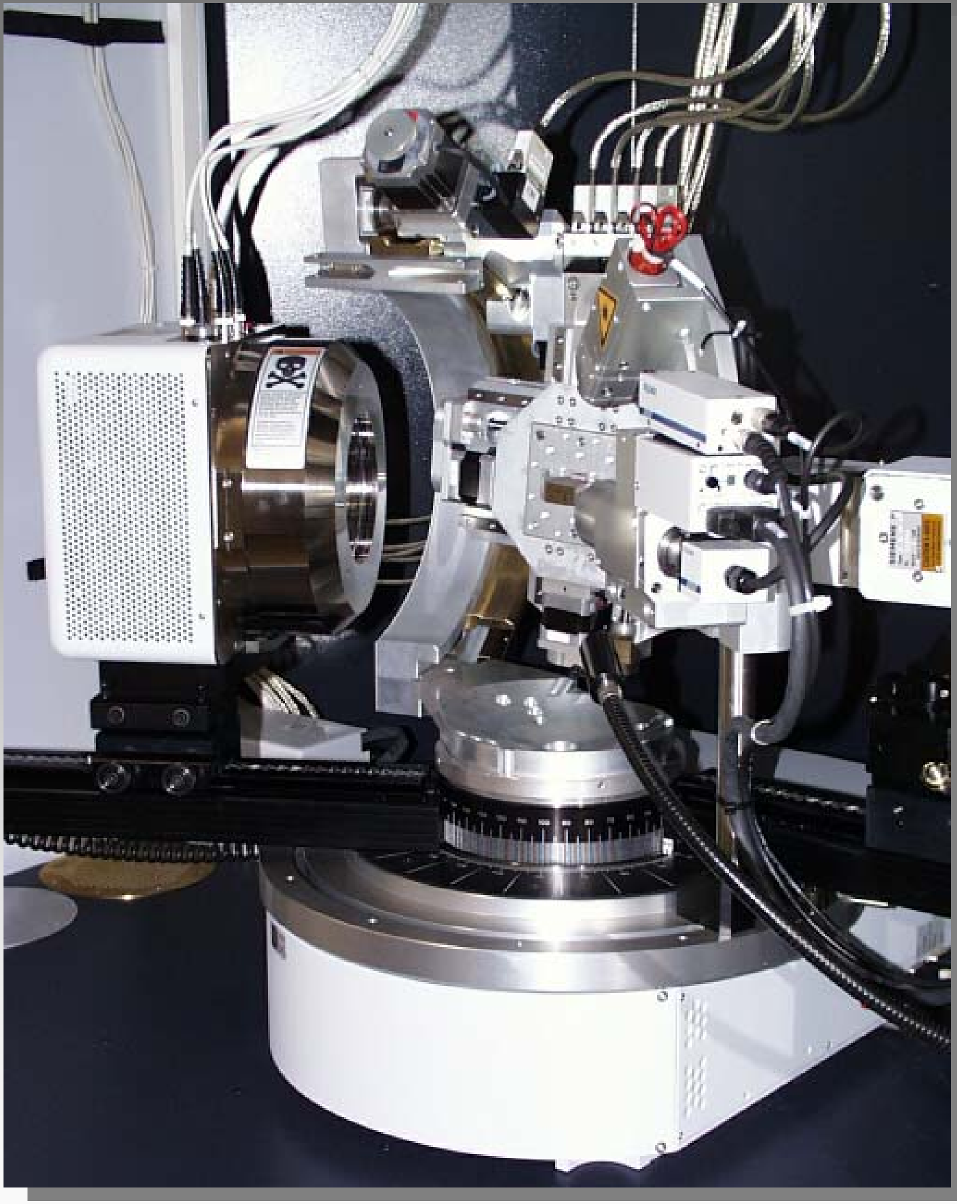
Divergenzbetrachtung - wie drehen Texturkomponenten ?



Divergenzbetrachtung -
wie drehen Texturkomponenten ?



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Röntgen-Raster-Textur-Eigenspannungsmeßplätze

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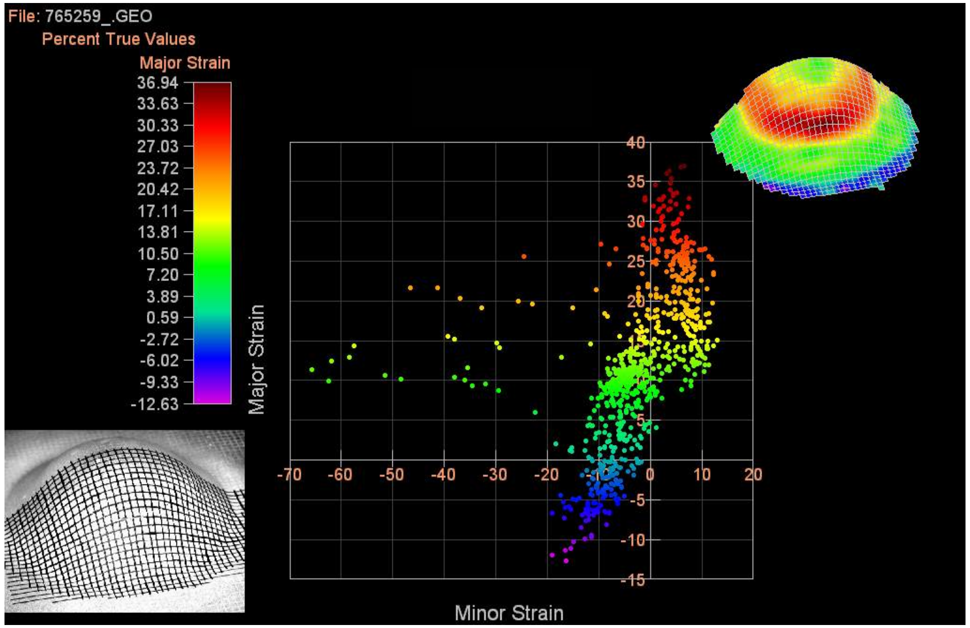
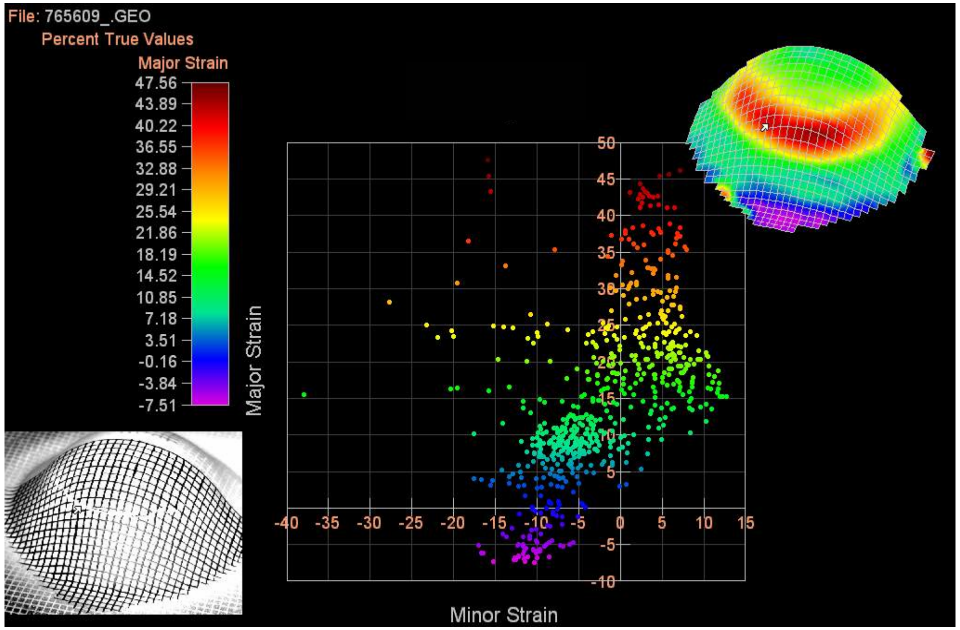
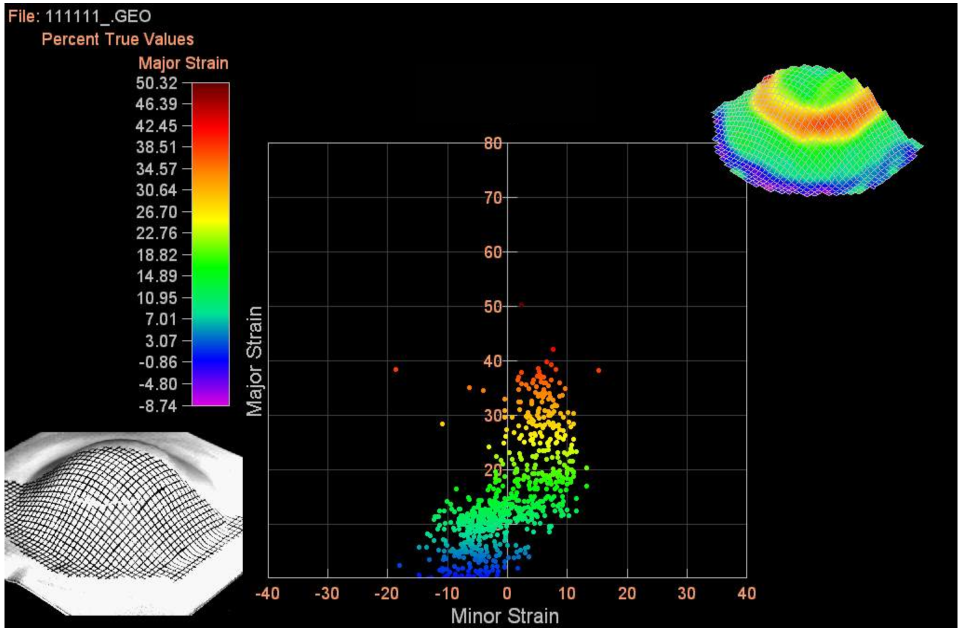
Hochauflösungs-Feldemissions-REM mit EBSP und EDX

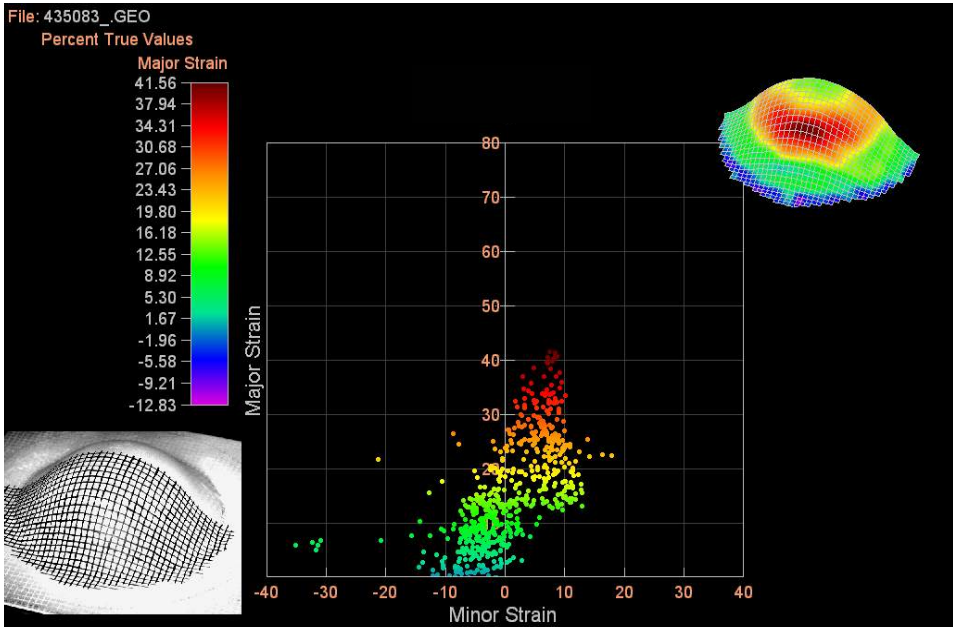
Rasterelektronenmikroskope mit EDX, EBSP

Transmissionselektronenmikroskop mit EDX und Texturanalyse









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Beispiel: Aluminium - Heterogenität der Dehnungsverteilung und Oberfläche in Automobil-Legierungen