



**Dreidimensionale Finite-Element-Analysen zur  
Beurteilung der Sickerströmung und des Qualmwassers  
in ungesättigten und gesättigten oberflächennahen  
Erdschichten von Flussregionen**

**Dr. rer. nat. R. A. Dietrich**

**IBSNM**

**Ingenieur-Büro für Systemanalyse und Numerische Modellierung**

**Neues Land 26 • 21522 Hohnstorf/Elbe • Tel. 04139- 6 96 91 49**

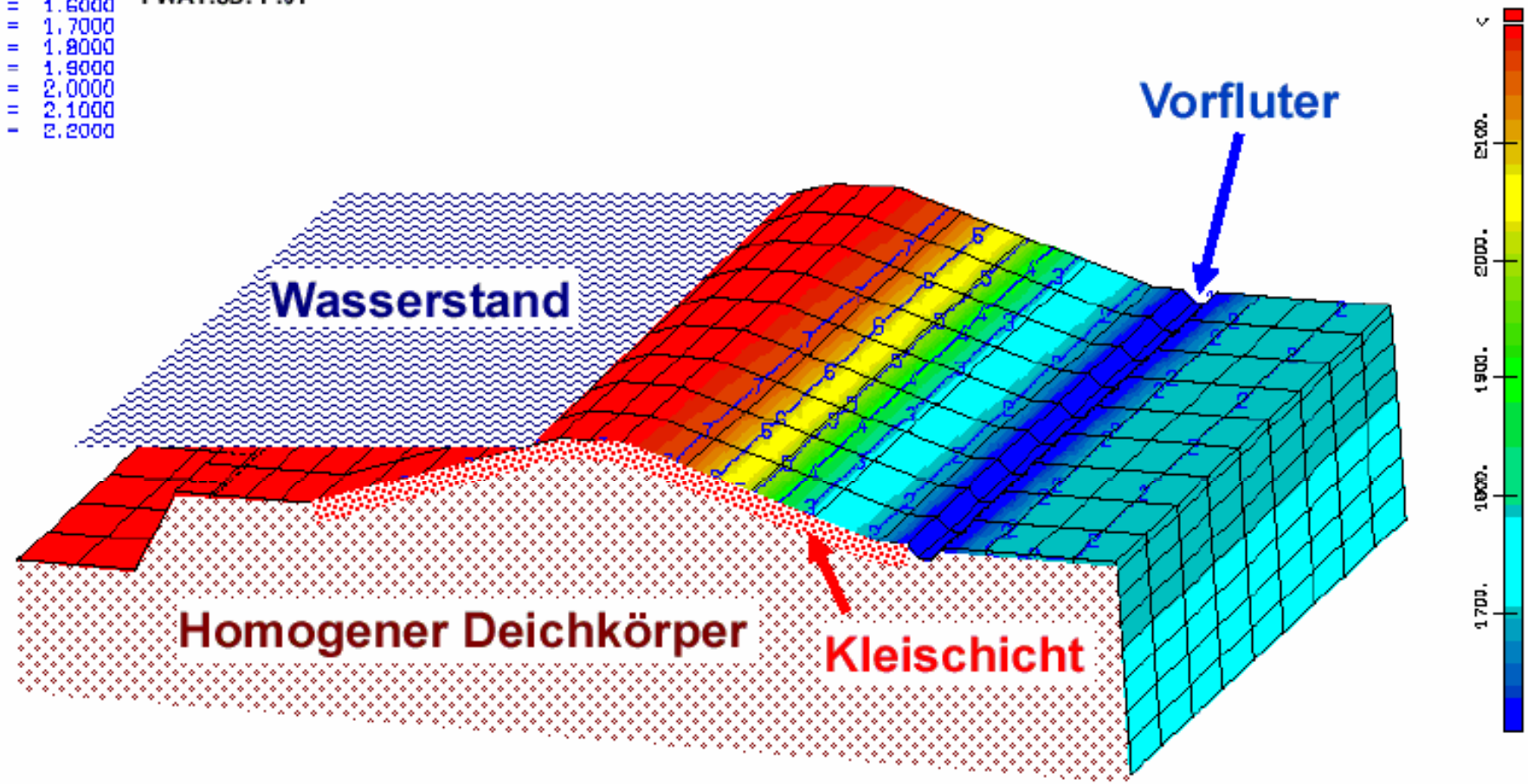
**E-Mail: [Rudolf-Adolf.Dietrich@t-online.de](mailto:Rudolf-Adolf.Dietrich@t-online.de)**

**Homepage: <http://www.rudolf-adolf-dietrich.de>**

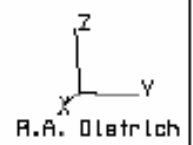
Faktor:  $10^3$   
1 = 1.6000  
2 = 1.7000  
3 = 1.8000  
4 = 1.9000  
5 = 2.0000  
6 = 2.1000  
7 = 2.2000

FWAT.3D: P.01

IBSNM/20.12.02



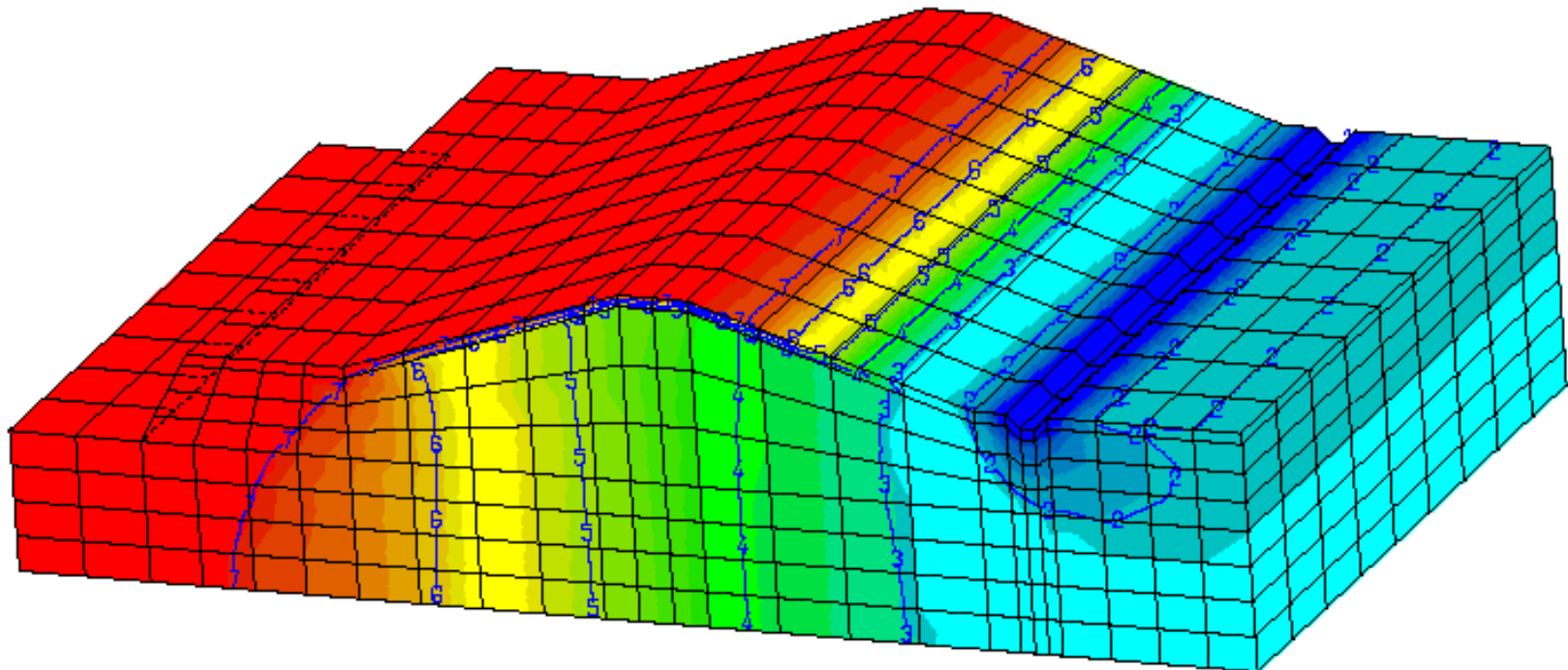
# Systemskizze



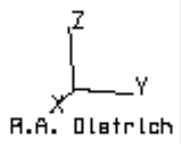
Faktor:  $10^3$   
1 = 1.6000  
2 = 1.7000  
3 = 1.8000  
4 = 1.9000  
5 = 2.0000  
6 = 2.1000  
7 = 2.2000

FWAT.3D: P.01

IBSNM/20.12.02



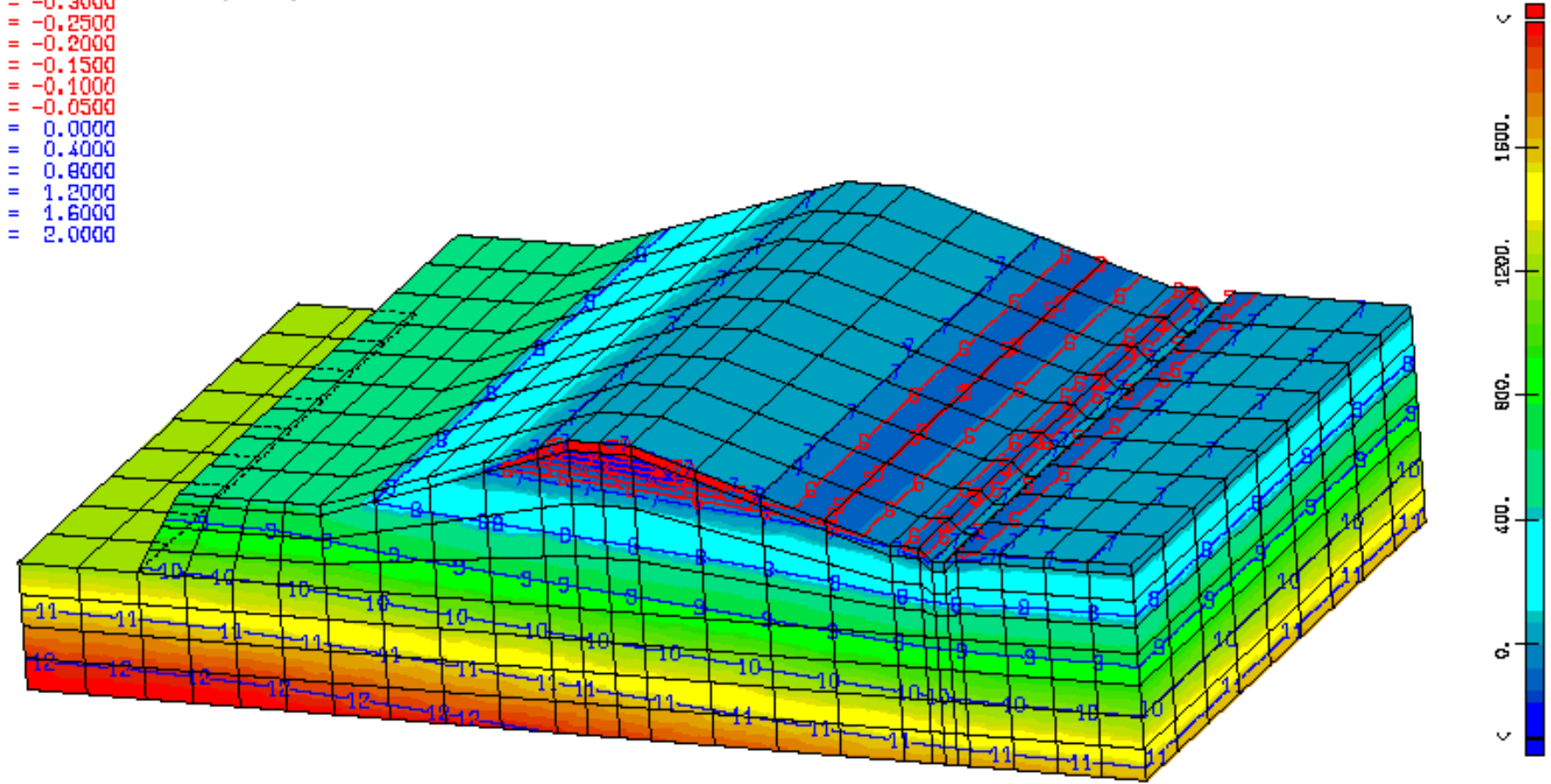
**BILD : TOTALE DRUCKHÖHE (cm)**  
Stationäre Analyse



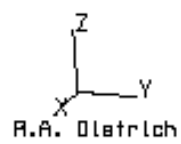
- Faktor:  $10^3$
- 1 = -0.3000
  - 2 = -0.2500
  - 3 = -0.2000
  - 4 = -0.1500
  - 5 = -0.1000
  - 6 = -0.0500
  - 7 = 0.0000
  - 8 = 0.4000
  - 9 = 0.8000
  - 10 = 1.2000
  - 11 = 1.6000
  - 12 = 2.0000

FWAT.3D: P.01

IBSNM/20.12.02



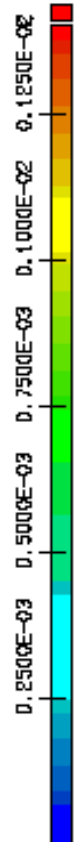
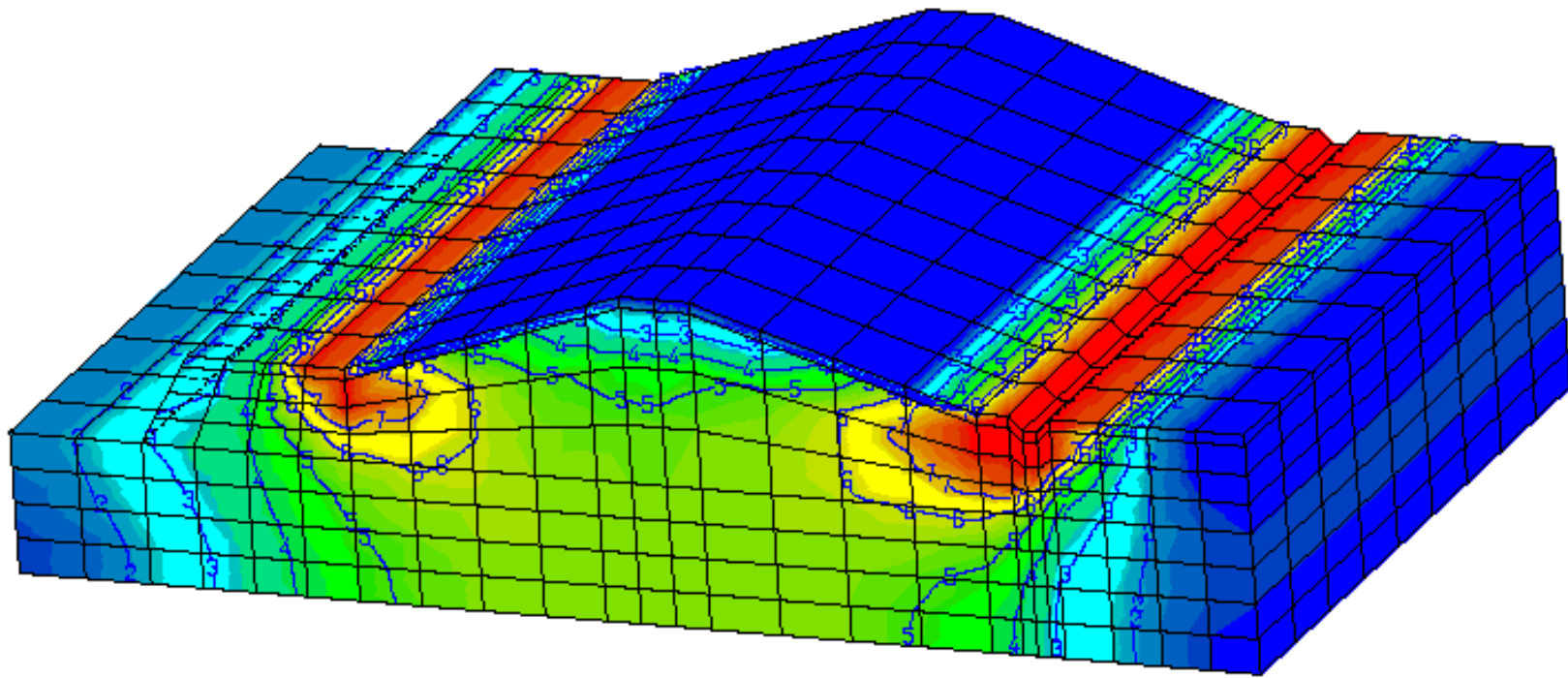
**BILD : FLUID-DRUCKHÖHE (cm)**  
Stationäre Analyse



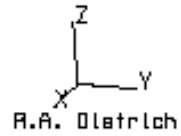
Faktor:  $10^{-3}$   
1 = 0.0000  
2 = 0.2000  
3 = 0.4000  
4 = 0.6000  
5 = 0.8000  
6 = 1.0000  
7 = 1.2000

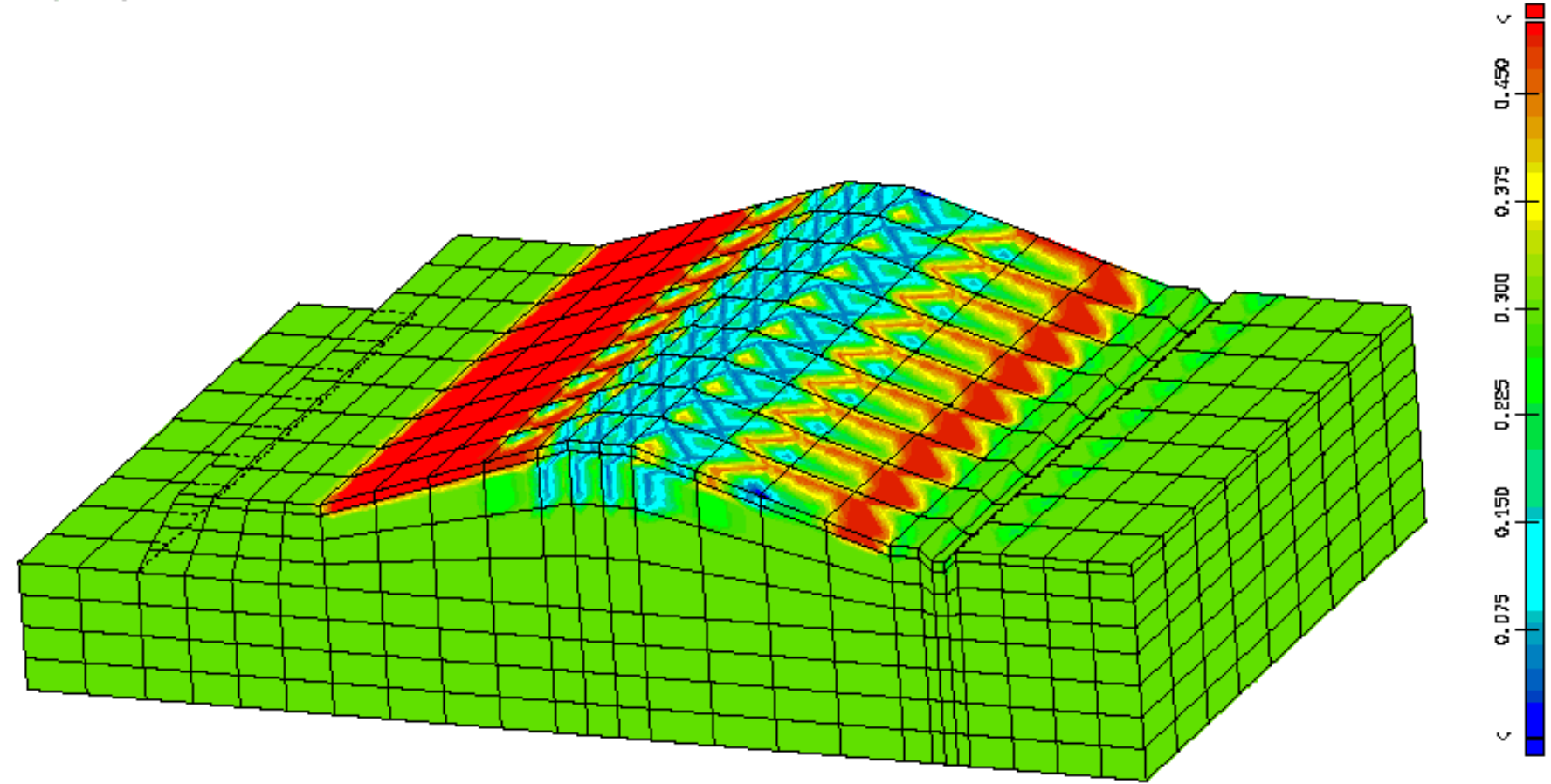
FWAT.3D: P.01

IBSNM/20.12.02

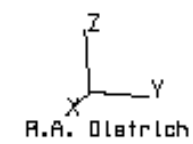


**BILD : WASSERGESCHWINDIGKEIT (cm/s)**  
Stationäre Analyse





**BILD : FEUCHTIGKEITSGEHALT (-)**  
Stationäre Analyse

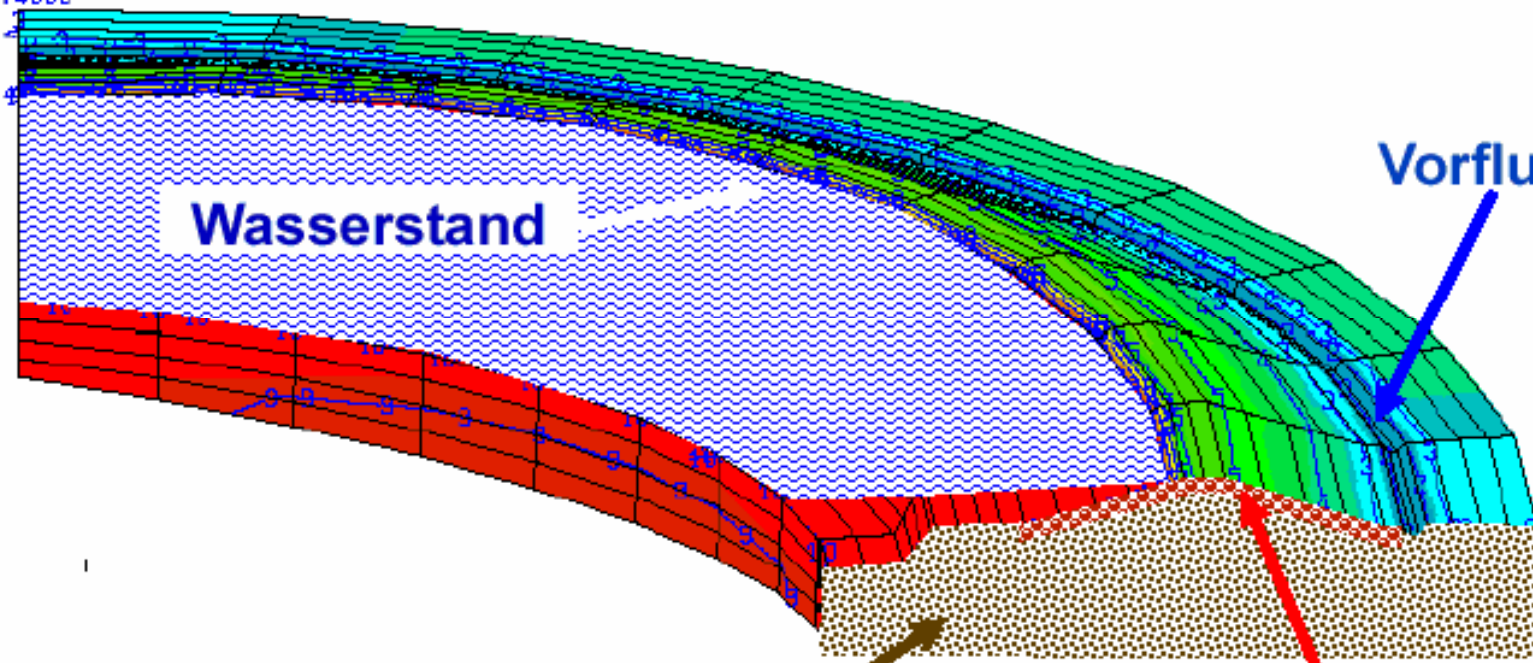




Faktor:  $10^2$   
1 = 0.0000  
2 = 1.0000  
3 = 2.0000  
4 = 3.0000  
5 = 4.0000  
6 = 5.0000  
7 = 6.0000  
8 = 7.0000  
9 = 7.2000  
10 = 7.4000

DEICH-3D:P.01

IBSNM / 14.07.03



Homogener Deichkörper

Kleischicht

**Systemskizze**

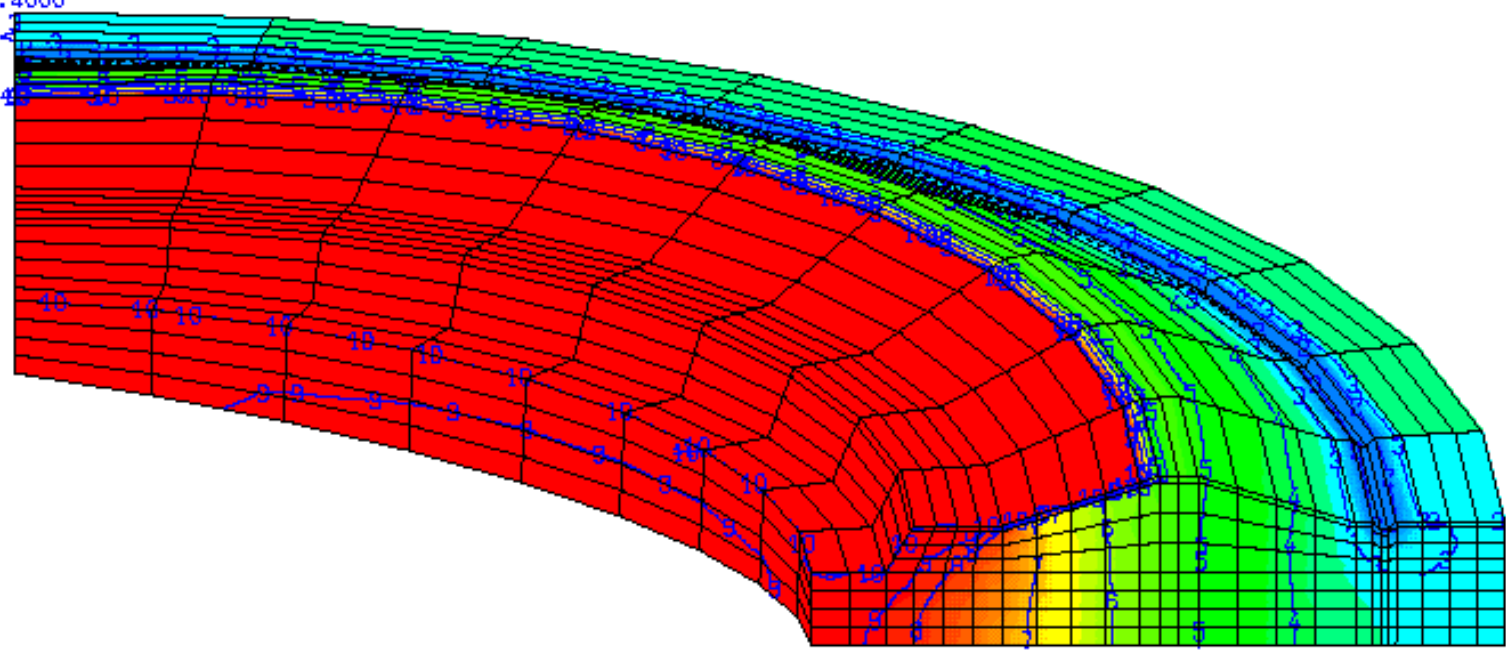
Z  
Y  
R.A. Dietrich



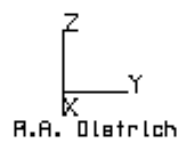
- Faktor:  $10^2$
- 1 = 0.0000
  - 2 = 1.0000
  - 3 = 2.0000
  - 4 = 3.0000
  - 5 = 4.0000
  - 6 = 5.0000
  - 7 = 6.0000
  - 8 = 7.0000
  - 9 = 7.2000
  - 10 = 7.4000

DEICH-3D:P.01

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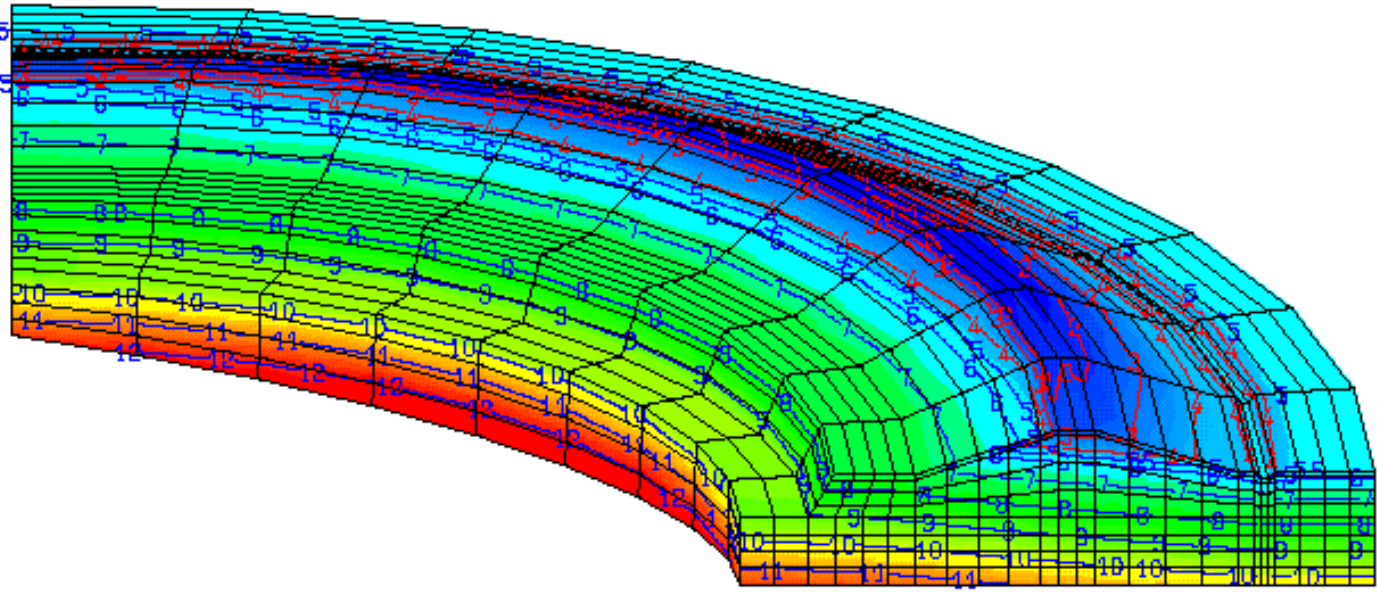
**TOTALE DRUCKHÖHE (cm)**  
Stationäre Analyse



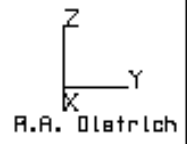
- Faktor:  $10^3$
- 1 = -0.7000
  - 2 = -0.5000
  - 3 = -0.3000
  - 4 = -0.1000
  - 5 = 0.0000
  - 6 = 0.1000
  - 7 = 0.4000
  - 8 = 0.8000
  - 9 = 1.2000
  - 10 = 1.6000
  - 11 = 2.0000
  - 12 = 2.4000

DEICH-3D:P.01

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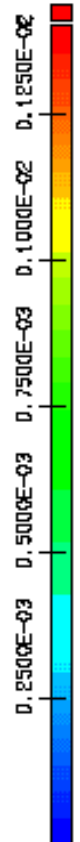
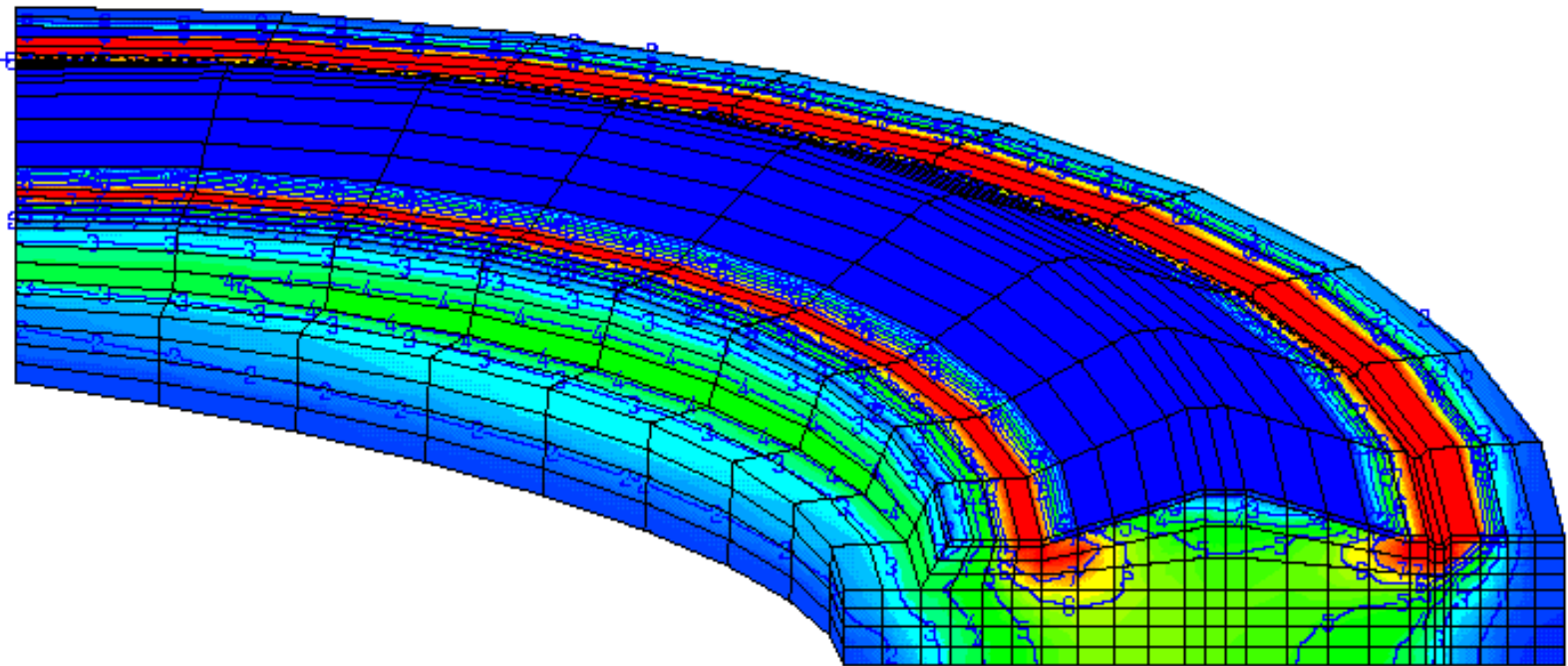
**FLUID-DRUCKHÖHE (cm)**  
Stationäre Analyse



Faktor:  $10^{-3}$   
1 = 0.0000  
2 = 0.2000  
3 = 0.4000  
4 = 0.6000  
5 = 0.8000  
6 = 1.0000  
7 = 1.2000

DEICH-3D:P.01

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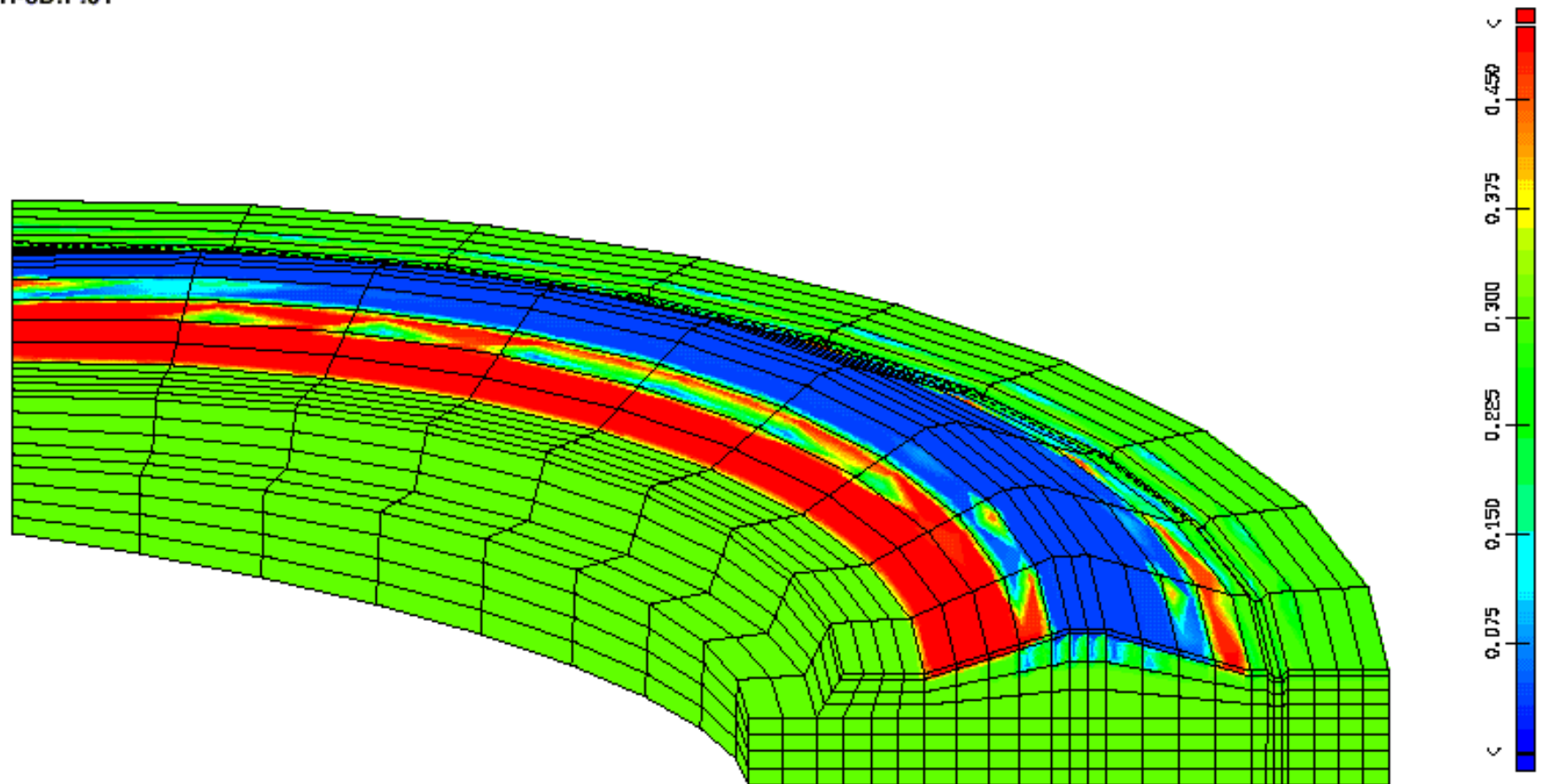


WASSERGESCHWINDIGKEIT (cm/s)  
Stationäre Analyse

Z  
Y  
K  
R.A. Dietrich

DEICH-3D:P.01

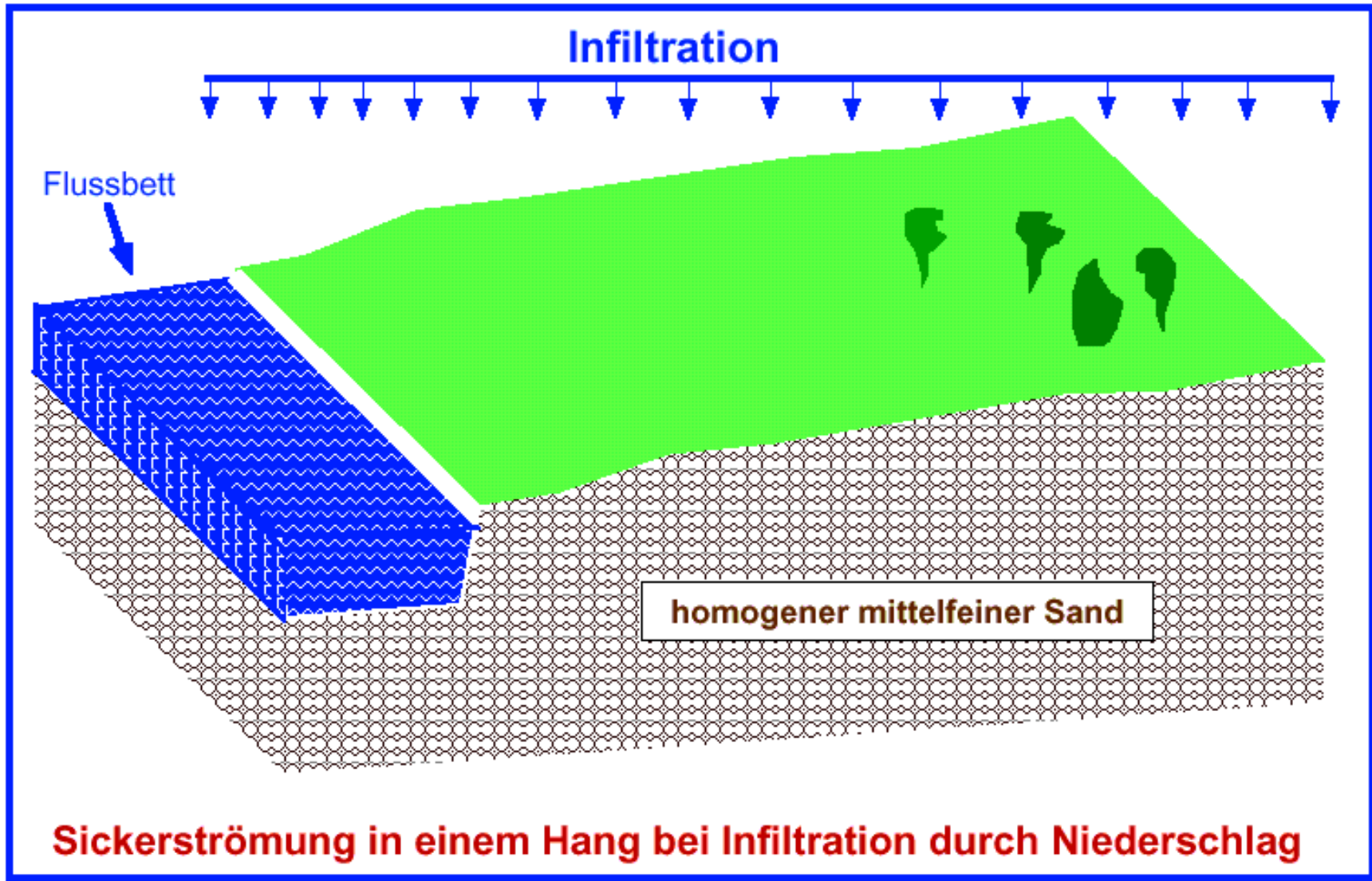
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**FEUCHTIGKEITSGEHALT (-)**  
Stationäre Analyse

Z  
Y  
K  
R.A. Dietrich





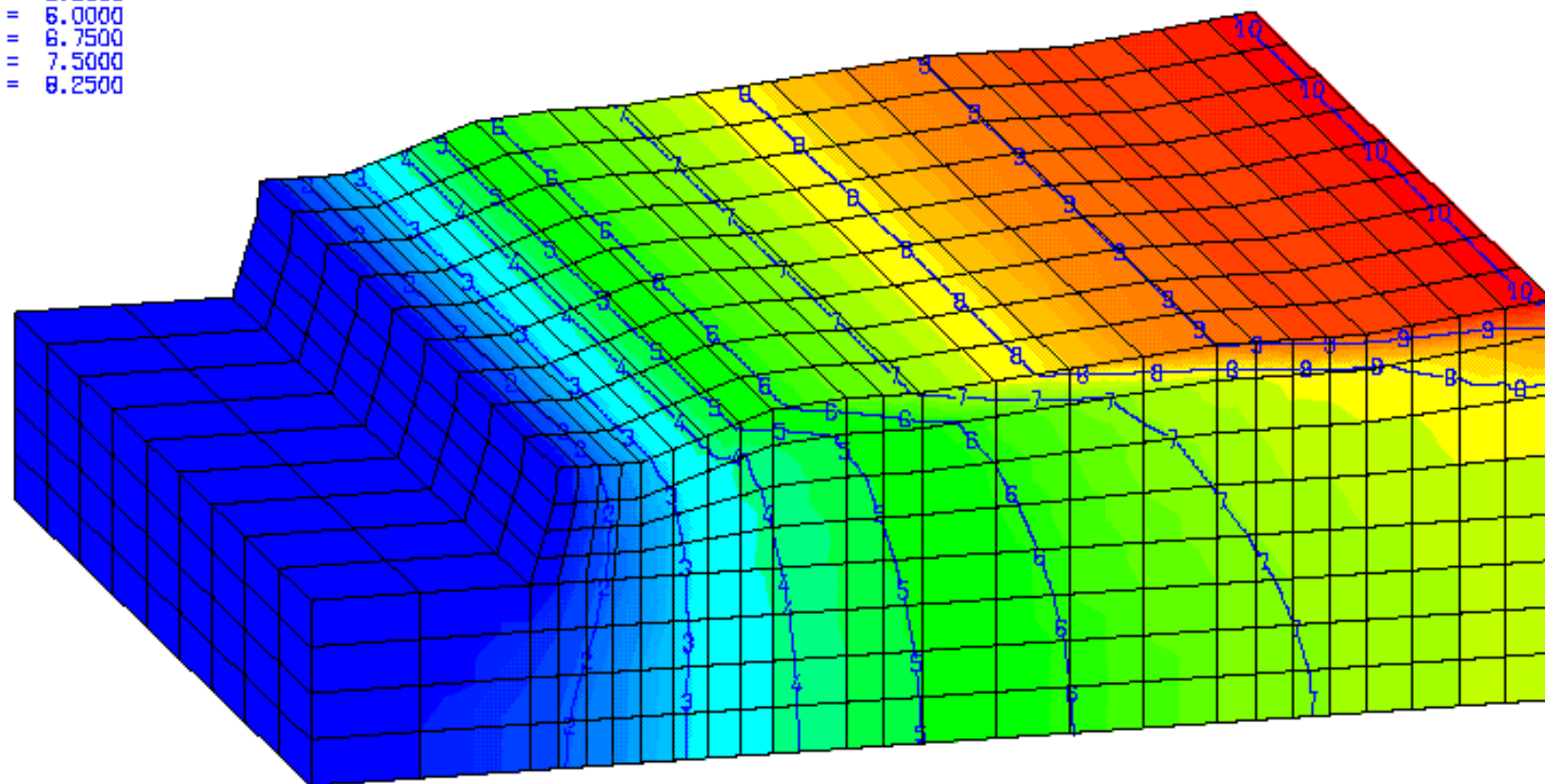
**Sickerströmung in einem Hang bei Infiltration durch Niederschlag**

Faktor:  $10^2$

HANG-3D:P.02

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- 1 = 1.5000
- 2 = 2.2500
- 3 = 3.0000
- 4 = 3.7500
- 5 = 4.5000
- 6 = 5.2500
- 7 = 6.0000
- 8 = 6.7500
- 9 = 7.5000
- 10 = 8.2500



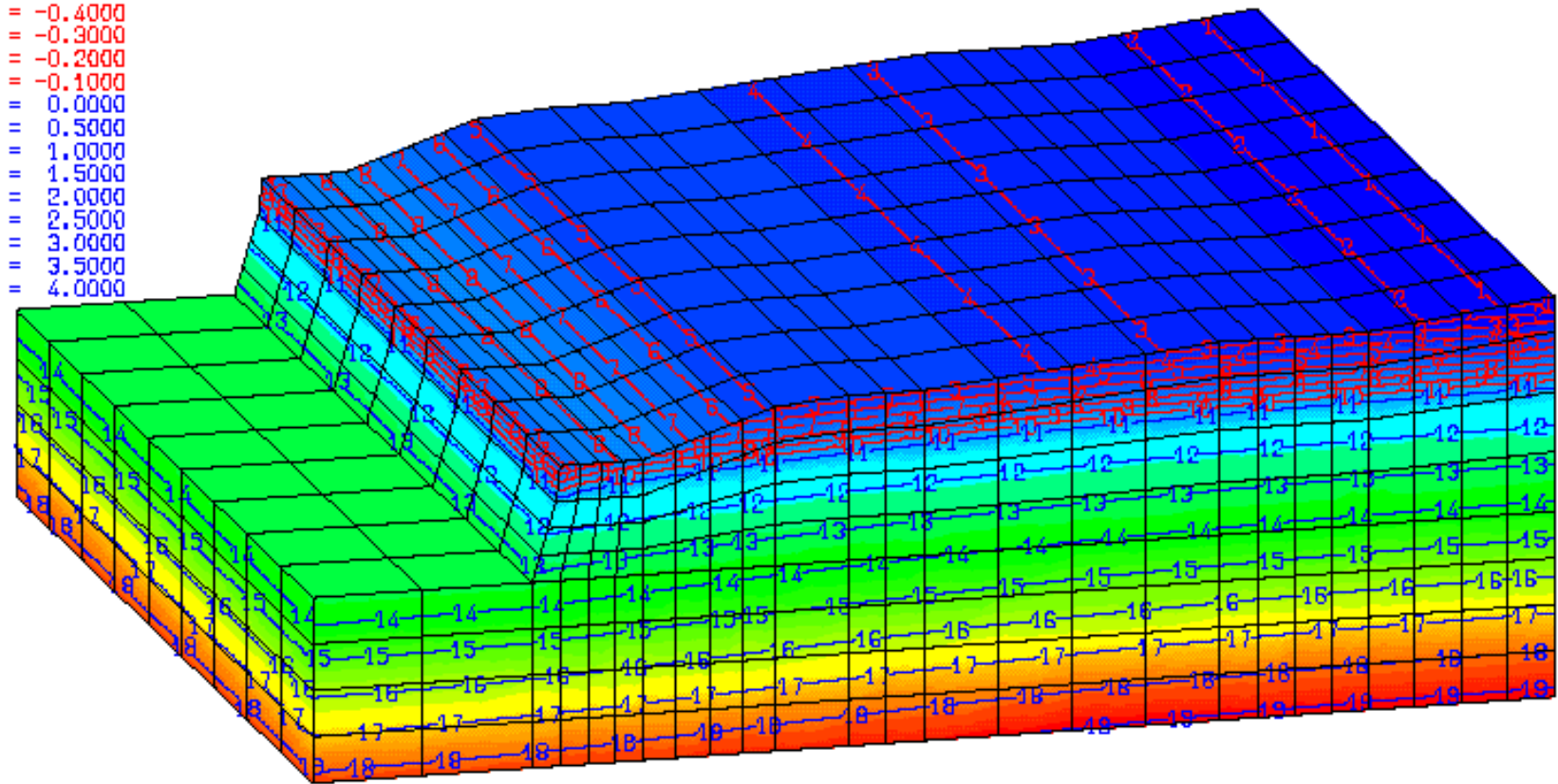
**TOTALE DRUCKHÖHE (cm)**  
Stationäre Analyse

Z  
Y  
R.A. Dietrich

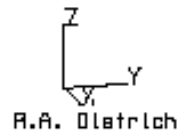
- Faktor:  $10^3$
- 1 = -1.0000
  - 2 = -0.9000
  - 3 = -0.8000
  - 4 = -0.7000
  - 5 = -0.6000
  - 6 = -0.5000
  - 7 = -0.4000
  - 8 = -0.3000
  - 9 = -0.2000
  - 10 = -0.1000
  - 11 = 0.0000
  - 12 = 0.5000
  - 13 = 1.0000
  - 14 = 1.5000
  - 15 = 2.0000
  - 16 = 2.5000
  - 17 = 3.0000
  - 18 = 3.5000
  - 19 = 4.0000

HANG-3D:P.02

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**FLUID-DRUCKHÖHE (cm)**  
Stationäre Analyse

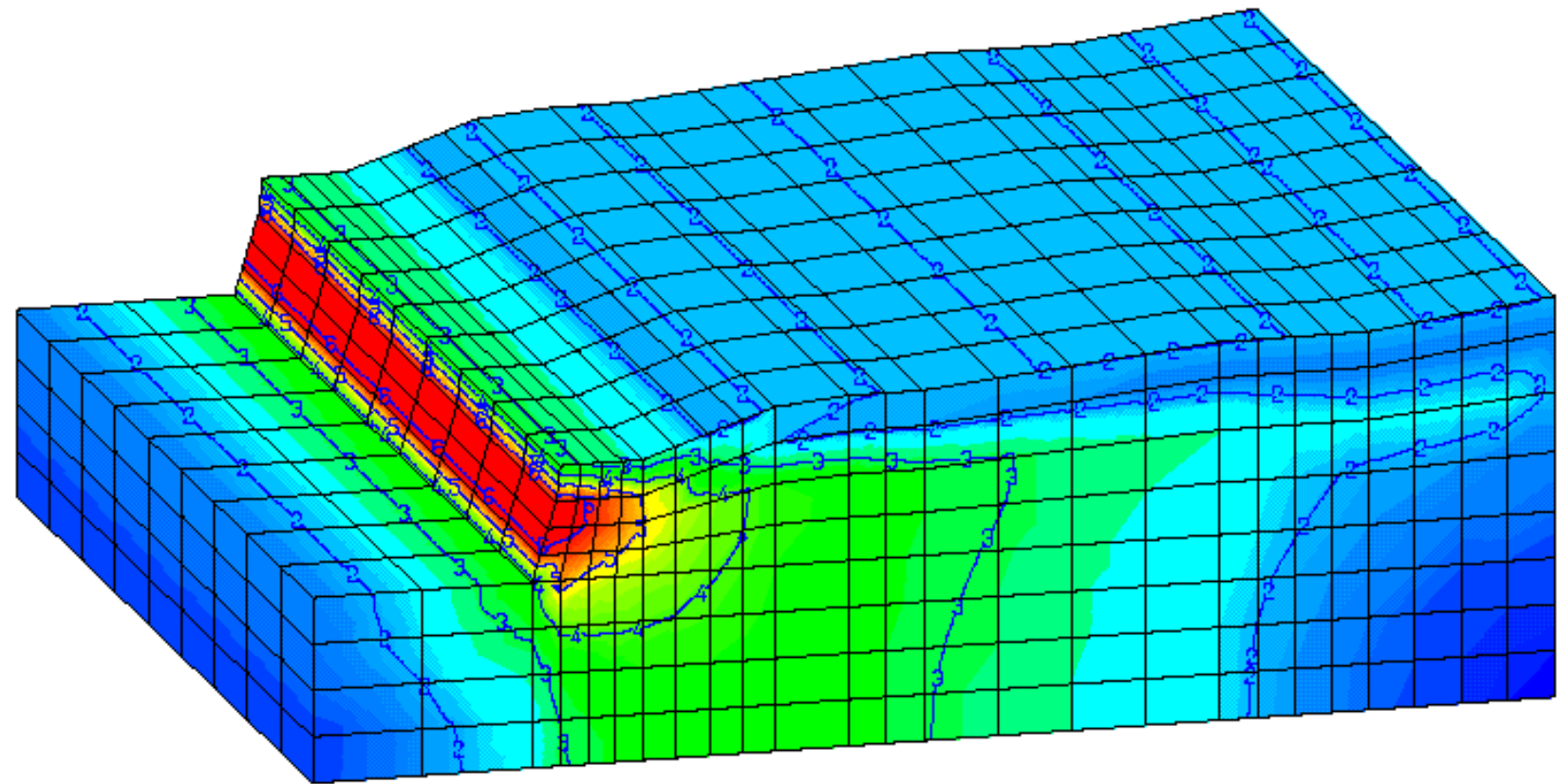




Faktor:  $10^{-4}$   
1 = 0.0000  
2 = 2.0000  
3 = 4.0000  
4 = 6.0000  
5 = 8.0000  
6 = 10.0000

HANG-3D:P.02

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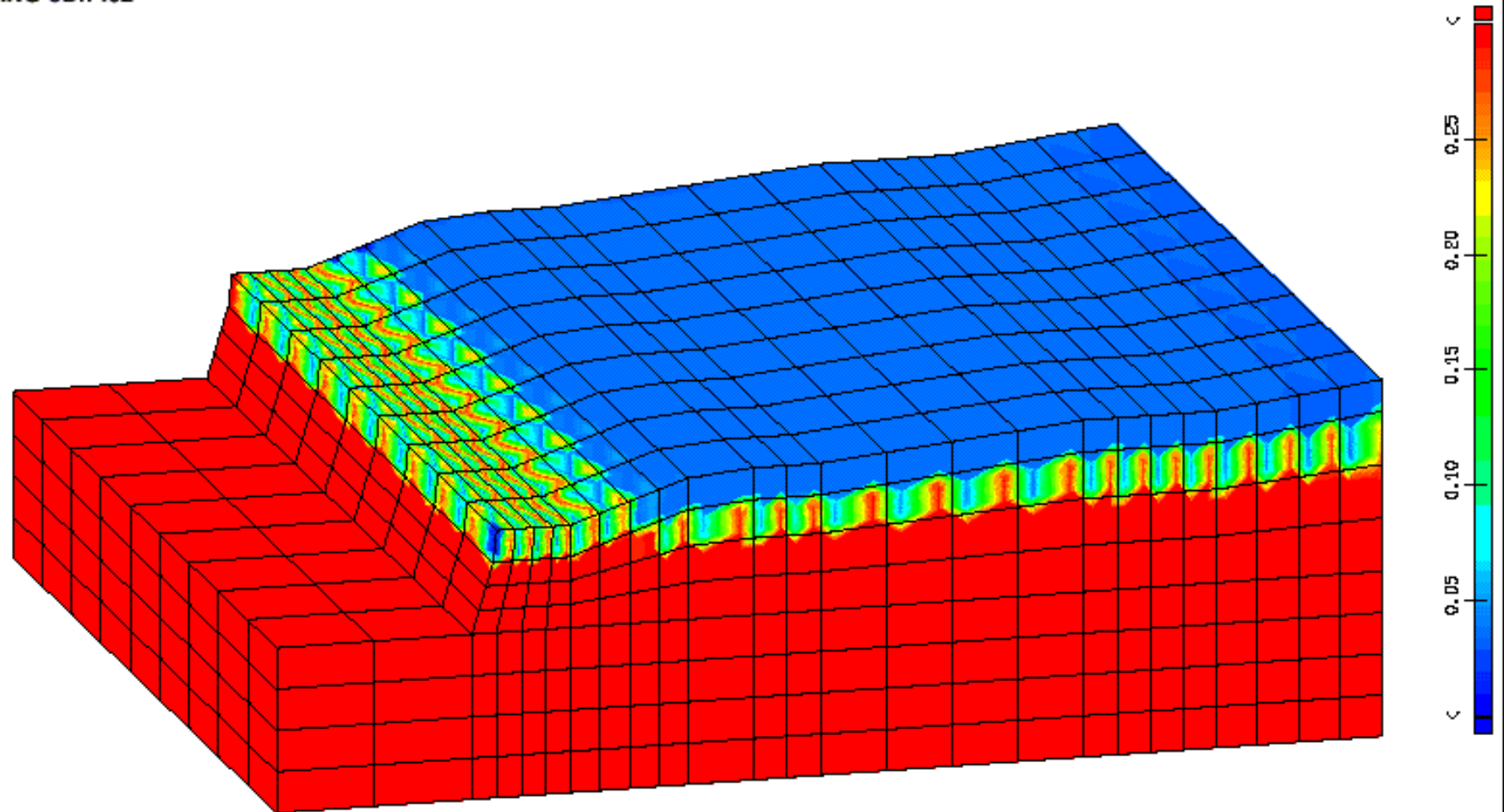


**WASSERGESCHWINDIGKEIT (cm/s)**  
Stationäre Analyse

Z  
Y  
X  
R.A. Dietrich

HANG-3D:P.02

IBSNM / 16.07.03



**FEUCHTIGKEITSGEHALT (-)**  
Stationäre Analyse

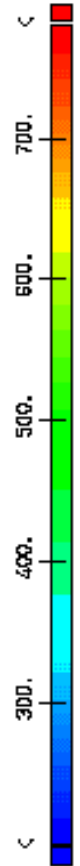
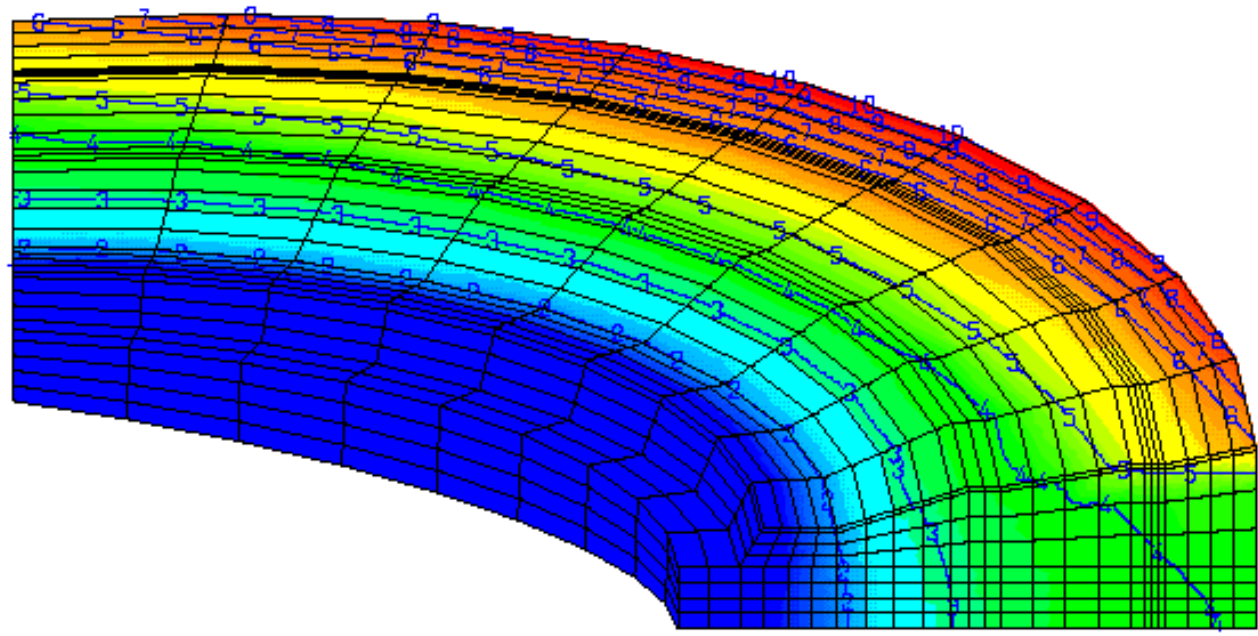
Z  
Y  
X  
R.A. Dietrich



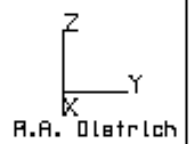
- Faktor:  $10^2$
- 1 = 2.0000
  - 2 = 3.0000
  - 3 = 4.0000
  - 4 = 5.0000
  - 5 = 6.0000
  - 6 = 7.0000
  - 7 = 7.2000
  - 8 = 7.4000
  - 9 = 7.6000
  - 10 = 7.8000

HANG-3D:P.01

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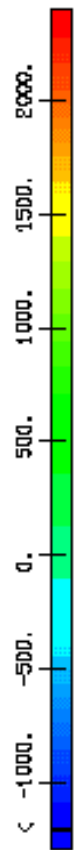
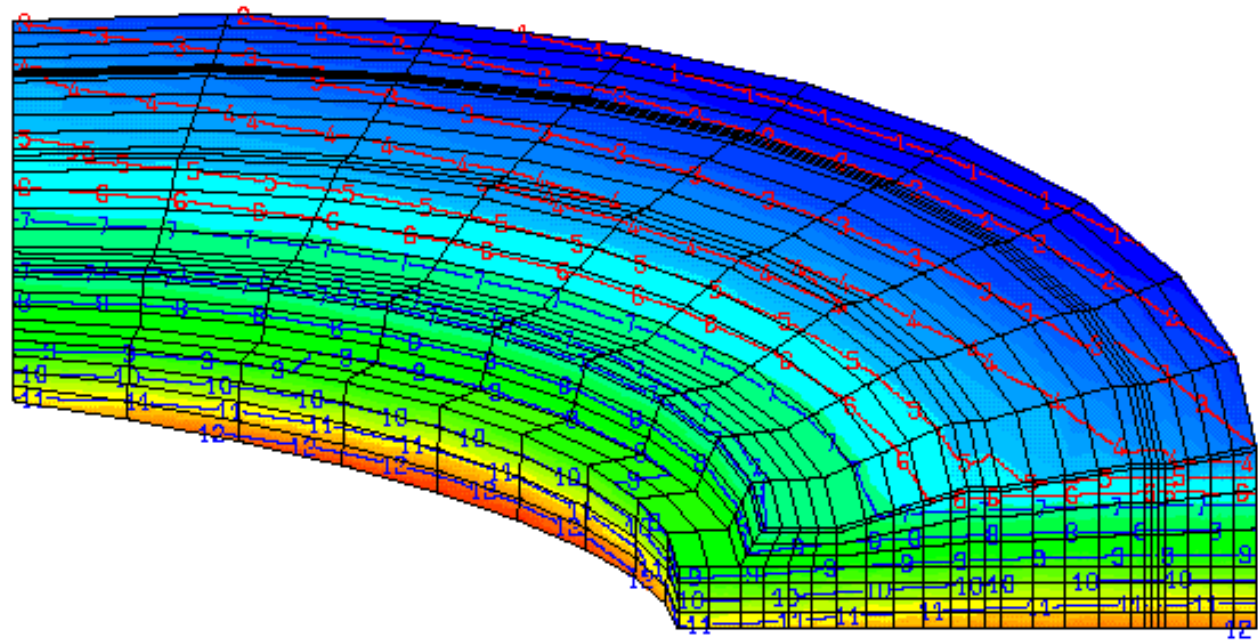
**TOTALE DRUCKHÖHE (cm)**  
Stationäre Analyse



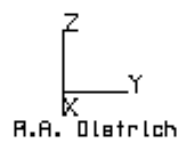
- Faktor:  $10^3$
- 1 = -1.2000
  - 2 = -1.0000
  - 3 = -0.8000
  - 4 = -0.6000
  - 5 = -0.4000
  - 6 = -0.2000
  - 7 = 0.0000
  - 8 = 0.4000
  - 9 = 0.8000
  - 10 = 1.2000
  - 11 = 1.6000
  - 12 = 2.0000
  - 13 = 2.4000

HANG-3D:P.01

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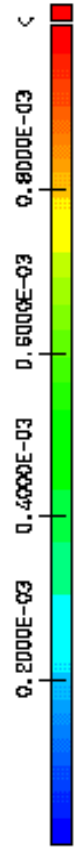
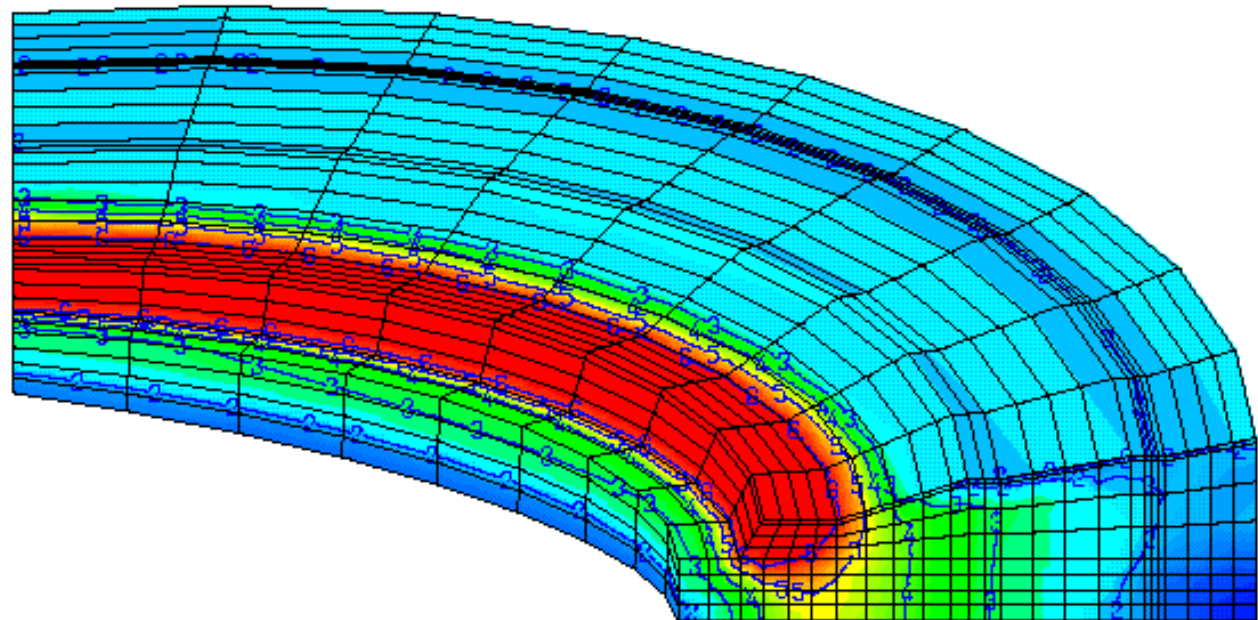
**FLUID-DRUCKHÖHE (cm)**  
Stationäre Analyse



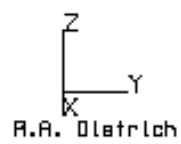
Faktor:  $10^{-4}$   
1 = 0.0000  
2 = 2.0000  
3 = 4.0000  
4 = 6.0000  
5 = 8.0000  
6 = 10.0000

HANG-3D:P.01

IBSNM / 14.07.03

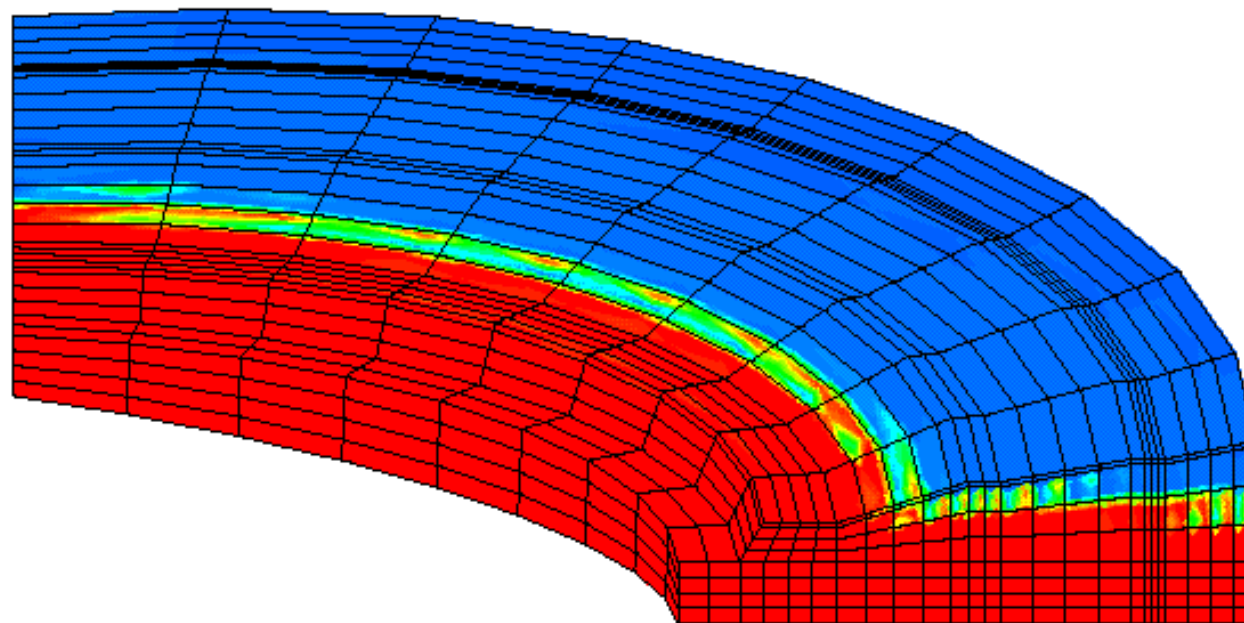


**WASSERGESCHWINDIGKEIT (cm/s)**  
Stationäre Analyse



HANG-3D:P.01

IBSNM / 14.07.03



**FEUCHTIGKEITSGEHALT (-)**  
Stationäre Analyse

Z  
Y  
K  
R.A. Dietrich