Hydrosystemanalyse
SoSe 2015

BHYWI-22-01
Einführung

Vorstellung
Introduction
Olaf Kolditz

Studium Ukraine (Physik)
Promotion AdW Chemnitz (Hydromechanik)
Habil U Hannover (Geohydrologie)
Auslandsaufenthalte (USA, CA, JP)
Prof. U Tübingen (Hydroinformatik)

Prof. TU Dresden (Systemanalyse)
Department Umweltinformatik UFZ Leipzig

Organisatorisches

Organisatorisches

- Vorlesungskonzept
  - Vorlesung Skript Übung / Lecture Notes Exercises
  - externe Dozenten aus Forschung / Praxis (6. DS)
- Zeitplan / Time schedule (show PDF)
  - Konsulationen (4. DS)
- Sprache / Language
- Lecture-Portal (HiWi)
- Literatur / Literature
- Prüfung / Exam
- Rechner / Computer
- Compiler

Organisatorisches

Lehre Sommersemester 2014
Hydroinformatik I
Hydrosystemanalyse

		April	Mai	Juni	Juli	August
						Klausur
			02.05.2014	06.06.2014	04.07.2014	
2. DS	09:20-10:50		Brückentag	Kolditz	Kolditz	HÜL/S186/H
3. DS	11:10-12:40			Delfs	VISLAB	HSZ/401/H
4. DS	13:00-14:30			Delfs	Bilke, Rink	HSZ/401/H
5. DS	14:50-16:20			Delfs	Fischer	HSZ/401/H
		11.04.2014	09.05.2014	13.06.2014	11.07.2014	
2. DS	09:20-10:50	Kolditz	Kolditz	Kolditz	Kolditz	HÜL/S186/H
3. DS	11:10-12:40	Kolditz	Kolditz	Kolditz	Geothermie	HSZ/401/H
4. DS	13:00-14:30	Kolditz	Sachse	Shao/	Shao	HSZ/401/H
5. DS	14:50-16:20		Sachse	Zolfaghari	Görke	HSZ/401/H
		18.04.2014	16.05.2014	20.06.2014	19.07.2014	
2. DS	09:20-10:50	Ostern	Kolditz	Kolditz	Kolditz	HÜL/S186/H
3. DS	11:10-12:40		Kolditz	Kolditz	Kolditz	HSZ/401/H
4. DS	13:00-14:30		Sachse	Kalbacher		HSZ/401/H
5. DS	14:50-16:20		Sachse	Kalbacher		HSZ/401/H
		25.04.2014	23.05.2014	27.06.2014		
2. DS	09:20-10:50	Kolditz	Kolditz	Kolditz		HÜL/S186/H
3. DS	11:10-12:40	Kolditz	Delfs	Kolditz		HSZ/401/H
4. DS	13:00-14:30	Sachse	Delfs	Kalbacher		HSZ/401/H
5. DS	14:50-16:20	Sachse	Delfs	Kalbacher		HSZ/401/H
			30.05.2014			
			Brückentag			

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Dozenten

- Agnes Sachse, Dipl.-Geogr.: Hydrologie
- Dr. Thomas Kalbacher: Bodenhydrologie
- Dr. Jens-Olaf Delfs: Oberflächenhydrologie
- JProf. Dr. Haibing Shao / Reza Zolfaghari: Stofftransport im Grundwasser

UFZ Exkursionen

- ENVINF-VISLab Team (Drs. Karsten Rink, Tom Fischer, Lars Bilke)
- Geothermie (JProf. Dr. Haibing Shao, Dr. Norihiro Watanabe)

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Lecture Portal
http://www.ufz.de/index.php?de=17984

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Lecture Portal

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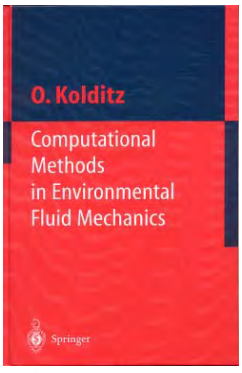
Literature



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Was ist Hydroinformatik ?
What is Hydroinformatics about ?

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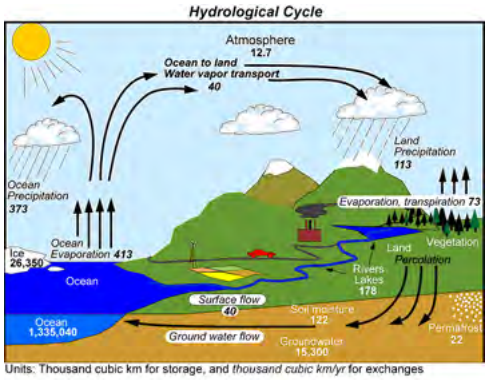
Def: Informationsverarbeitung in der Hydrologie



http://www.eea.europa.eu/themes/water

Humid
and
Arid
(Semi-arid)

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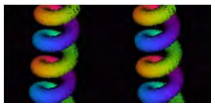
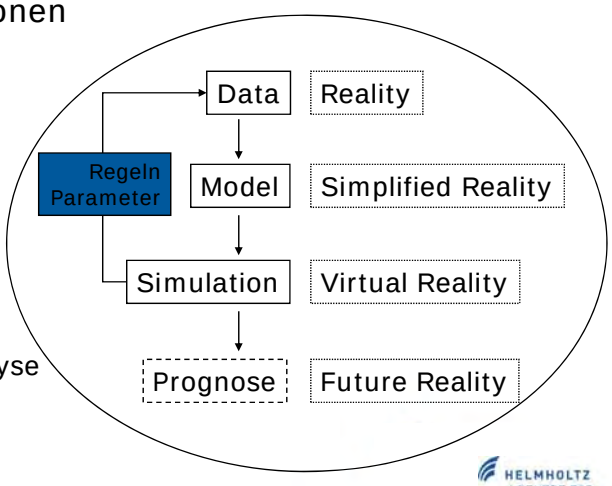
Contents

- **System-Analyse (Geo-Systeme)**
- Methoden I (Konzept-Modelle)
- Methoden II (Informatik–SoftwareEngineering)
- Applikationen
- Lehre

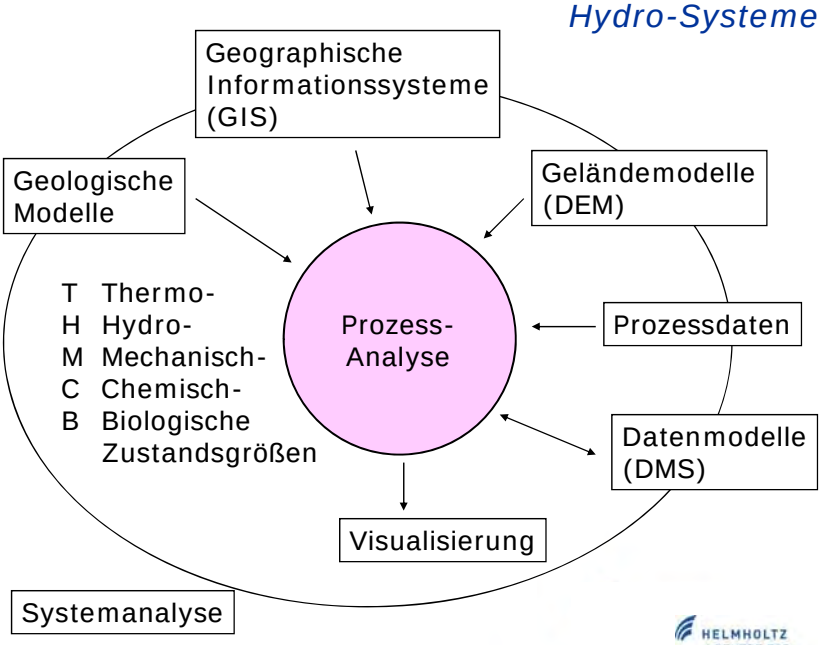


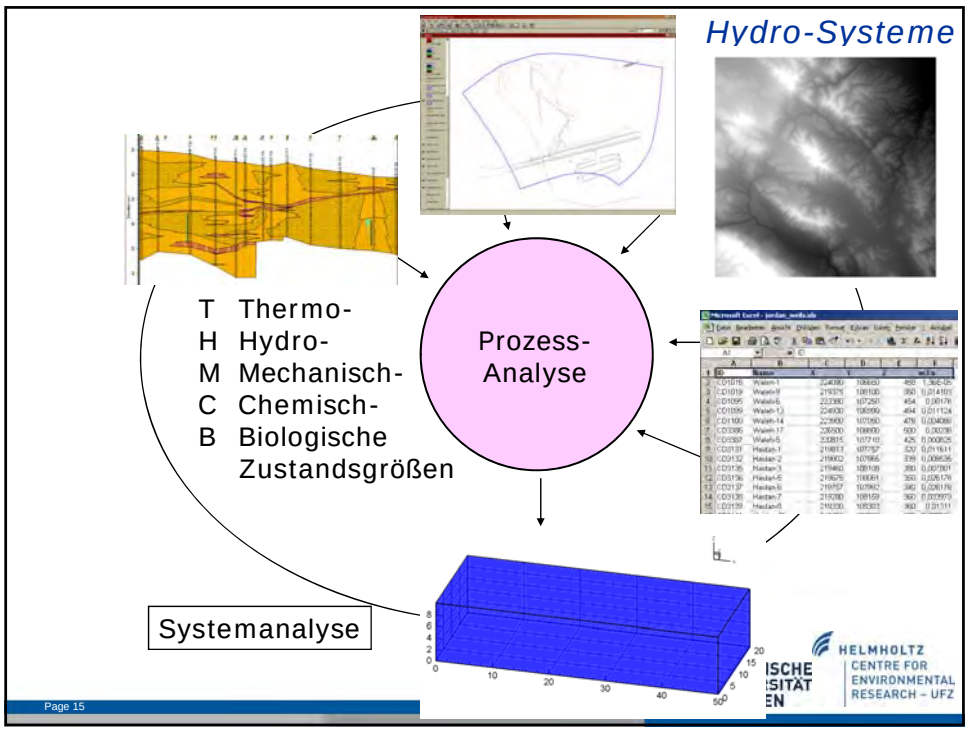
www.inf.uni-konstanz.de



System-Analyse
Kalibrierung
Verfizierung
Validierung

Hydro-Systeme




Hydro-Systeme
T Thermo-
H Hydro-
M Mechanisch-
C Chemisch-
B Biologische
Zustandsgrößen
Prozess-
Analyse
Systemanalyse
HELMHOLTZ
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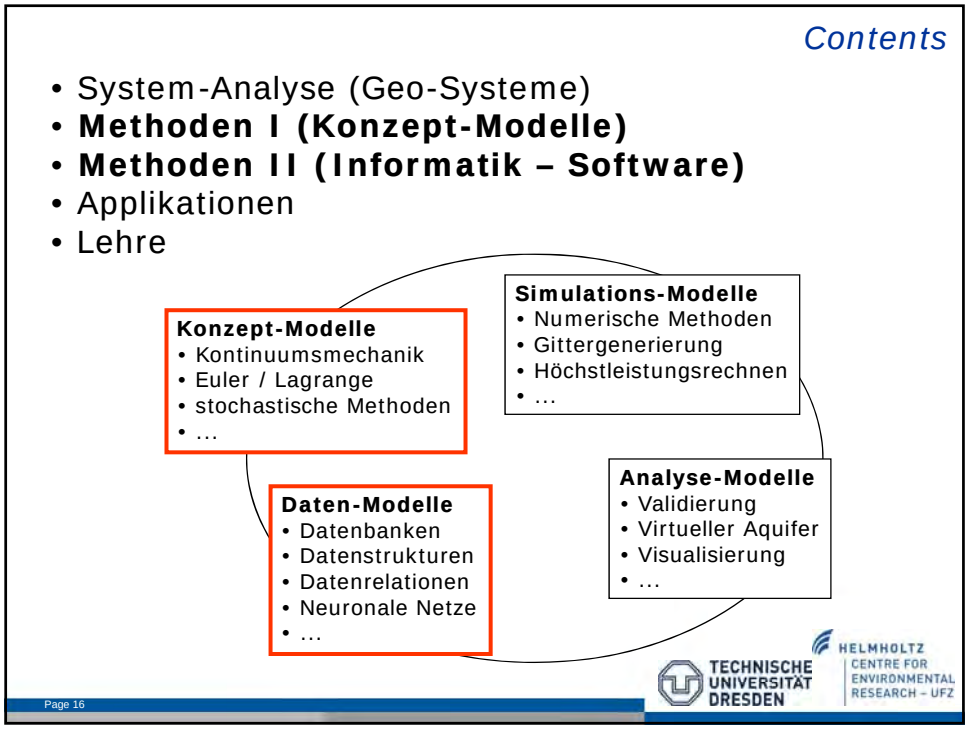
ENVIRONMENTAL
RESEARCH – UFZ
Page 15


Contents
• System-Analyse (Geo-Systeme)
• Methoden I (Konzept-Modelle)
• Methoden II (Informatik – Software)
• Applikationen
• Lehre
Konzept-Modelle
• Kontinuumsmechanik
• Euler / Lagrange
• stochastische Methoden
• …
Simulations-Modelle
• Numerische Methoden
• Gittergenerierung
• Höchstleistungsrechnen
• …
Daten-Modelle
• Datenbanken
• Datenstrukturen
• Datenrelationen
• Neuronale Netze
• …
Analyse-Modelle
• Validierung
• Virtueller Aquifer
• Visualisierung
• …
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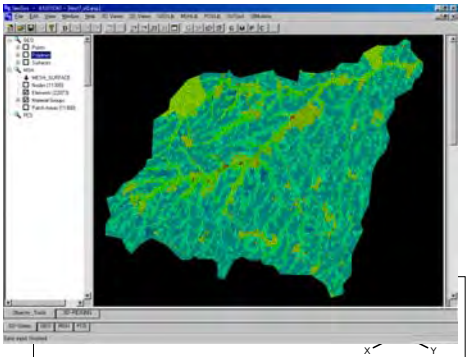
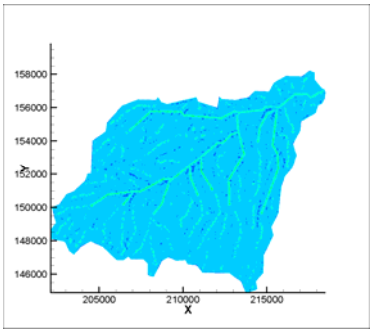
Page 16

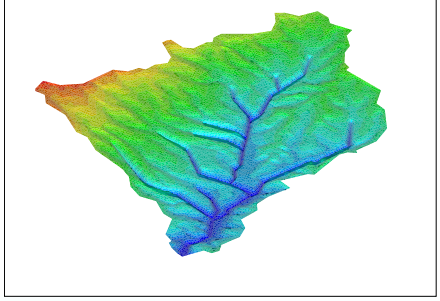
Meuse River Basin

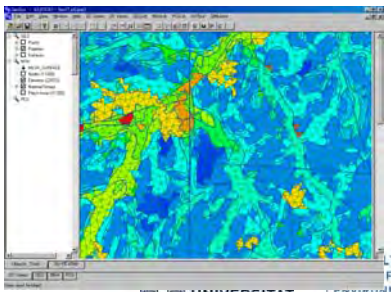
Beerze-Reusel catchment
Geer catchment

Hydrology Geer Basin

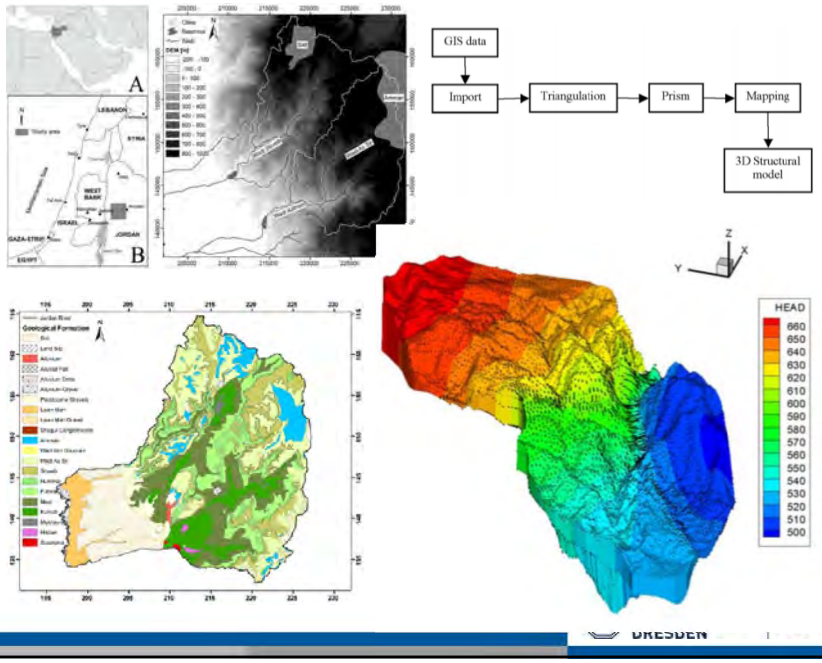


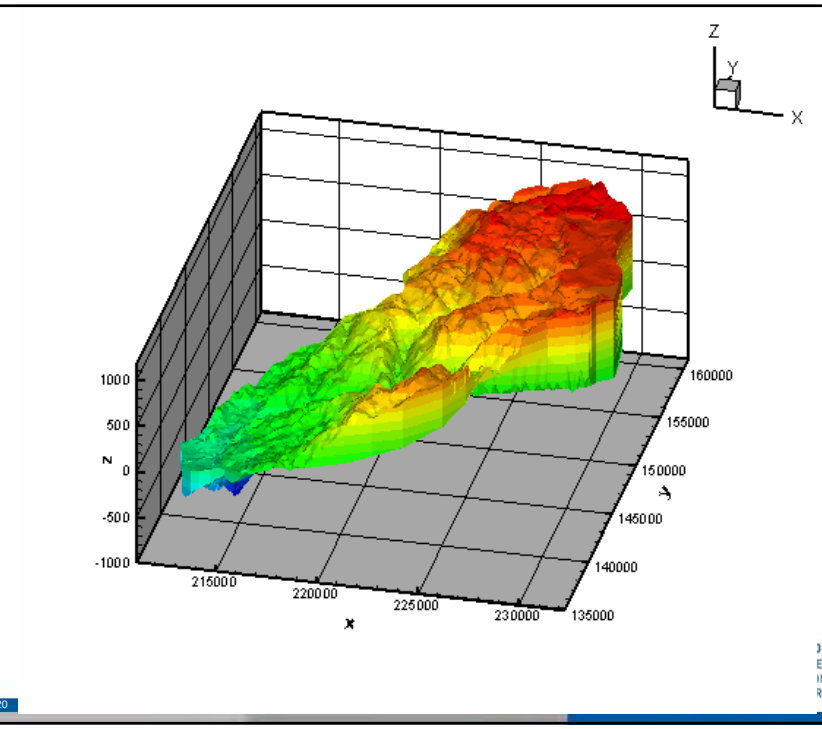


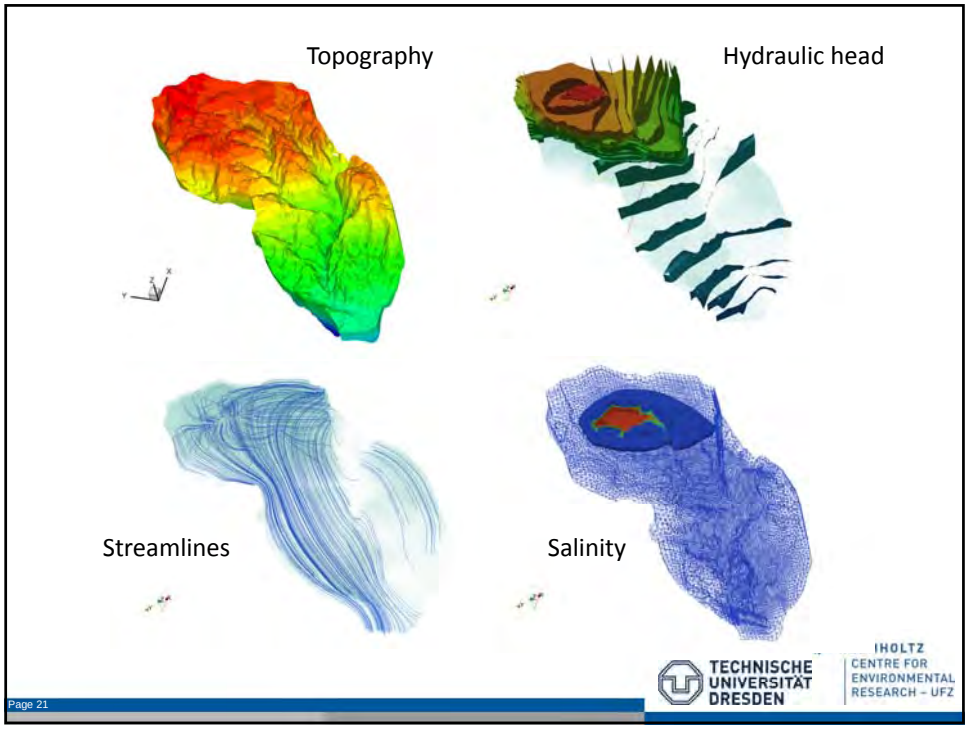




Beispiel: Groundwater Modeling






Topography
Hydraulic head
Streamlines
Salinity
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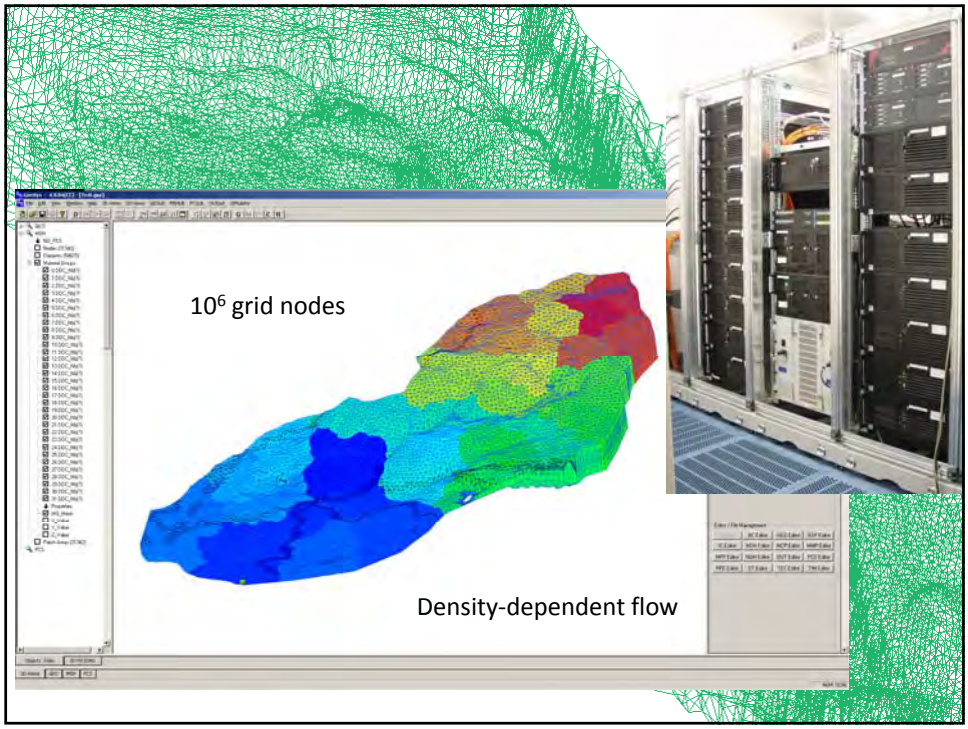
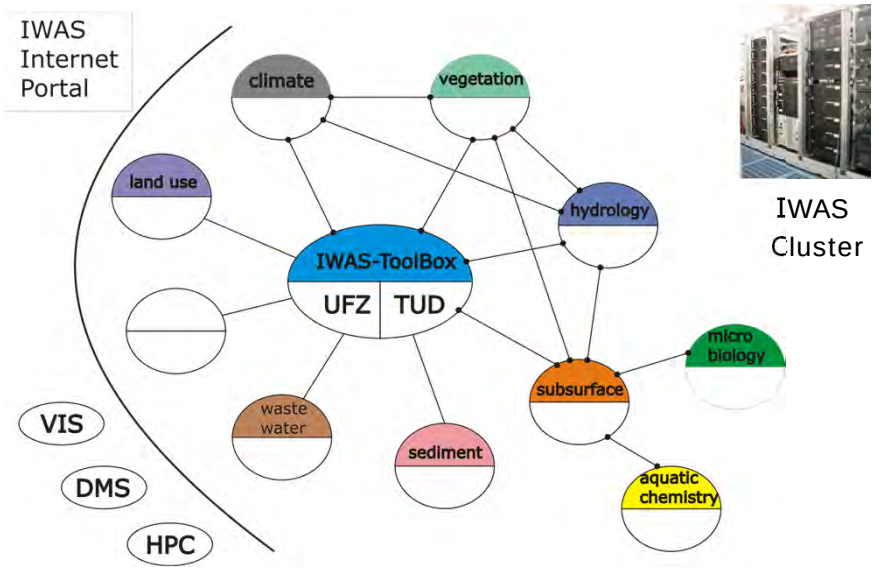
Page 21


10^6 grid nodes
Density-dependent flow

Methoden- und ToolBox



IWAS
Cluster

Page 23

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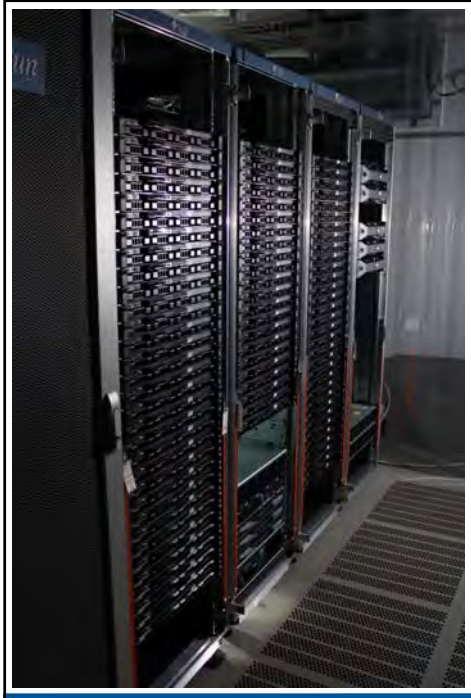

UFZ Cluster EVE

Medium Scale HPC
Vorbereitung von JUGENE Applikationen

Number of Cores: 1032
Processor: Intel XEON X5650, 2.6 GHz
Main Memory: 5.5 TB
Interconnect: QDR Infiniband (40 GB)
Operating System: Linux
Installation Year: 2011

WKDV Arbeitsgruppe Wissenschaftliches Rechnen und DMS

Schnicke et al.,
personal communication

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IWAS – International Water Research Alliance Saxony

Management of water resources in hydrologically sensitive regions

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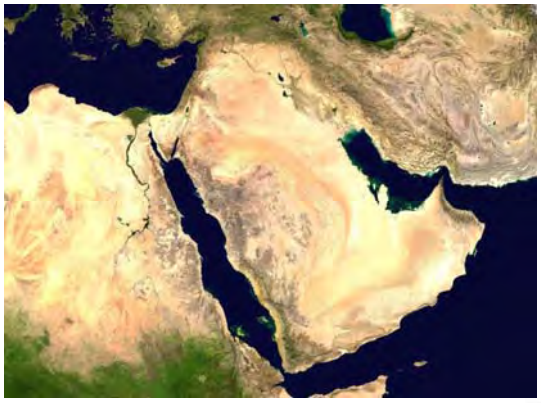
gtz

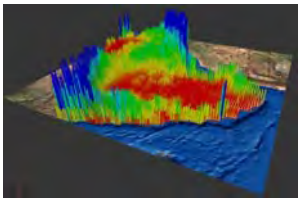


Middle East (Saudi Arabia, Oman)

funded by

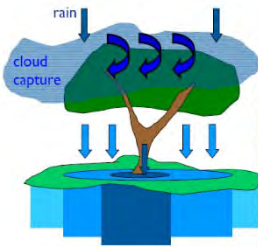
Federal Ministry of Education and Research

Water resources assessment in Arabian Peninsula



Jan Friesen

Climatic boundaries

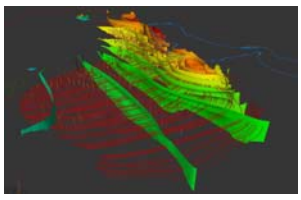


Anke Hildebrandt

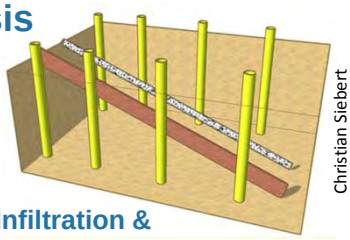
Vegetation

Integrated hydrological synthesis

Groundwater



T Kalbacher / E Kalbus
Rudolf Liedl / Marc Walter



Christian Siebert

Infiltration & recharge

Observation - Modeling - Analysis – Management

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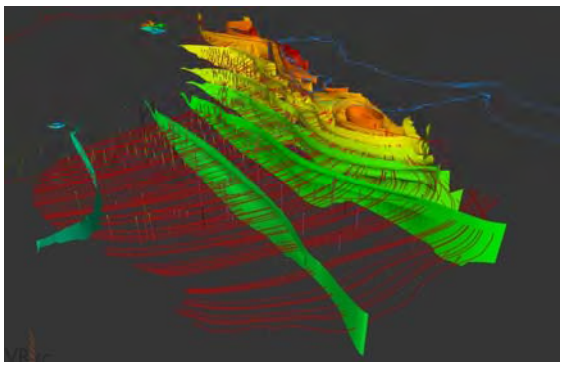

Data integration – System analysis - Visualization
New generation of Management Tools

OpenGeoSys *Scientific Software made by Helmholtz*

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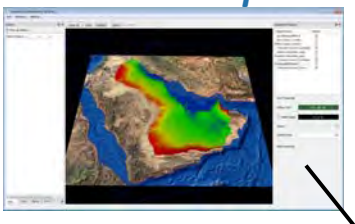
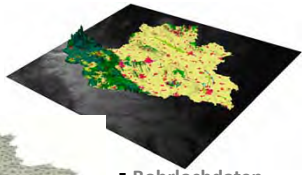
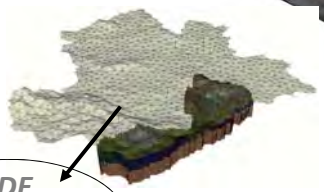
OGS – *Philosophie*

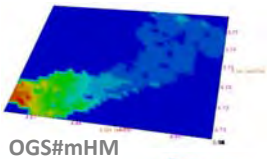




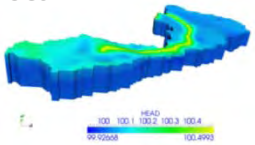


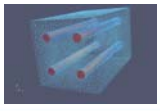
- Bohrlochdaten
- Zeitreihen
- DEM
- Landnutzung
- Strukturgeologie
- : 1/2/3/4 D
- : interaktiv

DE
OpenGeoSys
FEM

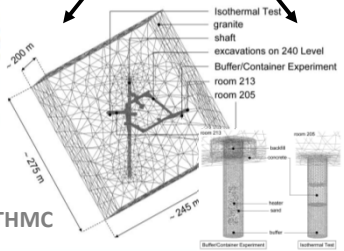


OGS#mHM

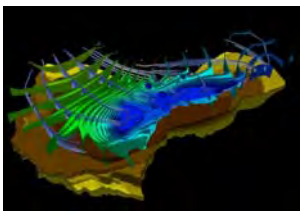




OGS-THMC



OGS-3D / OGS -> OpenSG



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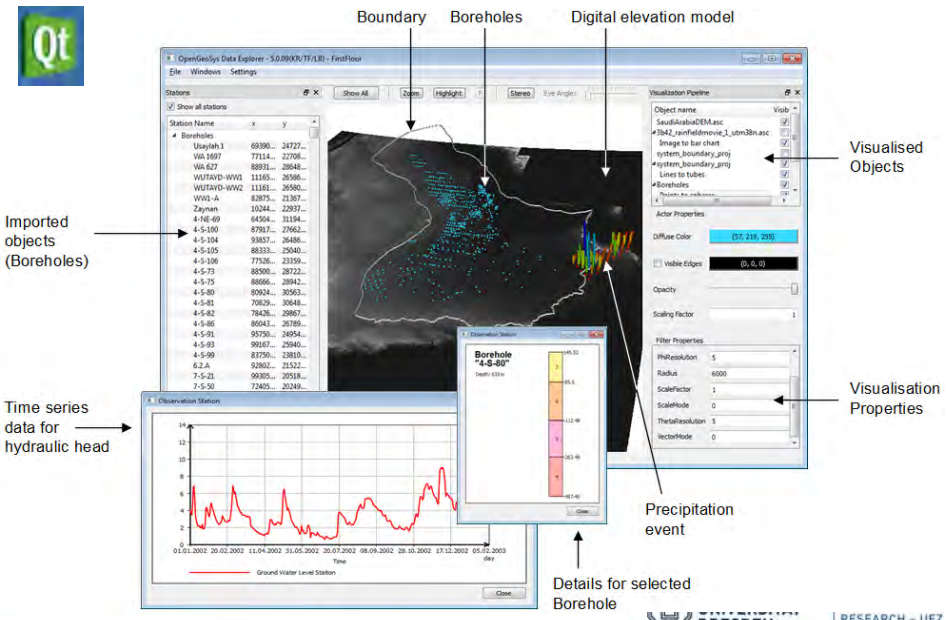
OGS – *Visibility*

Deutsch-Japanisches Wissenschafts- und Innovationsforum 2010

日独 科学・イノベーション フォーラム2010

DRESDEN

OpenGeoSys — *Data Integration: Which*



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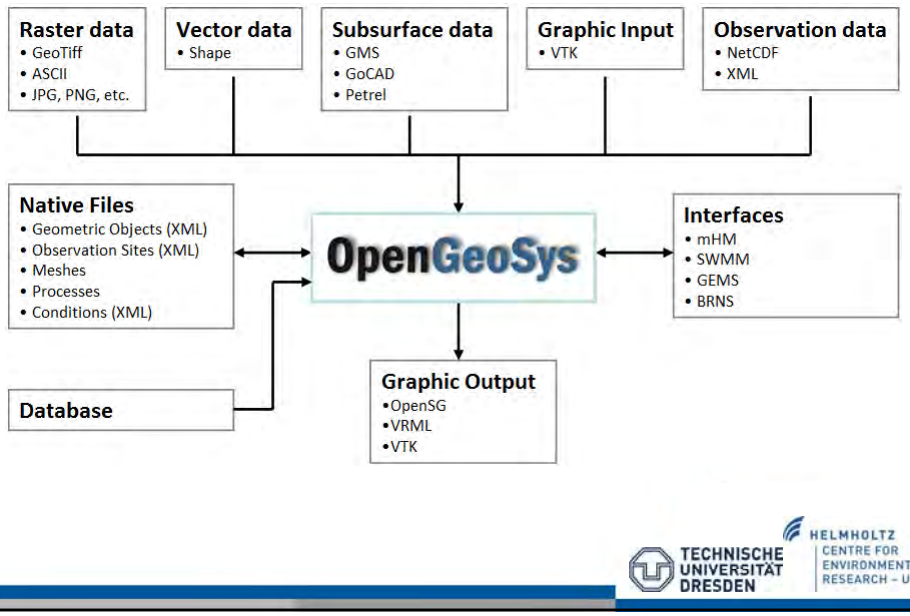
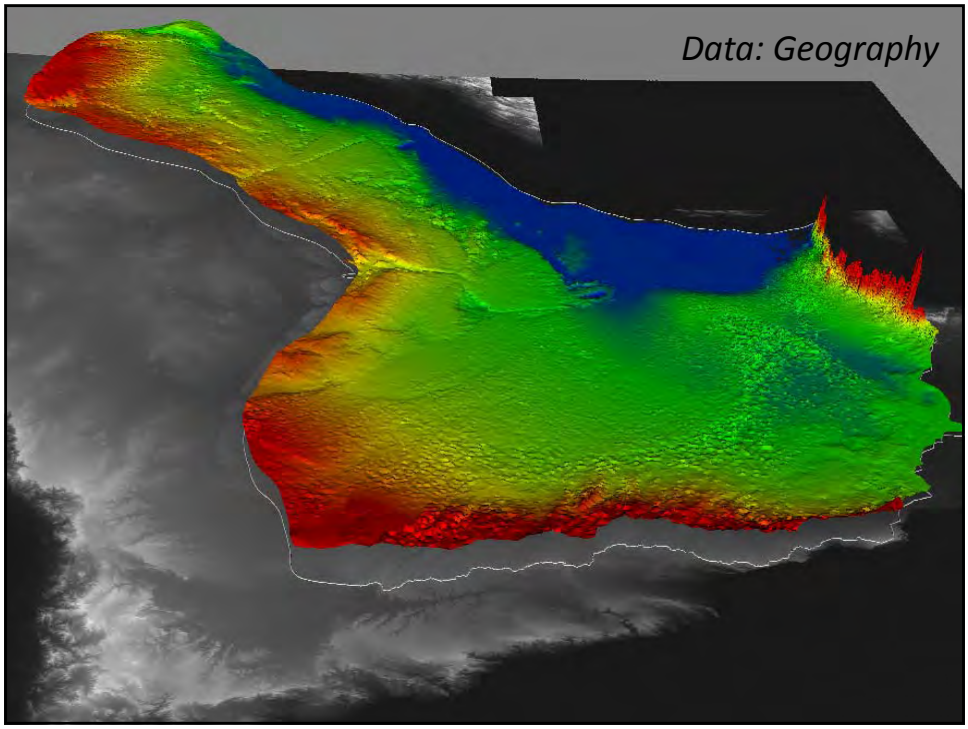
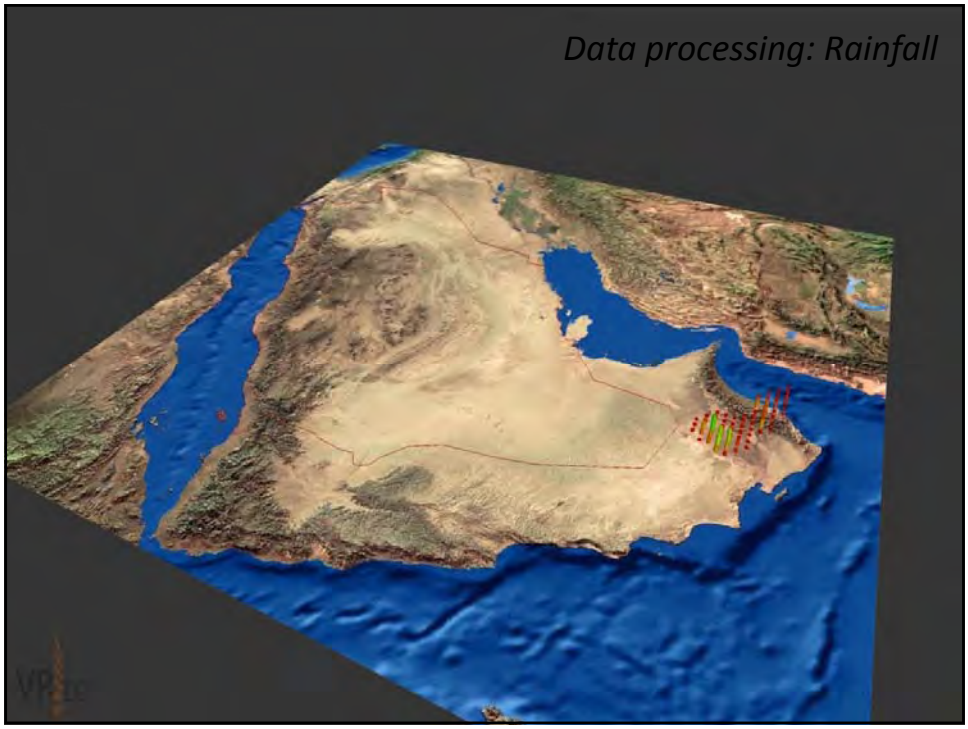
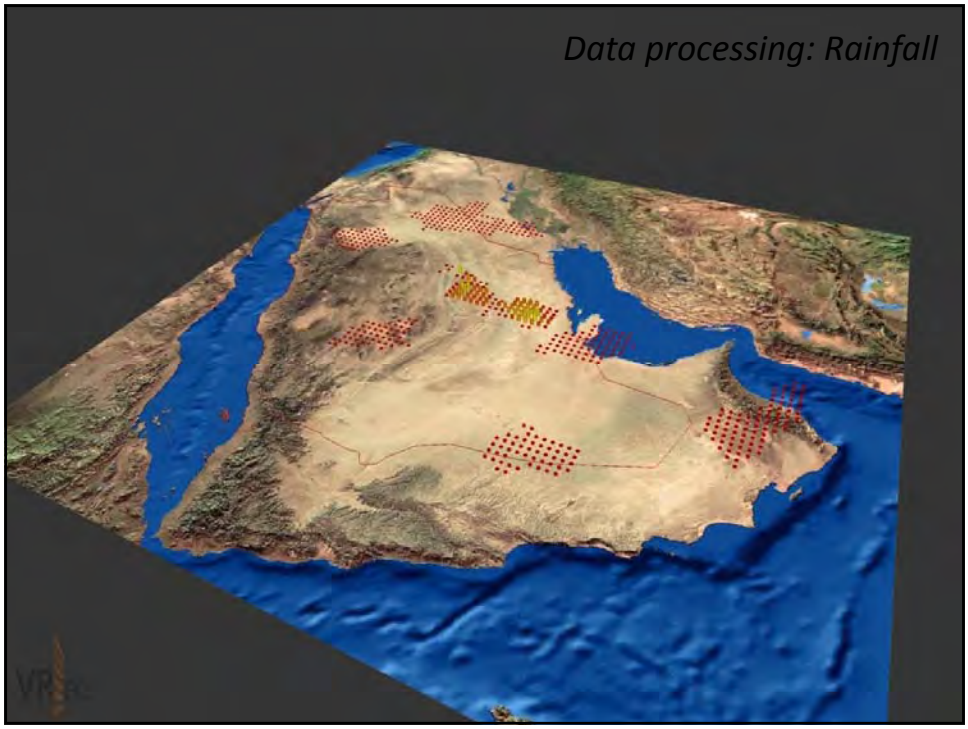
Data Integration: How to

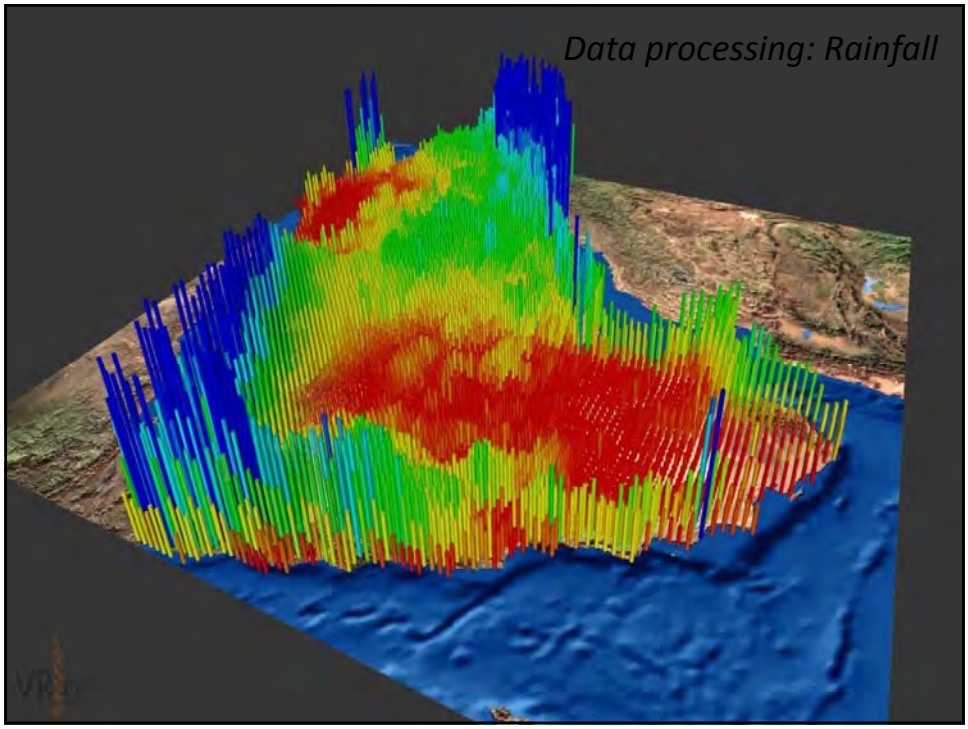


Data: Geography

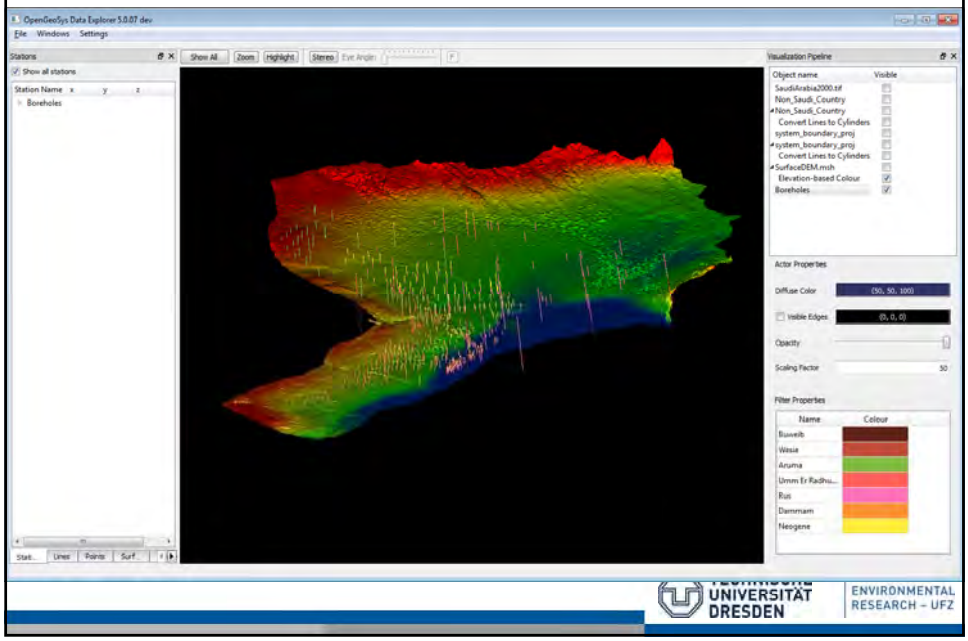



Data processing: Rainfall

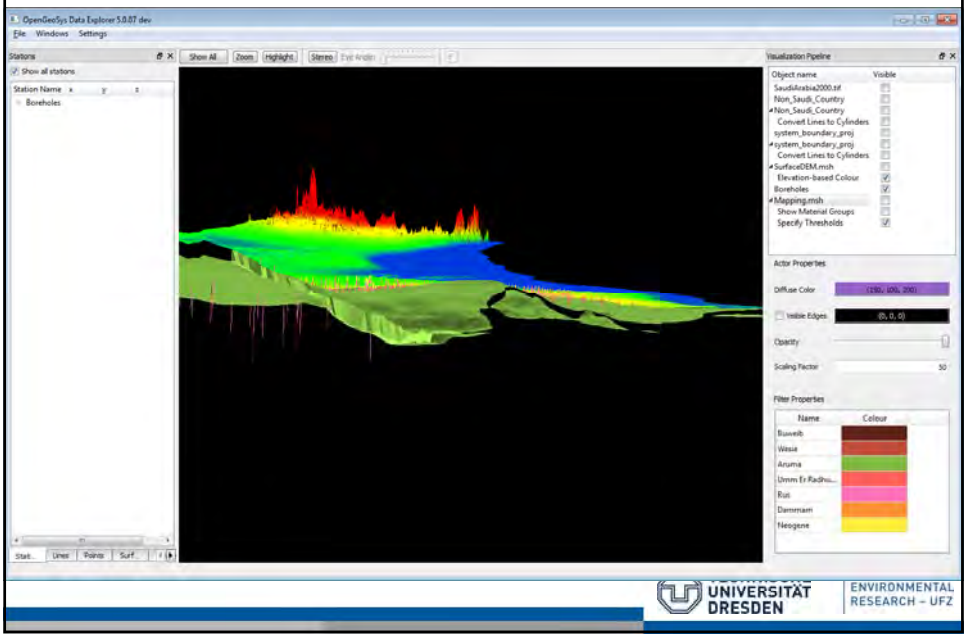

Data processing: Rainfall



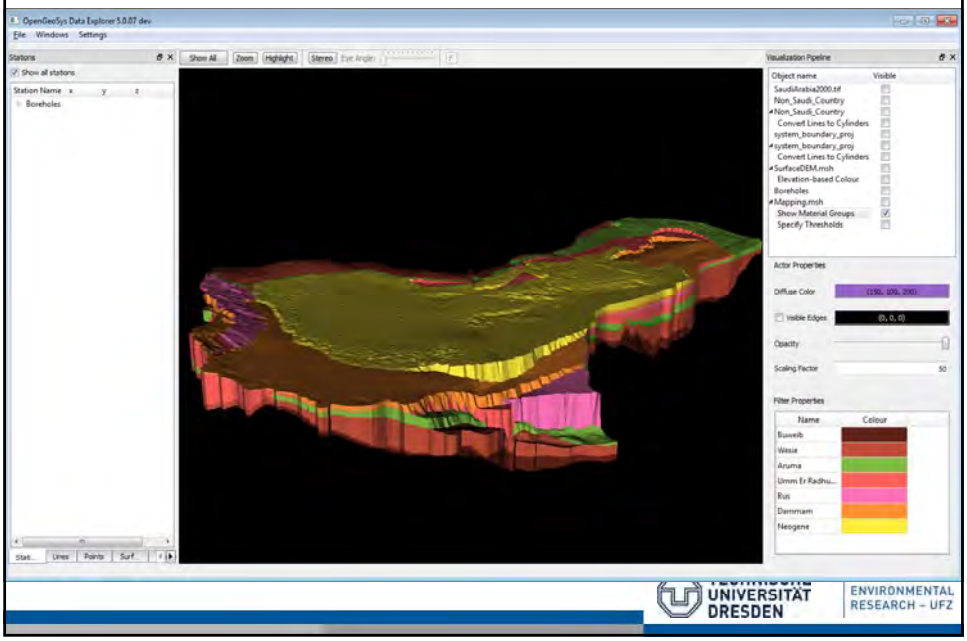
Data processing: Borehole data

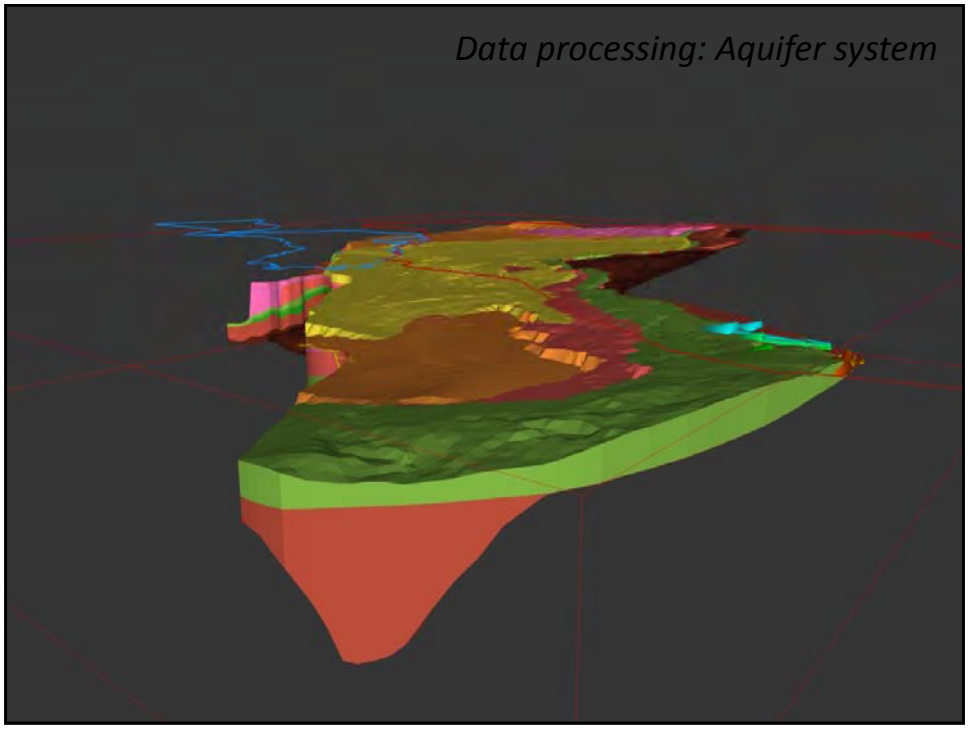


Data processing: Aquifer modeling

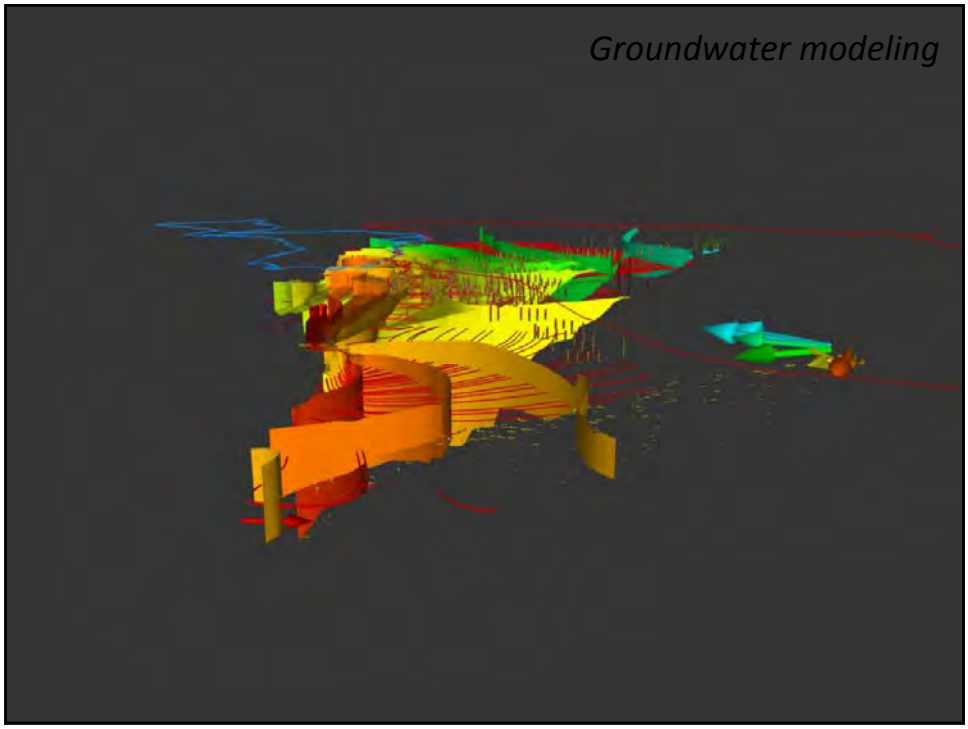


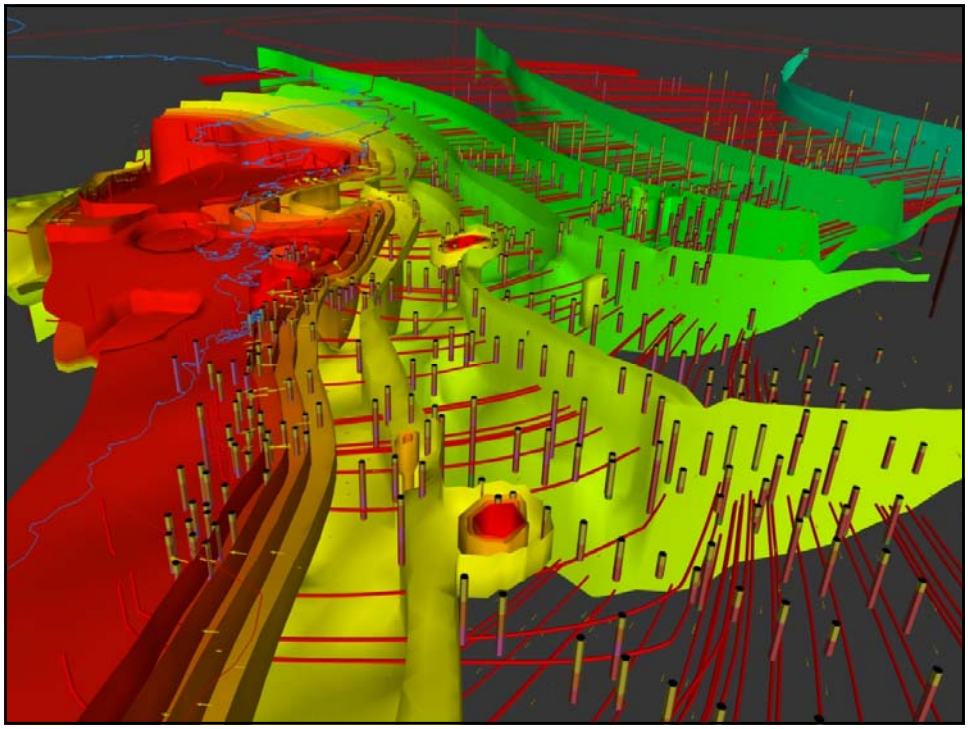
Data processing: Aquifer system

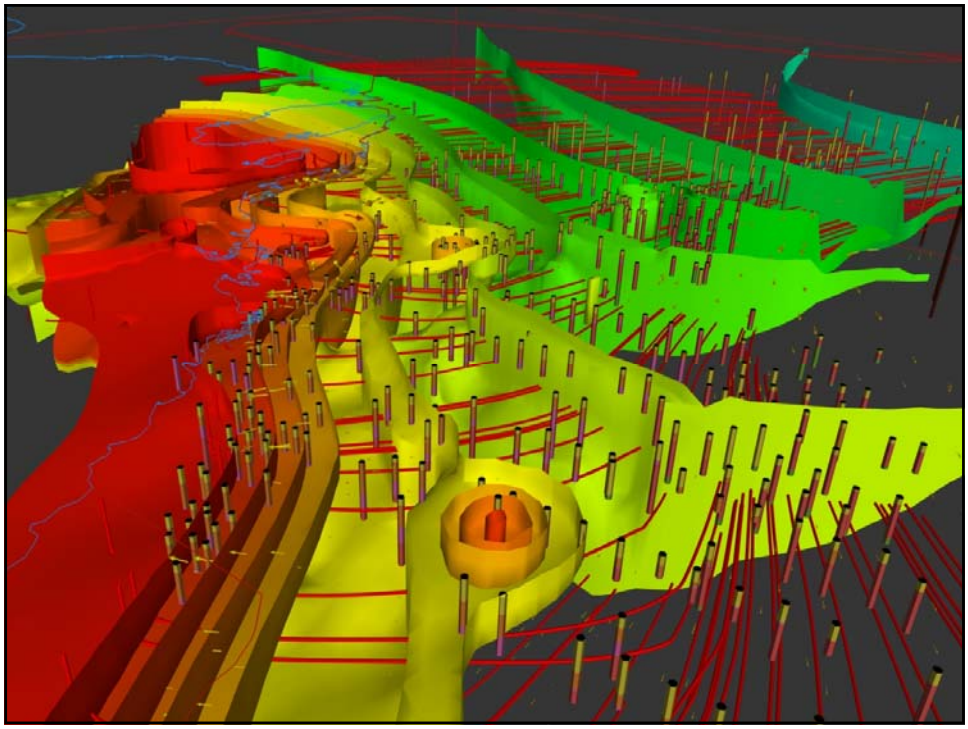


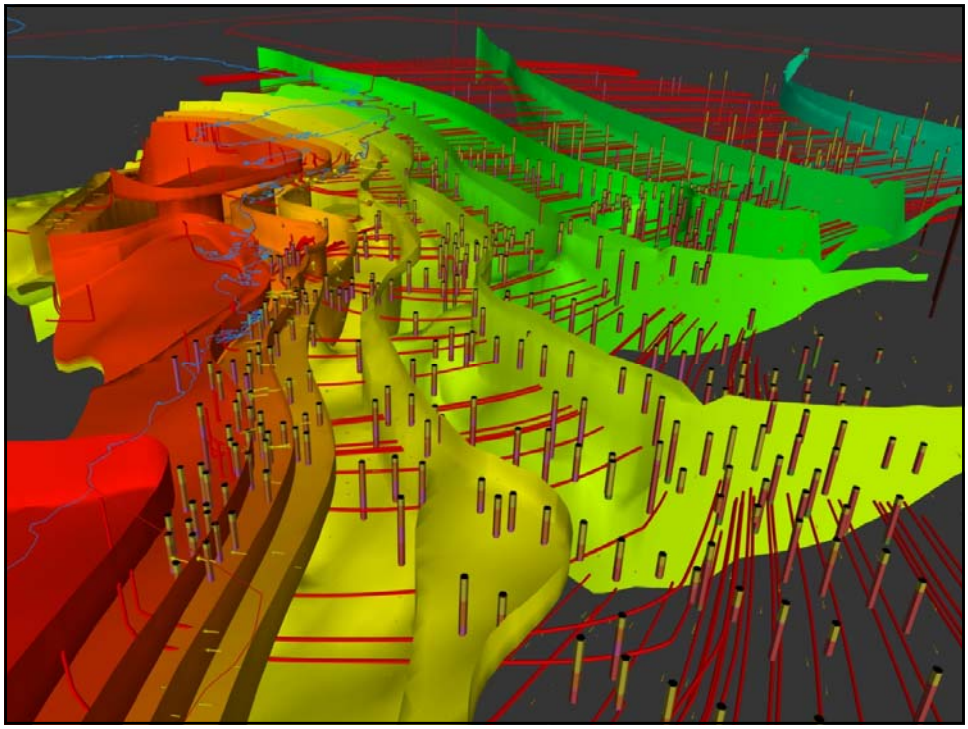


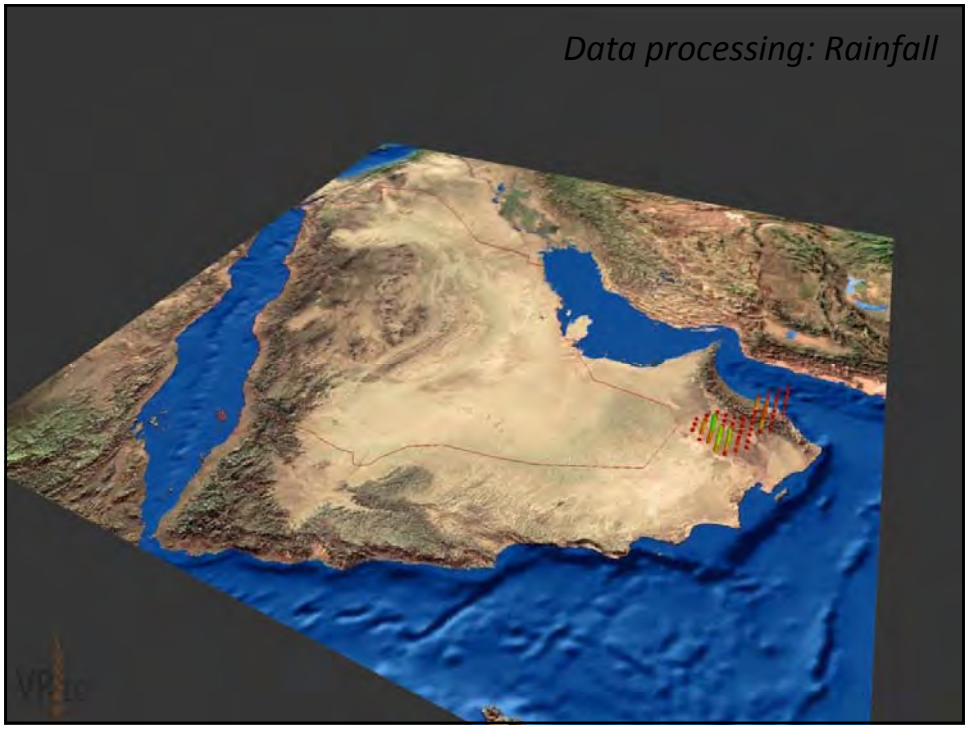
$$Ax = b$$


Groundwater modeling









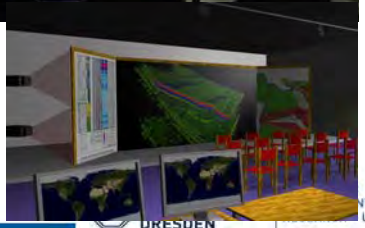
VISLab

Hydrosystemanalyse Exkursion ins UFZ VISLab

TECHNISCHE UNIVERSITÄT DRESDEN

HELMHOLTZ CENTRE FOR ENVIRONMENTAL RESEARCH – UFZ

VISLab: Projects



Aus: Zehner, 2009 / 2010

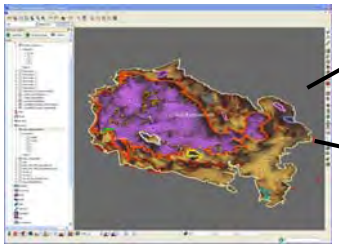
Probleme:

- Datenlage
- Komplexität
- Validierung

Zehner, 2005

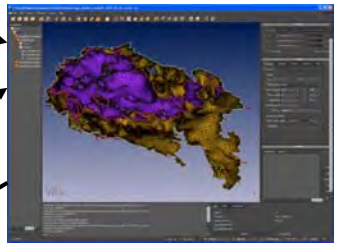
DRESDEN

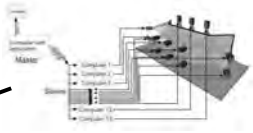
Data processing: Rainfall



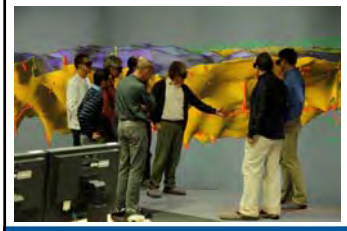
PLine, TSurf VSet
-> OpenSG file

SGrid, (Voxet,
Solid)-> VTK-file

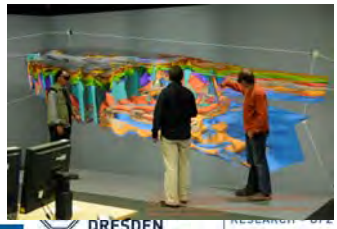




Thüringer Becken



Schleswig Holstein



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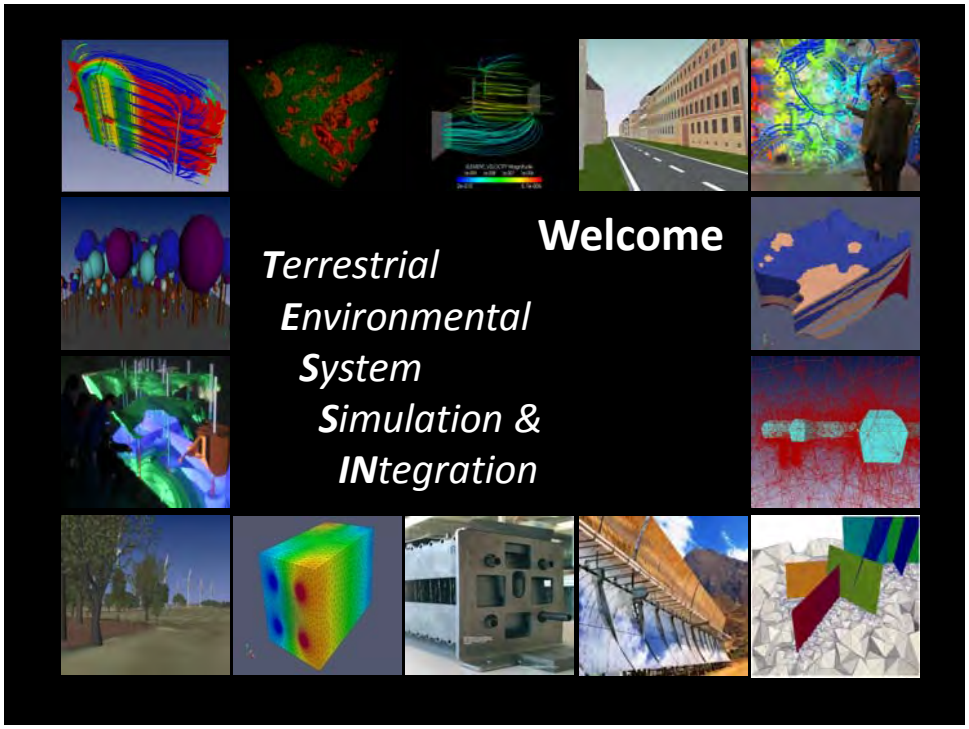
Welcome
Terrestrial
Environmental
System
Simulation &
INtegration