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Lectures Density dependent groundwater flow, IHE, Delft, 7-8-12-13 July 2021

Download: Powerpoint presentation sheets: pdf format

Download: Lecture Notes: Density Dependent Groundwater Flow

Download: Animations

Exercises

Vertical interface:

- **Download:** Vertical interface: pdf document
- **Download:** Vertical interface: word docx document
- **Download:** Vertical interface: PMWIN files

Freshwater lens:

- **Download:** Freshwater lens: pdf document
- **Download:** Freshwater lens: word docx document
- **Download:** Freshwater lens: PMWIN files

Henry's problem:

- **Download:** Henry's problem: pdf document
- **Download:** Henry's problem: word docx document
- **Download:** Henry's problem: PMWIN files

Elder's problem:

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- **Download:** Elder's problem: PMWIN files

Download: word documents Henry, Elder, Vertical Interface, Freshwater Lens

Additional material

Download: info on numerical dispersion and oscillation: Chapter 8, p. 119-132

Download: animation Elder

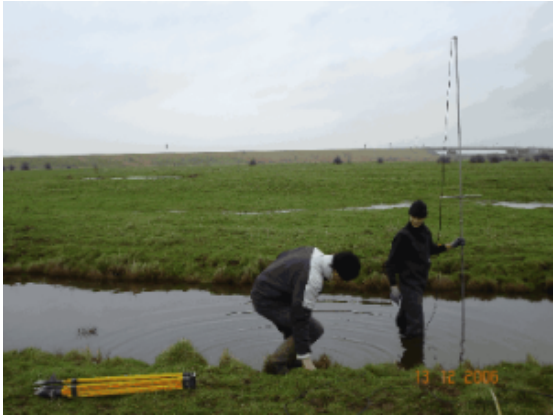
Download: Solution exercises lecture notes

Total Commander: link

Download: Some Total Commander Hotkeys

Movies

- Slim Water Management, case Rijnland
- Innovatie in Perkpolder, peilbuizen beschermen grondwater tegen verzilting
- The Challenges of Saline Groundwater
- Zoetwater zelfvoorzienendheid, Deltaproof
- GO-FRESH: Ondergrondse waterbergingsproeven Proeftuin Zuidwestelijke Delta
- Kansrijke oplossingen voor een robuuste zoetwatervoorziening (Uitleg GO-FRESH 3 proeven, 4m20s)
- Kreekrug Infiltratie Proef in bedrijf (2m39s)
- De effectiviteit van het doorspoelen van polders in Nederland
- De bronnen van verzilting, en de lange geschiedenis die eraan voorafgaat, case NL
- Nederland, een Landschap gevormd door Mens en Natuur



Course Hazards and risk assessment GEO4-4425, Utrecht University, 20 March 2020

Topic: Vulnerability of groundwater systems to flooding events

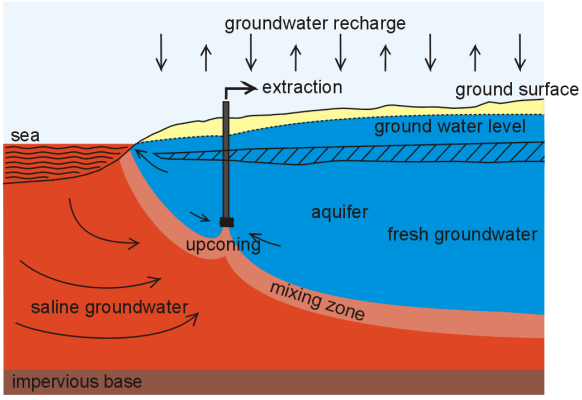
Download: Powerpoint presentation: pdf format
Download: Effect saline flooding event on groundwater: pdf document
Download: saltfresh_flooding: PMWIN files, Exercise 1
Download: saltfresh_flooding: PMWIN files, Exercise 5

Regional Workshop on Saltwater Intrusion Modeling & Implications of Sea Level Rise, July 23-24, 2014

Lecture Notes Density Dependent Groundwater Flow: Salt water intrusion in coastal aquifers

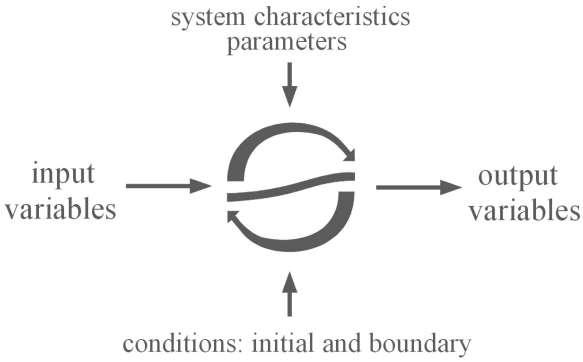
Auteur: Gualbert Oude Essink
Dictaat: Density Dependent Groundwater Flow

1 Introduction
2 Characteristics of a density dependen groundwater system
3 Freshwater head
4 The concept of a fresh-saline interface
5 Control of salt water intrusion
6 Numerical modelling
7 Salt water intrusion in the Netherlands
8 Heat transport in porous media: introduction



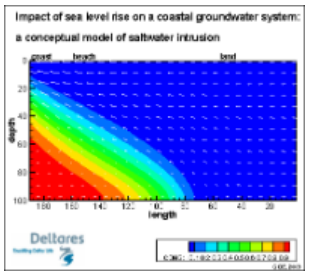
Lecture Notes Groundwater Modelling

Auteur: Gualbert Oude Essink
Dictaat: Groundwater Modelling
PART I Modelling Protocol
1 Introduction
2 Classication of mathematical models
3 Methodology of modelling
4 Data gathering
PART II Groundwater Modelling
5 Introduction
6 Mathematical description of hydrogeologic processes
7 Solution techniques
8 Numerical aspects of groundwater models
9 Some selected groundwater codes

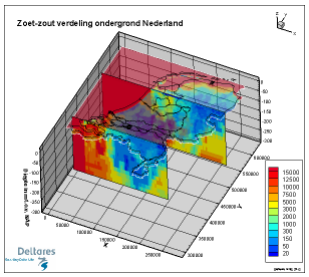


Animations: examples of salinisation processes

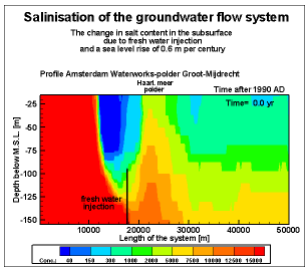
Henry's profile with sea level rise	**3D zoet-zout verdeling ondergrond NL**	**Fresh water injection to combat salinisation**	**3D zoet-zout verdeling ondergrond Texel**	**Region partly c**



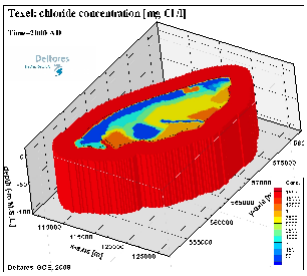
Henry's profile with sea level rise



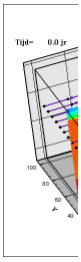
3D zoet-zout verdeling ondergrond NL



Fresh water injection to combat salinisation

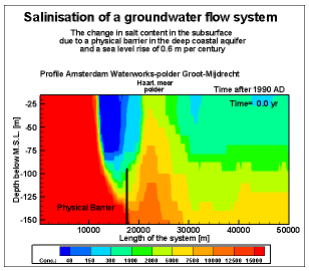


3D zoet-zout verdeling ondergrond Texel



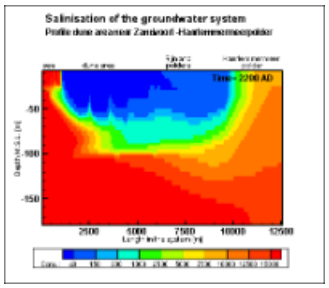
Regional captured

Physical barrier in the coastal zone



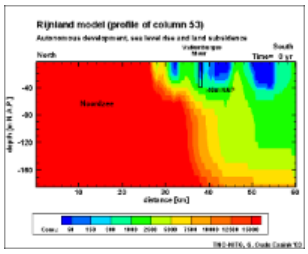
Physical barrier in the coastal zone

Dutch profile: extraction, upconing and low inland levels



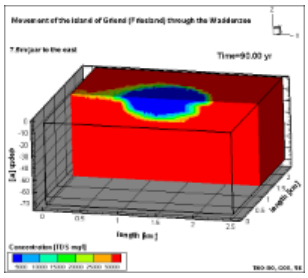
Dutch profile extraction, upconing and low inland levels

Profile over 3D model: effect sea level rise on salinisation



Profile over 3D model: effect sea level rise on salinisation

Movement of the island De Griend (NL): creation of a freshwater lens

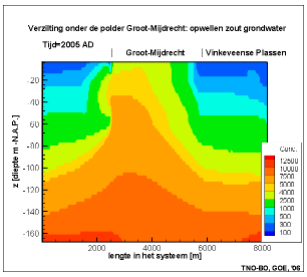


Movement of the island De Griend (NL): creation of a freshwater lens

Evo lens

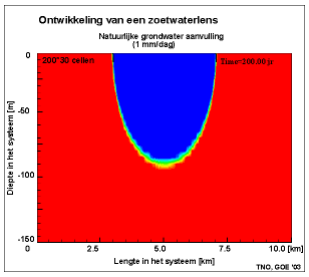
Evolu lens

Upconing saline groundwater under a low-lying area



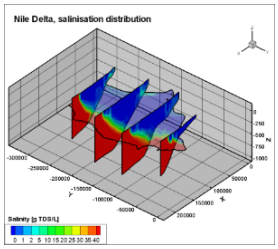
Upconing saline groundwater under a low-lying area

Ontwikkeling van een zoetwaterlens



Development lens

3D salinity groundwater distribution of the Nile Delta, Egypt



Nile delta

CRYSTECHSALIN

Download:
Proceedings Meeting 21-24 September 2002, Scanzano, Italy

Homage Prof. Custodio:

article: Salinisation of groundwater resources in the Dutch Deltaic Area: modelling, monitoring, Climate Change and Solutions