

Download

[Projects](#) [Publications](#) [Download](#) [Internships](#) [Knowledge Base](#) [Contact](#)

Lectures Density dependent groundwater flow, IHE, Delft, 8-9-10 April 2024

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:

- **Download:** [Elder's problem: pdf document](#)
- **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](#)

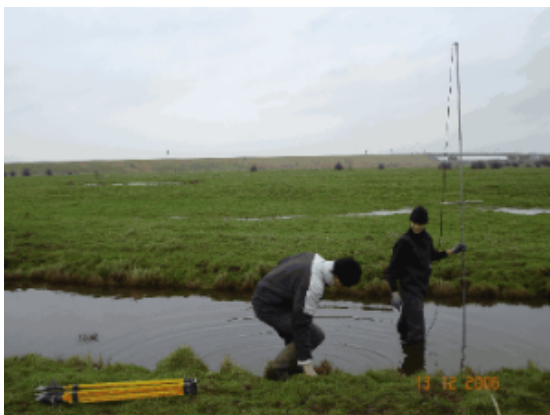
Download: [Solution exercises lecture notes](#)

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 \(Uitleg GO-FRESH 3 proeven, 4m20s\)](#)
- [Kreekkrug 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](#)



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](#)

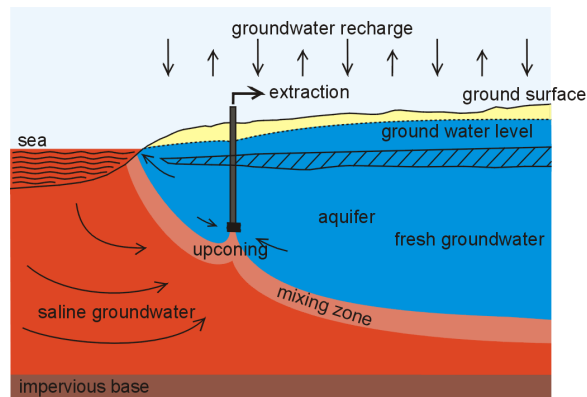
Regional Workshop on Saltwater Intrusion Modeling & Implications of Sea Level Rise, July 23-24, 2014

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 dependent 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

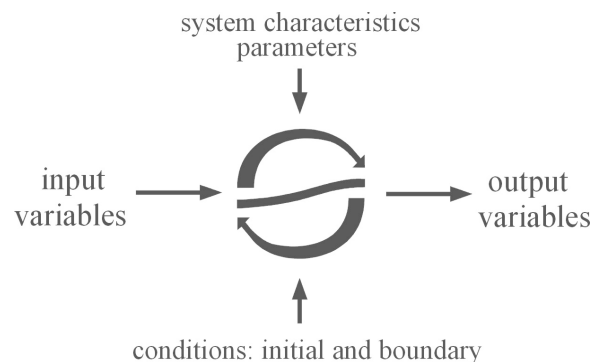
Dictaat: [Groundwater Modelling](#)

PART I Modelling Protocol

- 1 Introduction
- 2 Classification 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	Dutch profile: extraction, upconing and low inland levels	Profile over 3D model: effect sea level rise on salinisation	Movement of the island De Griend (NL): creation of a freshwater lens	Evo lens

Salinisation of a groundwater flow system The change in salt content in the subsurface due to a physical barrier in the deep coastal aquifer and a sea level rise of 0.5 m per century Profile Amsterdam Waterworks-polder Groot-Mijddrecht Haast near polder Time after 1990 AD Time= 0.0 yr	Salinisation of the groundwater system Profile close to polder Zandvoort-Haastmoorespolder	Rijnland model (profile of column 53) Autonomous development, sea level rise and land subsidence Columns 50-58 Time= 0.0 yr	Movement of the island of Griend (Friesland) through the Waddenzee 7 km/year to the east Time=95.00 yr	Evolution
Physical barrier in the coastal zone	Dutch profile extraction, upconing and low inland levels	Profile over 3D model: effect sea level rise on salinisation	Movement of the island De Griend (NL): creation of a freshwater lens	Evolution

Upconing saline groundwater under a low-lying area	Ontwikkeling van een zoetwaterlens	3D salinity groundwater distribution of the Nile Delta, Egypt
Verziltig onder de polder Groot-Mijddrecht: opwelen zout grondwater Tijd=2005 AD Groot-Mijddrecht Vinkeveense Plassen	Ontwikkeling van een zoetwaterlens Natuurlijke grondwater aanvulling (1 mm/dag) 2007.30 column Time=200.00 yr	Nile Delta, salinisation distribution
Upconing saline groundwater under a low-lying area	Development lens	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](#)