# Download



## 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:**

- **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

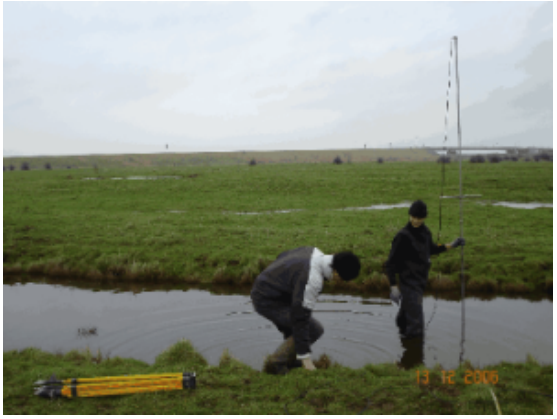
**Download:** Solution exercises lecture notes

**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)
- 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**

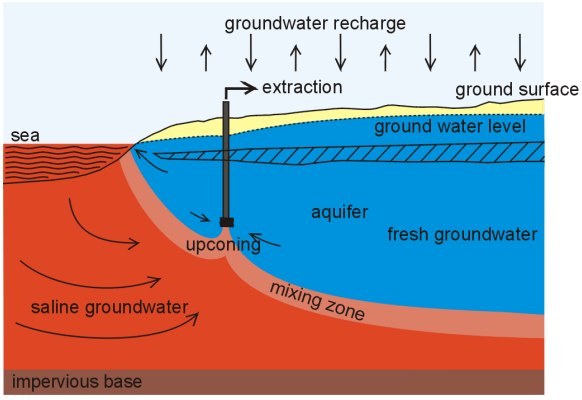
**Download:** Powerpoint presentation: pdf format
**Download:** Effect saline flooding event on groundwater: pdf document
**Download:** saltfresh_flooding: PMWIN files, Exercise 1
**Download:** saltfresh_flooding: PMWIN files, Exercise 5

## 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

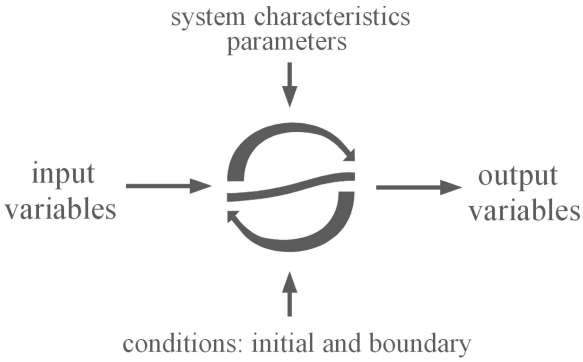
**Auteur:** Gualbert Oude Essink
**Dictaat:** Density Dependent Groundwater Flow

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



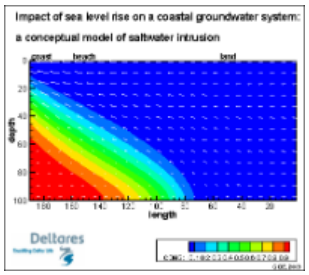

### Lecture Notes Groundwater Modelling

**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

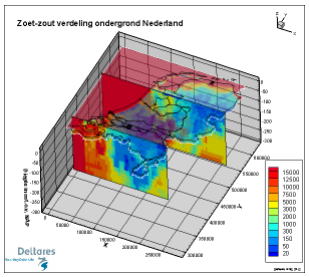



## Animations: examples of salinisation processes

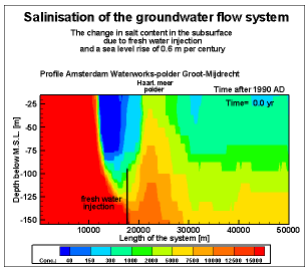
| | | | | |
|---|---|---|---|---|
| **Henry's profile with sea level rise** | **3D zoet-zout verdeling ondergrond NL** | **Fresh water injection to combat salinisation** | **3D zoet-zout verdeling ondergrond Texel** | **Region partly c** |



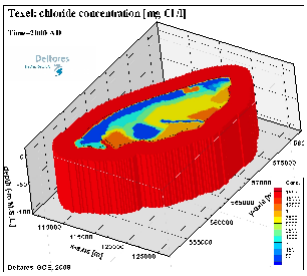

Henry's profile with sea level rise



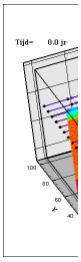

3D zoet-zout verdeling ondergrond NL




Fresh water injection to combat salinisation

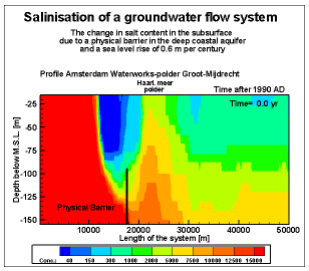



3D zoet-zout verdeling ondergrond Texel



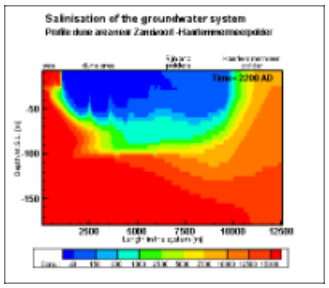
**Regional captured**

Physical barrier in the coastal zone



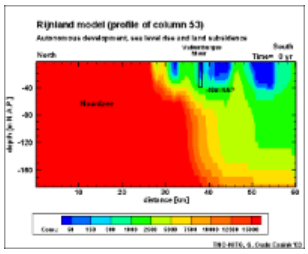

Physical barrier in the coastal zone

Dutch profile: extraction, upconing and low inland levels



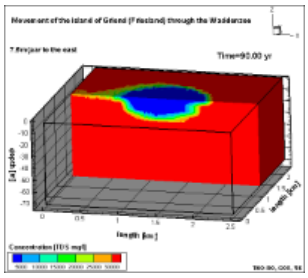

Dutch profile extraction, upconing and low inland levels

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

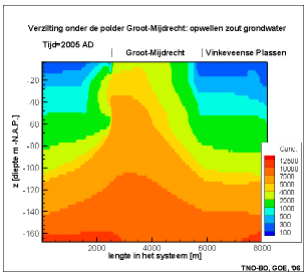



Movement of the island De Griend (NL): creation of a freshwater lens

Evo lens

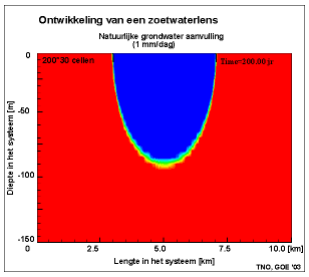
Evolu lens

**Upconing saline groundwater under a low-lying area**



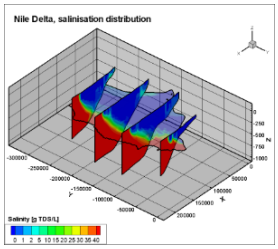

Upconing saline groundwater under a low-lying area

**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