Report title

Author 1, Author 2

April 3, 2023

Contents

Abstract

Put your abstract here.

1 Introduction

Put your introduction here. Cite literate as **?** or (**?**).

2 Instruments, Data and Methods

2.1 Darcy's law

Darcy's law describes the hydraulic flux of a fluid through a cross section using the hydraulic conductivity.
Without gravitational influence the instantaneous flux $q[m/s]$ though a porous medium with cross section $A[m^2]$ and permeability $k[m^2]$ of a fluid with viscosity $\mu[Pa\ s]$ is given by equation 1

$$q = -\frac{k}{\mu}\nabla p \tag{1}$$

Where $\nabla p[Pa]$ is the pressure gradiant over the volume. The negative sign means that the fluid flows from high pressure area to a low pressure area. In the case of vertical flux and by assuming a hydrostatic pressure we can relate the pressure to the height of the fluid by Stevin's law. We then consider the seawater to be incompressible and the height of the hole to be negligible compared to the radius of the earth, so that g and ρ can be assumed constant.

$$q(t) = -\frac{\rho g k}{\mu L}\Delta h(t) \tag{2}$$

Where g is the gravitational acceleration, ρ is the density of the fluid and $L[m]$ is the distance the fluid percolates. Note that we have added a time dependency of the height and thus flux. Darcy's law does not account for a change in pressure, but as our holes fills with water the height and pressure changes, altering the flux. Thus, only the first part when the pressure gradient is fairly large this law will apply
The solution to the first-order linear ordinary differential equation 2 is given on the form:

$$y(t) = A\,\frac{d}{dt}\,(y(t)) \Rightarrow y(t) = c_1\,e^{\frac{t}{A}} \tag{3}$$

The solution shows an exponential relation between height and time.

$$h(t) = h_0\,exp\left(-\frac{\rho g k t}{\mu L}\right) \tag{4}$$

Linearizing and solving for the permeability k yields:

$$k = -a\frac{\mu L}{\rho g} \tag{5}$$

Were as a is a linear relation coefficient defined as $a = \log\left(\frac{h(t)}{h_0}\right)/t$ which can be found by regression.

2.2 Empirical model

3 Results

Put your results here.

report_template/figures/dummy-figure.jpg

Figure 1: Caption of the dummy figure

4 Discussion

Put your discussion here. Your conclusion could be included in this part, or given in the extra "05_discussion.tex" file. Remember to include or exlude the files (comment or uncomment) in "COMPILE_REPORT.tex" and "main.tex" accordingly!

5 Summary

Put your summary/conclusion here, if it is not included in the discussion section. Remember to include or exlude the files (comment or uncomment) in "COMPILE_REPORT.tex" and "main.tex" accordingly!

6 Appendix

Put your appenx here, if you have any. Remember to include or exlude the files (comment or uncomment) in "COMPILE_REPORT.tex" and "main.tex" accordingly!

If you have multiple appendices and want to structure them, you can use subsections as bellow!

6.1 Appendix 1

Put appendix 1 here.

6.2 Appendix 2

Put appendix 1 here.