Universität Stuttgart
Geodätisches Institut

Titel der Studien- oder Diplomarbeit
evtl. eine zweite Zeile

Studienarbeit im Studiengang
Geodäsie und Geoinformatik
an der Universität Stuttgart

Vorname V. Name

Stuttgart, Monat 20xx

Betreuer: Prof. Dr.-Ing. Nico Sneeuw
Universität Stuttgart

Dr.-Ing. Heinz Obermann
Technische Universität Unterdorf

Erkl%■rung der Urheberschaft

Ich erkl%■re hiermit an Eides statt, dass ich die vorliegende Arbeit ohne Hilfe Dritter und ohne Benutzung anderer als der angegebenen Hilfsmittel angefertigt habe; die aus fremden Quellen direkt oder indirekt ¸bernommenen Gedanken sind als solche kenntlich gemacht. Die Arbeit wurde bisher in gleicher oder %■hnlicher Form in keiner anderen Pr¸fungsbehˆrde vorgelegt und auch noch nicht verˆffentlicht.

Ort, Datum Unterschrift

In diesem kurzen Text erfolgt die Zusammenfassung der Arbeit oder – auf Englisch – das Abstract.

Contents

List of Figures

List of Tables

Chapter 1

Introduction

1.1 Water Cycle

Water is necessary resources for human beings. It is the most important ingredient of life; it has a regulating effect on climate and all industries can not function well without it. However, 98 % of the water on the earth is in the oceans, 1.6% is in ice caps, which means only 0.4 % is the fresh water on land. So, a very little variability of the water cycle can have big effects on water resources.

The hydrology cycle (see figure 1.1) includes 3 major parts: evaporation, precipitation and runoff. The water evaporates from the oceans and the land surface as vapor to become part of the atmosphere along with water from evapotranspiration, which is water transpired from plants and evaporated from the soil and the cooler temperature causes the vapor into clouds. The clouds fall out of the sky as precipitation, which includes rain, snow and ice. Most precipitation falls back into the oceans or onto land. Precipitated water may be intercepted by vegetation, become overland flow over the ground surface, flow through the soil as subsurface flow and discharge into streams as surface runoff.

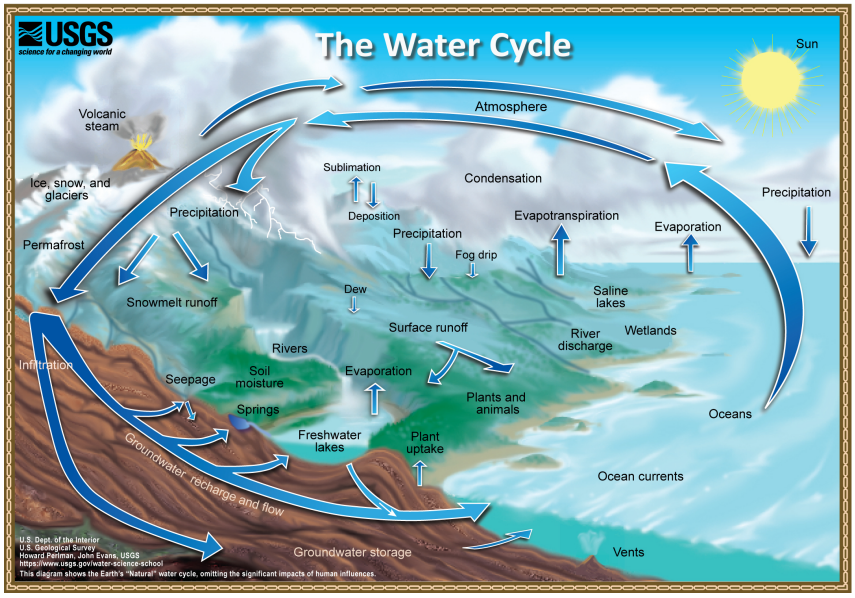

Figure 1.1: *horologic cycle, source: https://www.usgs.gov/media/images/water-cycle-natural-water-cycle*

1.2 Observation from Satellite Gravimetry

However, it was extremely difficult to measure the global water storage change consistently. In some way. Remote sensing with satellite is the perfect tool for hydrology research, which has the ability to provide the data globally in a long term.

The GRACE twin satellites, launched 17 March 2002, are making detailed measurements of Earth's gravity field, which are caused by monthly changes in mass. The mass changes can be thought of as concentrated in a very thin layer of water thickness changes near the Earth's surface by moving ocean, atmospheric and land ice masses and by mass exchanges between these Earth system compartments.

There are 2 satellites with tandem polar orbit. Since the orbit is around the pole and the earth rotates itself, the satellites were able to get the whole view of the earth. Unlike the normal remote sensors, the GRACE satellites measured the gravity field of the earth. When the 2 satellites went over a mass anomaly like a big mountain, the distance of them will be a little bit smaller. By calculating this distance difference with the help of GPS system, the gravity filed of the earth along with the total water storage are able to be plotted monthly.

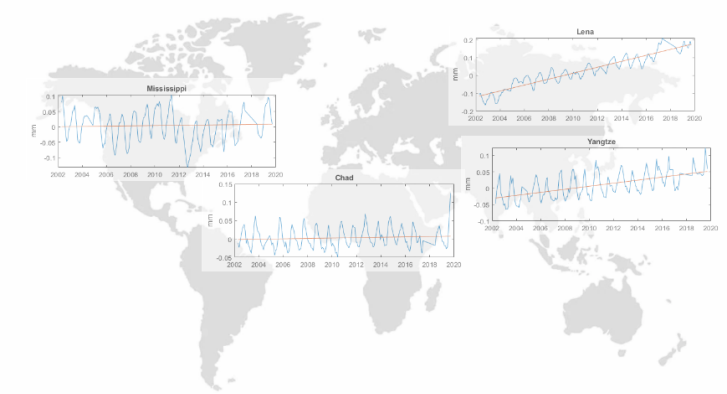

Figure 1.2: *Water Storage Change*

1.3 Motivation

Since 2002 it has been discovered that the water storage of many big basins has increased (see figure 1.2). One important basin of them is Ob basin in west Siberia (see figure 1.3). The reason and the start time of this positive trend would be very interesting and also important.

The Thesis is organized in the following way:

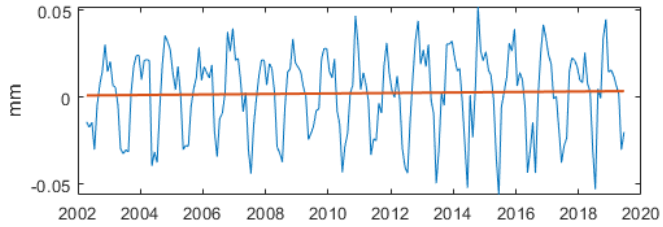

Figure 1.3: *Ob basin*

- Chapter 2 will describe the basic information of the study area, including the location, topography and climate.
- In chapter 3, the theoretical basis, the data source and the analyzing methods will be presented.
- The chapter 4 provides the results: the main reason of the main reason of the positiv trend would be critical discussed.
- In the last chapter, a brief summary and conclustion will be provided

1.4 Objectives

Chapter 2

Zweites Kapitel

2.1 Neuer Abschnitt

Hier f¸ge ich mal eine Tabelle ein

SpalteA	SpalteB	SpalteC	SpalteD
InhaltA1	InhaltB1	InhaltC1	InhaltD1
InhaltA2	InhaltB2	InhaltC2	InhaltD2
InhaltA3	InhaltB3	InhaltC3	InhaltD3

Table 2.1: *Beispiel einer Tabelle*

Wie man in der Tabelle 2.1 sehen kann ...

Chapter 3

Drittes Kapitel

3.1 Absatz

Hier mal eine Aufz%■hlung

1. erster Punkt
2. noch ein Punkt
3. letzter Punkt

Super, oder?

Chapter 4

Viertes Kapitel

4.1 Eine Sektion

Hier mal eine Auflistung von Elementen

- erstes Element
- zweites Element
- noch ein Element

Und Schluss mit der Vorlage ...

Bibliography

Mustermann, M. (2003), 'Der Geodät in seiner natürlichen Umgebung', *Nature* **108**(1–2), 37–46.

Appendix A

Und das hier ist noch der Anhang...