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Het doordringingsvermogen van taal: natuurkundig communiceren

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Moleculaire biologie (1985)

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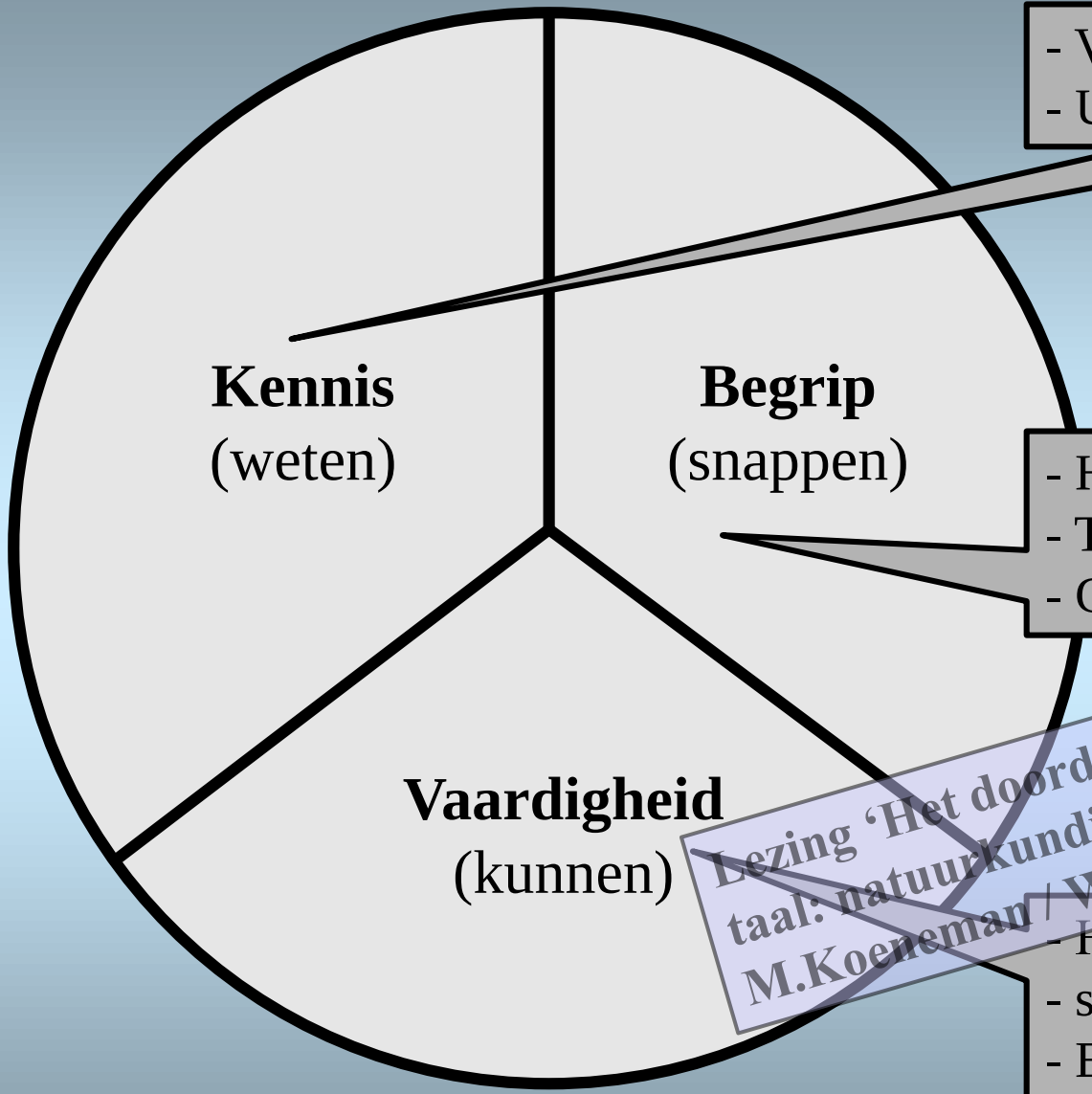

- Veel met het vak bezig zijn.
- Uit het hoofd leren (alleen).

- Het boek eens echt lezen.
- Thuis praten over het vak.
- Goed naar de uitleg luisteren.

- Huiswerk maken, het best…
- samen met een klasgenoot.
- Extra opgaven maken.

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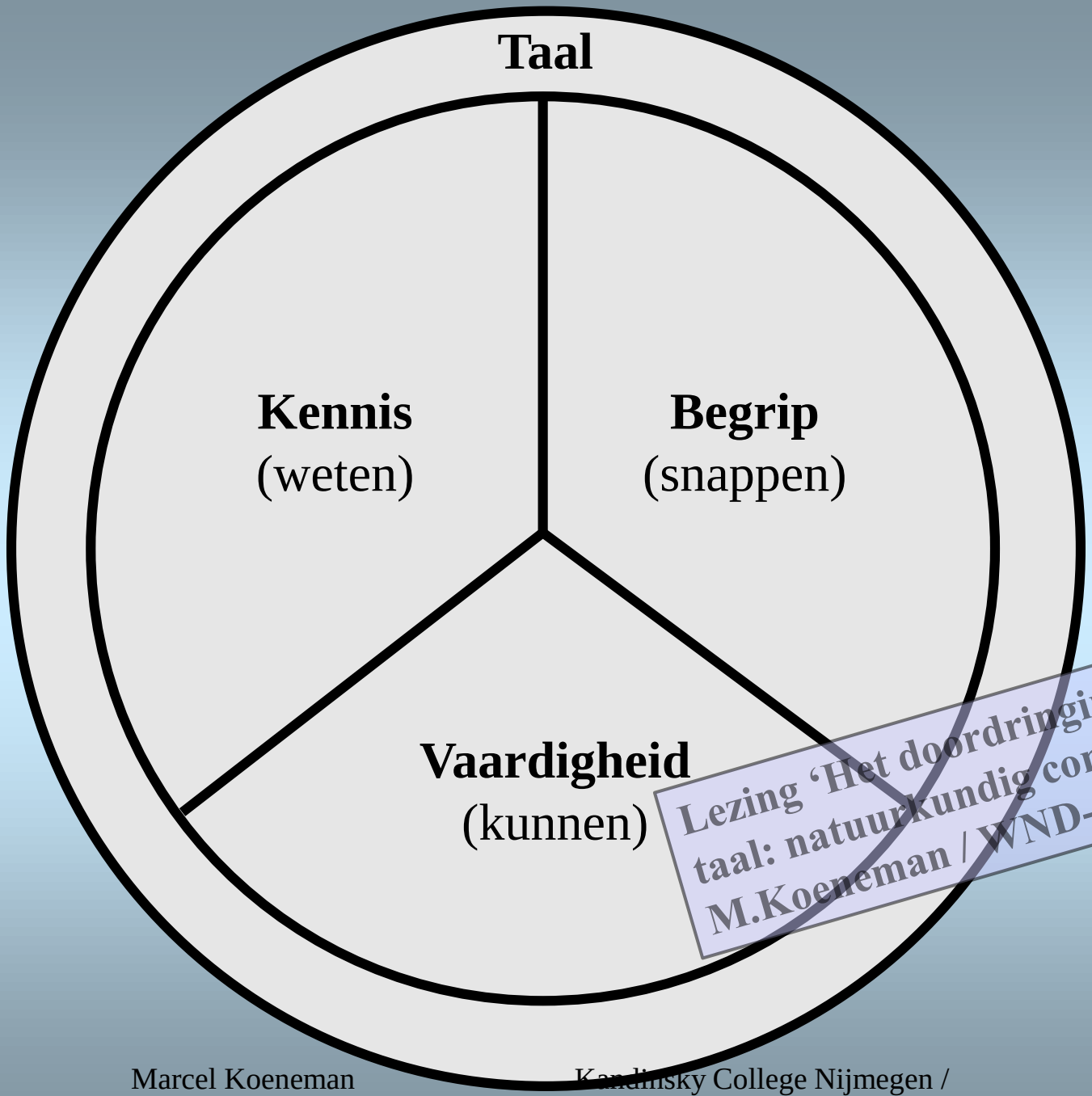

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“Geef hiervoor een volledige verklaring in je eigen woorden.”

Het vocabulaire en het idioom van de vaktaal leren en toepassen.

Vooral lastig bij termen met een afwijkende triviale betekenis: kracht, energie, deeltje, positief, negatief, verbinding, breking, warmte…

$a = 2{,}4\ m/s^2$

Google Scholar | 3 Engineering Disasters

news.aucotec.com/3-engineering-disasters-result-miscommunication/

3 Engineering Disasters That Were the Result of Miscommunication

May 31, 2016 Collaboration and Communication, General Engineering

Tweet G+ Like 19 Share

Taal is in de natuurkunde buitengewoon belangrijk.

De absolute top van natuurkundig taalgebruik is de wetenschappelijke publicatie.

Focus hier: verslagen van experimenteel onderzoek.

Redenen om deze zogenaamde *research papers* te bestuderen:

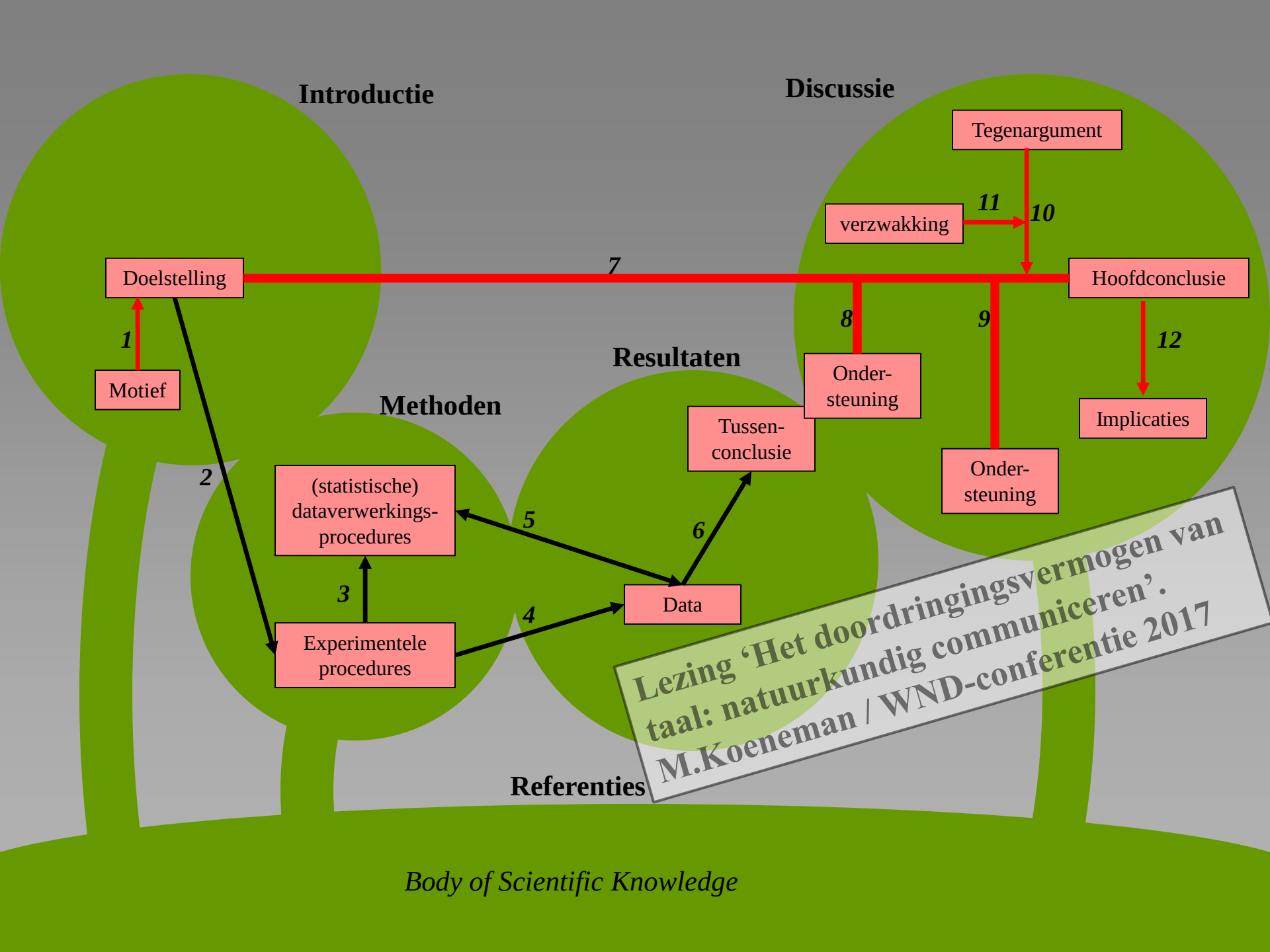
- Je hebt het wetenschappelijke nieuws heet van de naald;
- Je leest het vanuit de eerste bron;
- Je hoeft niet meer te wachten tot een journalist van NRC of BBC er een bericht over geschreven heeft;
- Journalisten van minder gedegen media begrijpen zo'n artikel zelf soms niet, of ze leggen accenten die voor jou niet interessant zijn.

Redenen om deze zogenaamde *research papers* niet te bestuderen:

- Het taalgebruik is erg ingewikkeld, ‘hermetisch’;
- De natuurkundige theorie is te moeilijk;
- Je kunt ze niet vinden.

Het goede nieuws over research papers:

- Je kunt heel veel van deze artikelen vinden en lezen via Google Scholar: **https://scholar.google.nl/**
- Iedereen kan ze lezen op zijn eigen niveau en diepte;
- Er zit altijd een herkenbare structuur in;
- Het bestuderen ervan kun je leren.


Introductie
Discussie
Tegenargument
verzwakking
11
10
Doelstelling
7
Hoofdconclusie
1
Motief
8
9
12
Resultaten
Onder-
steuning
Methoden
Tussen-
conclusie
Implicaties
Onder-
steuning
2
(statistische)
dataverwerkings-
procedures
5
6
3
Data
4
Experimentele
procedures
Lezing 'Het doordringingsvermogen van taal: natuurkundig communiceren'.
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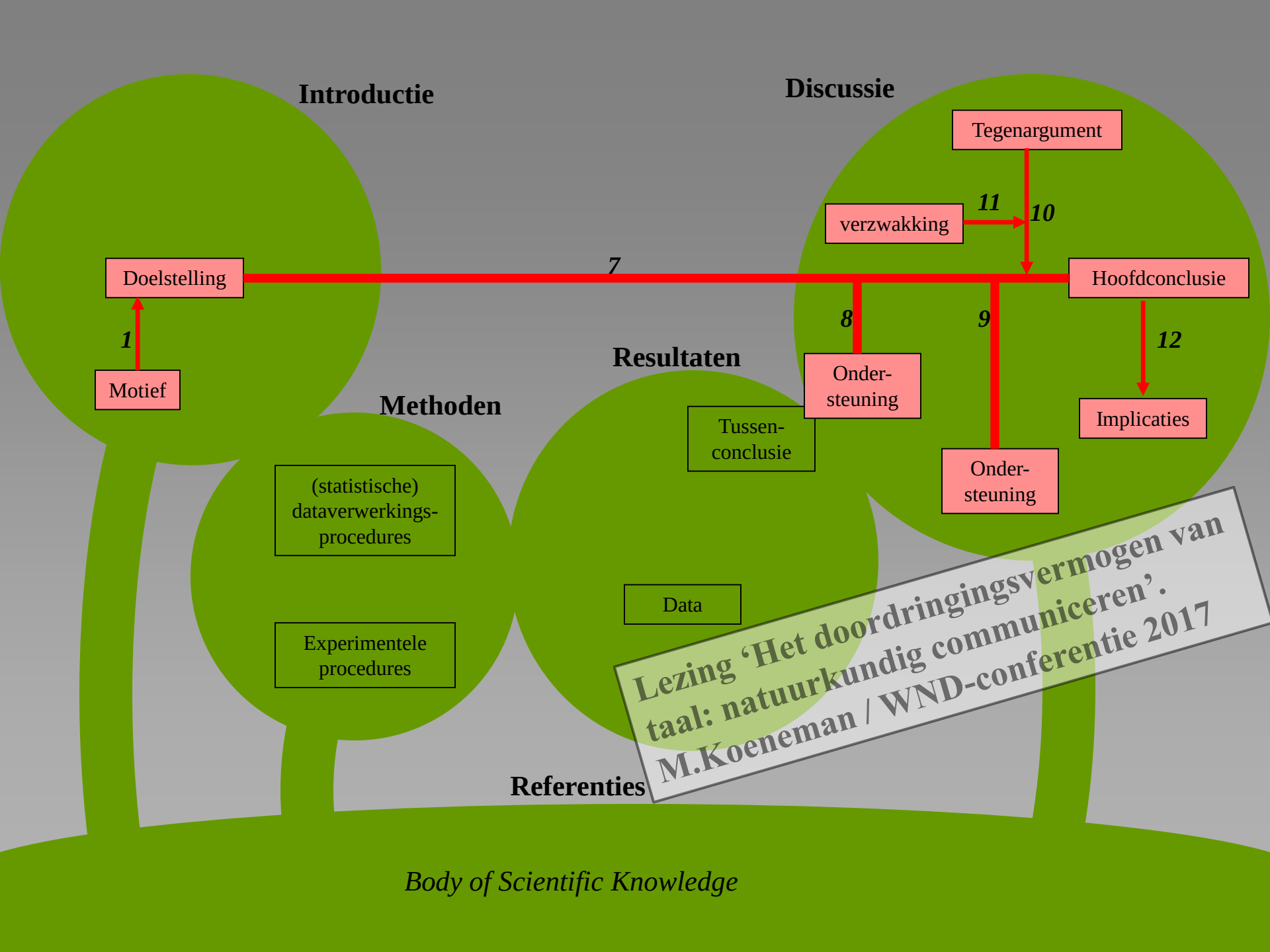
Referenties
Body of Scientific Knowledge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Lezing 'Het doordringingsvermogen van taal: natuurkundig communiceren'.
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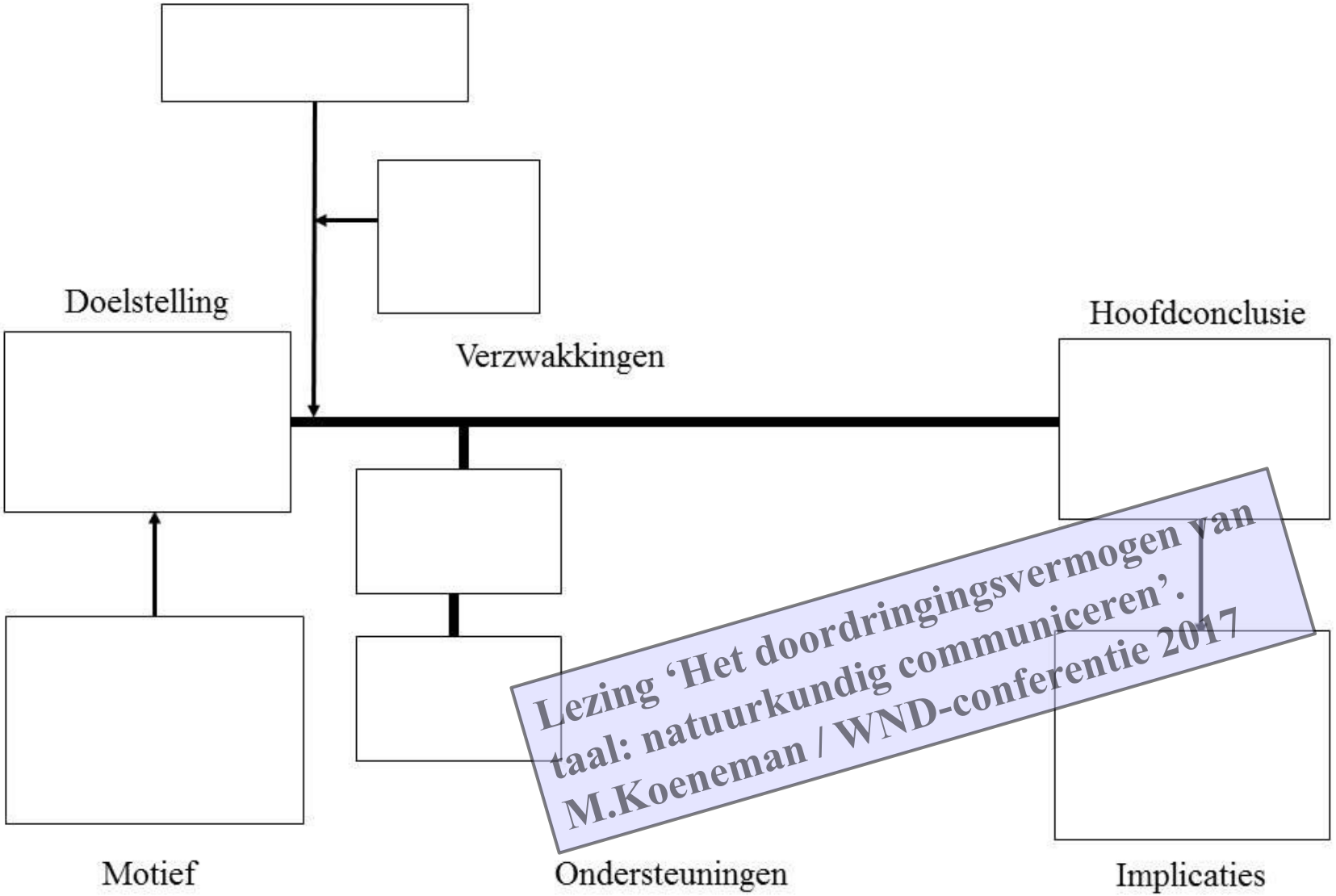
SAM-model invulschema

Tegenargumenten

Teken desgewenst extra vakken of laat overbodige vakken leeg.



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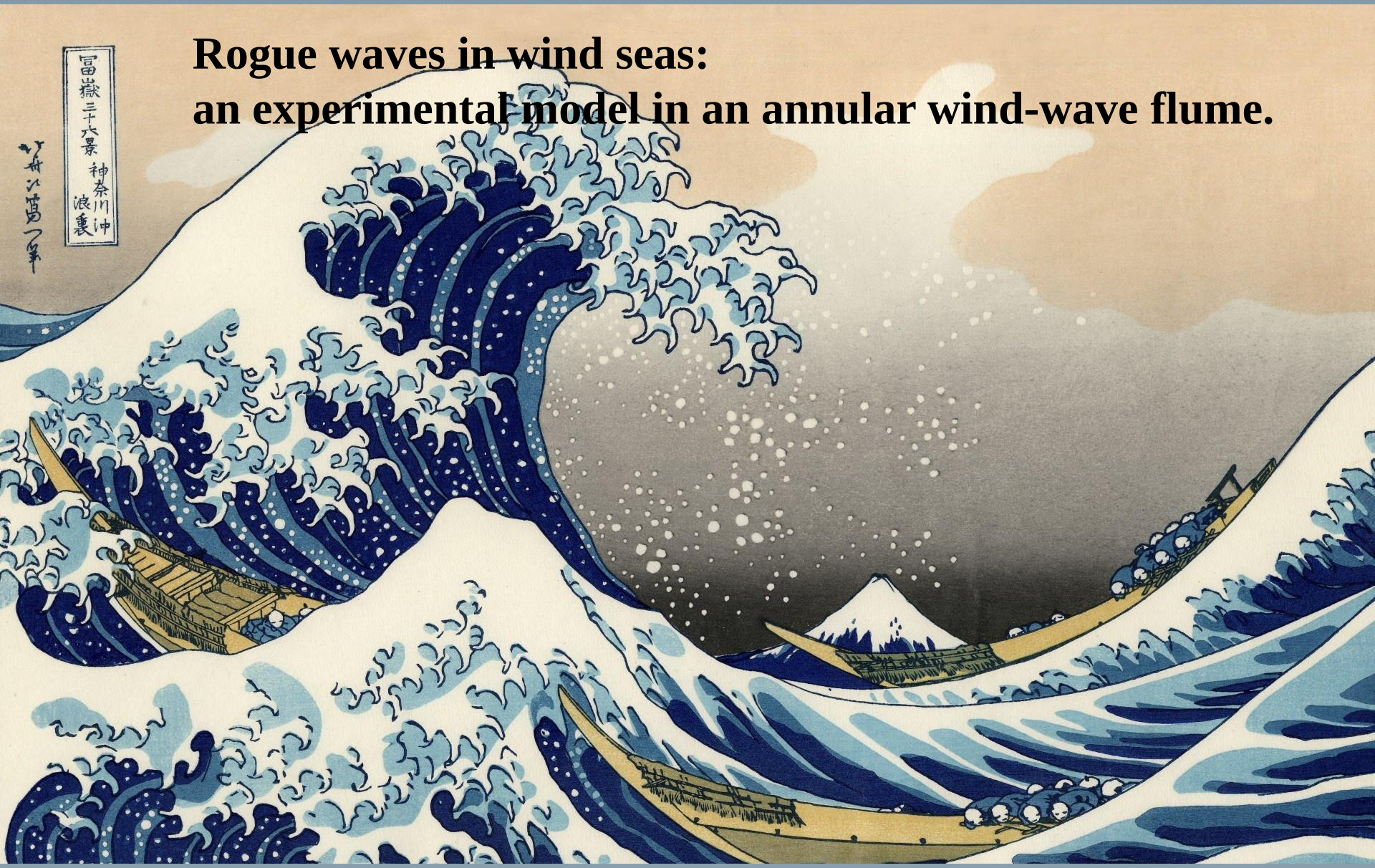
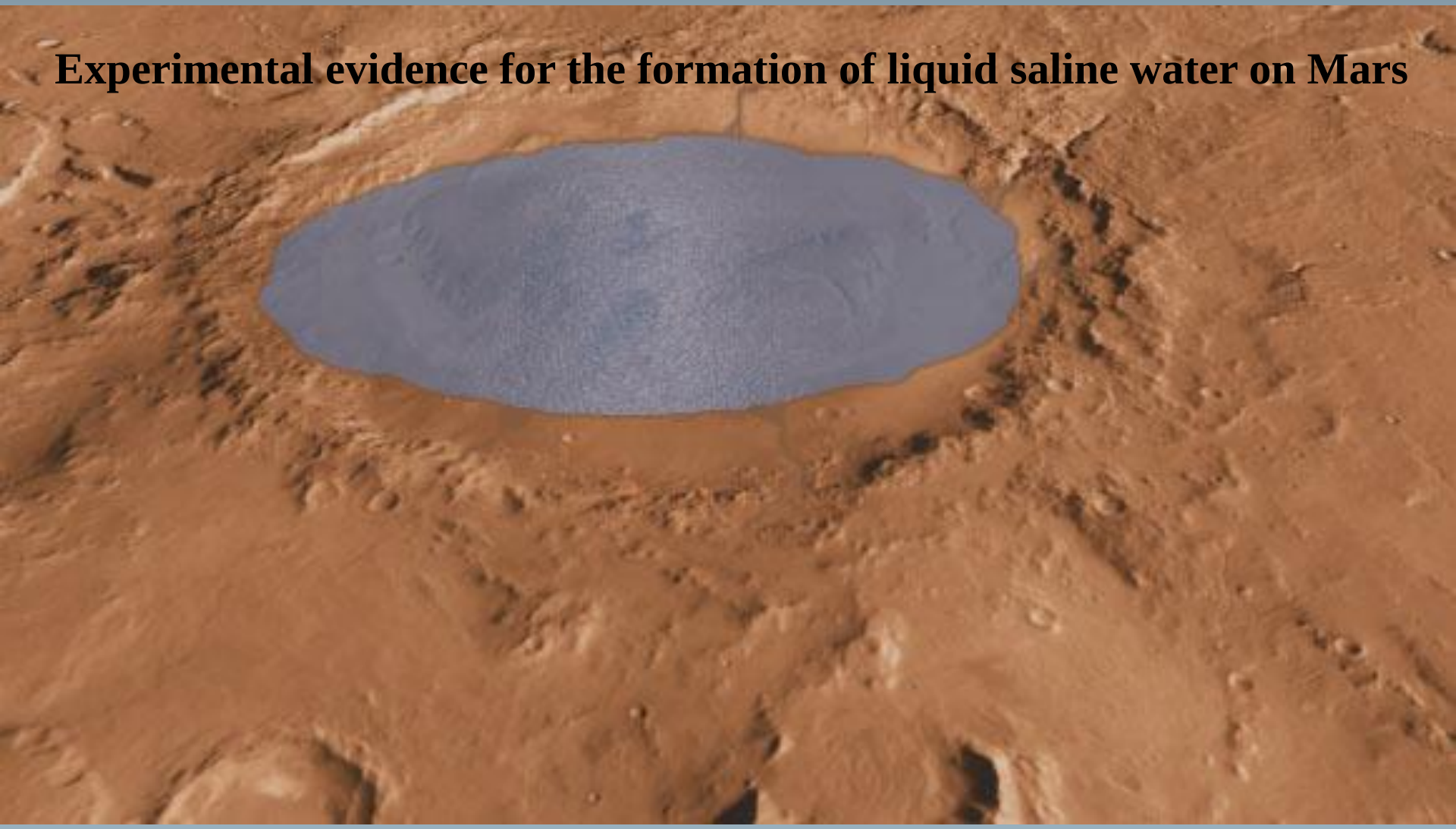
Renewable hydrogen production using sailing ships



Rogue waves in wind seas: an experimental model in an annular wind-wave flume.

Experimental evidence for the formation of liquid saline water on Mars



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1. Introduction

Our view of Mars has changed dramatically in the past two decades, from an inhospitable cold desert to a potentially habitable planet. Water ice was discovered in the shallow subsurface of areas ranging from polar latitudes to midlatitudes [*Boynton et al.*, 2002; *Mitrofanov et al.*, 2002; *Feldman et al.*, 2002; *Smith et al.*, 2009; *Byrne et al.*, 2009]; salts such as $Ca(ClO_4)_2$, $Mg(ClO_4)_2$, and $NaClO_4$, capable of deliquescing and forming aqueous solutions at Martian temperatures were discovered in the polar and equatorial regions [*Hecht et al.*, 2009; *Glavin et al.*, 2013]. The idea that deliquescence (defined as the dissolution of a salt by the absorption of water vapor [*Mirabel et al.*, 2000]) is a slow process not capable of producing bulk aqueous solutions during the few hours of the diurnal cycle in which conditions are favorable for it is well established [*Möhlmann*, 2011] because Mars is extremely cold and dry [*Lewis et al.*, 1999; *Meslin et al.*, 2013]. This appears to contradict the discovery of observational evidence for deliquescence in Mars' polar region [*Rennó et al.*, 2009] and of possible flows of liquid brines in the equatorial region [*McEwen et al.*, 2011].

In an effort to shed light on this issue, we use Raman scattering spectroscopy [*Zhang and Chan*, 2003] to study the formation of liquid brines from bulk amounts of salt at Mars environmental conditions. Here we define "bulk" as a macroscopic collection of salt grains. First, we study the formation of liquid brines when water vapor is the only source of water (bulk deliquescence). Then, we investigate the formation of liquid brines when the salts are placed in direct contact with water ice like that observed in Mars' polar region [*Martínez et al.*, 2012; *Smith et al.*, 2009; *Whiteway et al.*, 2009]. Our results have important implications for the understanding of habitability because liquid water is essential for life as we know it, and halophilic terrestrial bacteria thrive in brines [*Mikucki et al.*, 2009; *Boetius and Joye*, 2009].

2. Methodology

4. Discussion and Conclusion

The O-H vibrational band of the Raman spectra is excellent for studying the formation of liquid brines at Martian conditions. The change in the O-H spectrum from eight narrow peaks between ~3400 and 3600 cm^{-1} with nearly all of them having the widths of less than 50 cm^{-1} typical of the hydrated perchlorate salts, to the four wide peaks between ~3200 and 3600 cm^{-1} with the widths greater than 100 cm^{-1} typical of liquid water, is an unambiguous indicator of a solution. The changes in the O-H band provide a much clearer indication of the formation of the liquid phase than the changes in the perchlorate band (the ~930 to ~1000 cm^{-1} region of the spectrum) because it is less sensitive to changes in the salt hydration and the concentration of the solution [*Zhang and Chan*, 2003; *Miller and Macklin*, 1985]. Thus, observations of changes in the O-H vibrational band could aid the search for liquid brines on Mars.

samen-vatting resultaten

HC

The results described above indicate that perchlorate salts in contact with ice can form liquid brines during the short periods of the diurnal cycle during which the ground temperatures are above the salts' eutectic temperatures, whereas when atmospheric water vapor is the only source of water bulk deliquescence is too slow to occur. We conclude that liquid brines are likely to form in the shallow subsurface where water ice exists, since the heating of the ground by solar radiation causes the temperature of the shallow Martian subsurface to exceed the eutectic temperature of many salts found on Mars, while the top regolith inhibits sublimation and evaporation. The formation of liquid brines in the shallow subsurface resolves the apparent inconsistency between observational evidence for liquid brines on Mars and the slow kinetics of deliquescence on a cold and dry planet.

I_1-I_4

The results of our experiments suggest that the spheroids observed on a strut of the Phoenix lander formed on water ice splashed during landing [*Smith et al.*, 2009; *Rennó et al.*, 2009]. They also support the hypothesis that "soft ice" found in one of the trenches dug by Phoenix was likely frozen brine that had been formed previously by perchlorates on icy soil. Finally, our results indicate that liquid water could form on the surface during the spring where snow has been deposited on saline soils [*Martínez et al.*, 2012; *Möhlmann*, 2011]. These results have important implications for the understanding of the habitability of Mars because liquid water is essential for life as we know it, and halophilic terrestrial bacteria can thrive in brines [*Mikucki et al.*, 2009; *Boetius and Joye*, 2009].

Acknowledgments

References

Einde.

Formulieren met schema’s bij de uitgang.

Vragen…