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Enabling new technology

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TITLE ENGLISH

DISSERTATION

to obtain
the degree of doctor at the University of Twente,
on the authority of the rector magnificus,
Prof. Dr. H. Brinksmā,
on account of the decision of the graduation committee,
to be publicly defended
on Friday the nth of September 20XX at XX:XX

by

full name written out here
Born on the day of birth e.g. 1st of January 1901
in City, Country

This dissertation has been approved by the promotor:

Prof. Dr. X

and the copromotor:

Assoc. Prof. Dr. Y

Contents

| | |
|---|-----------|
| Introduction | 1 |
| 1 Ultimate turbulent Taylor-Couette flow | 3 |
| 1.1 Introduction | 4 |
| 1.2 Experiment | 4 |
| 1.3 Analysis and Results | 4 |
| 1.4 Conclusion | 6 |
| Conclusions | 7 |
| References | 9 |
| Summary | 11 |
| Summary (Frisian) | 13 |
| Summary (Dutch) | 15 |
| Acknowledgements | 17 |
| Bio | 19 |
| Scientific output | 21 |

Introduction

Turbulence is omnipresent. It's in our blood, in our respiratory system, in our tea and coffee, in the hot air that rises above us, in the wake behind us when we walk, in the air in a room, around our cars and planes, in the wind above our farmlands, in the water of all the seas and oceans, in our sun, and in all the other stars.

For macroscopic flows of water and air the Reynolds number, the ratio of inertial to viscous forces and describing the amount of turbulence, is generally much larger than unity. This means practically that all the common flows around us are turbulent. The difficulty in describing turbulence resides in the fact that turbulent flows are generally irregular, chaotic, and therefore very hard to predict. Think of the weather; we can only predict a few days ahead—at best. In addition, turbulent flows have characteristics across many length- and time scales, so describing them is non-trivial. Although the equations describing them are well known, it has puzzled scientists for centuries and we have not yet 'solved' turbulence.

Taylor Couette

The Taylor-Couette apparatus is one of the fundamental configurations to test theories in fluid dynamics....

Open Questions

- Q1
- Q2
- Q3
- Q4

A guide through the thesis

Up to now, for the high Reynolds numbers ($> 10^4$), the focus...

Chapter 1

Ultimate turbulent Taylor-Couette flow¹

main text here... [1]

¹Published as: **Sander G. Huisman**, Dennis P.M. van Gils, Siegfried Grossman, Chao Sun, and Detlef Lohse, *Ultimate Turbulent Taylor-Couette Flow*, Phys. Rev. Let. **108**, 024501 (2012). Experiments, analysis and writing are done by Huisman, supervision by Sun, and Lohse. Proofread by everyone.

1.1 Introduction

The Taylor-Couette (TC) system is one of the fundamental geometries...

$$\text{Re}_w \propto \text{Ta}^{1/2} \quad (1.1)$$

1.2 Experiment

The apparatus used for the experiments has an inner cylinder...

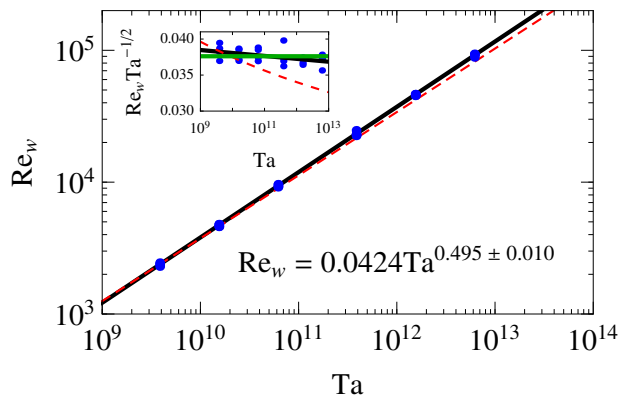


Figure 1.1: a nice image

1.3 Analysis and Results

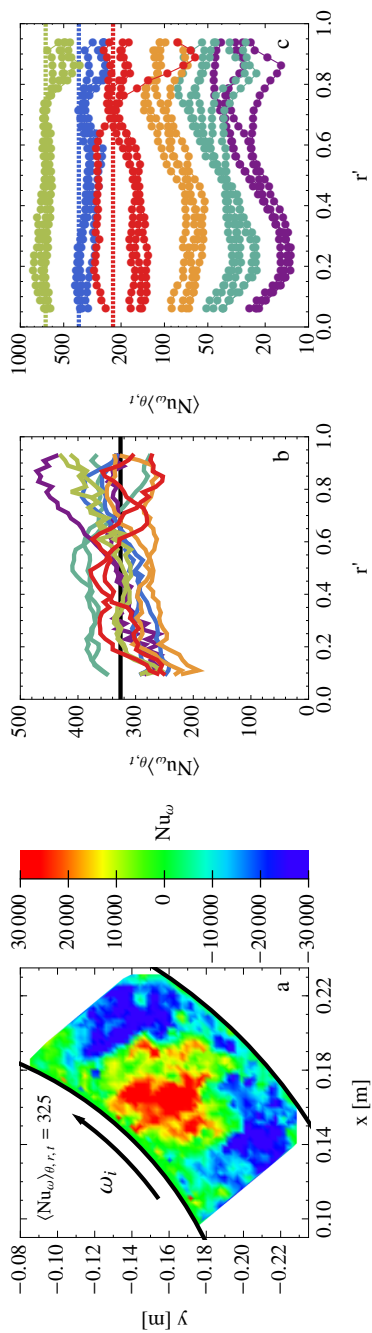


Figure 1.2: just to show you how a vertical page is done

1.4 Conclusion

In conclusion....

Conclusions

In this thesis high Reynolds number Taylor-Couette flow has been examined...

References

- [1] S. G. Huisman, D. P. M. van Gils, S. Grossmann, C. Sun, and D. Lohse, “Ultimate turbulent Taylor-Couette flow”, *Phys. Rev. Lett.* **108**, 024501 (2012).

Summary

The ubiquity of turbulent flows in nature and technology...

Summary (Frisian)

Turbulinte streamings binne oeral fertsjintwurdige yn 'e natoer en technyk...

Summary (Dutch)

Turbulente stromingen zijn alomvertegenwoordigd in de natuur en techniek...

Acknowledgements

acknowledgements here

Bio

Sander Gerard Huisman was born in...

Scientific output

Publications

- **2014:** *Multiple states in highly turbulent Taylor-Couette flow*
Sander G. Huisman, Roeland C.A. van der Veen, Chao Sun, Detlef Lohse
Nat. Commun. 5, 3820
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Phys. Rev. Lett., **108**, 024501
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Dennis P.M. van Gils, **Sander G. Huisman**, Gert-Wim H. Bruggert, Chao Sun, Detlef Lohse
Phys. Rev. Lett., **106**, 024502

