



Report

Course Project: Statistics of Turbulence and the Onset of Chaos

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Course: Turbulence ME-467
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1 Part I: Statistical Analysis of Turbulence

1.1 Introduction (Limit: 1 page)

1.2 Data Analysis

1.2.1 Velocity Signal in the Spatial Domain

Table 1: Table of results 1.

Param.	Dim.	A_1	A_2	A_3	A_4	A_5	A_6
d	m	1.0	2.0	3.0	4.0	5.0	6.0
U	m/s	10.52223399	10.52201583	10.52117473	10.52232686	10.52234804	10.52185721
I	adim.	0.12180673	0.05480351	0.03954964	0.0320026	0.02713776	0.02407247

1.2.2 Correlation Length of the Velocity Signal

Table 2: Table of results 2.

Param.	Dim.	A_1	A_2	A_3	A_4	A_5	A_6
L_C	m	0.36669985	0.63447755	0.77330634	0.90386788	1.00909318	1.08532957
L_{int}	m	0.35895344	0.62704922	0.76843644	0.88769361	1.00077964	1.07598959

1.2.3 Energy Spectrum of the Flow

Table 3: Table of results 3.

Param.	Dim.	A_1	A_2	A_3	A_4	A_5	A_6
$L_{\text{int},E}$	m	5.23598776	8.97597901	12.5663706	14.9599650	18.4799568	19.6349541
η_E	m	0.02513274	0.03695991	0.0418879	0.0448799	0.04833219	0.05235988

1.2.4 The Dissipation Rate and Different Reynolds Numbers

Table 4: Table of results 4.

Param.	Dim.	A_1	A_2	A_3	A_4	A_5	A_6
ϵ	m^2/s^3	2.87076074	0.15110392	0.04658421	0.02112303	0.01153716	0.00748596
Re_λ	adim.	969.527172	855.4148643	802.221265	780.2180855	759.1436670	741.4848822
Re	adim.	3672952.56	6296359.55	8814198.72	10494242.77	12963502.49	13773078.90

1.2.5 Turbulence Decay

Table 5: Table of results 5.

Param.	Dim.	A_1	A_2	A_3	A_4	A_5	A_6
\mathcal{E}	m^2/s^2	2.46405129	0.49877643	0.25971965	0.1700926	0.12231075	0.09623149

1.2.6 Velocity Increments

1.2.7 Structure Functions and Energy Dissipation

1.3 Discussion (Limit: 1 page)

2 Part II: Nonlinear Dynamics and the Emergence of Chaos

Note: A template for this part will be provided later.

Appendix

List of Sources

List of Collaborators

Personal Statement

I hereby certify that I fully respect the stated Honor Code and specifically that:

1. My report is my original work prepared solely by me;
2. All sources used are cited;
3. All people I collaborated with are listed.

Signature (Matteo Calafà)

Date