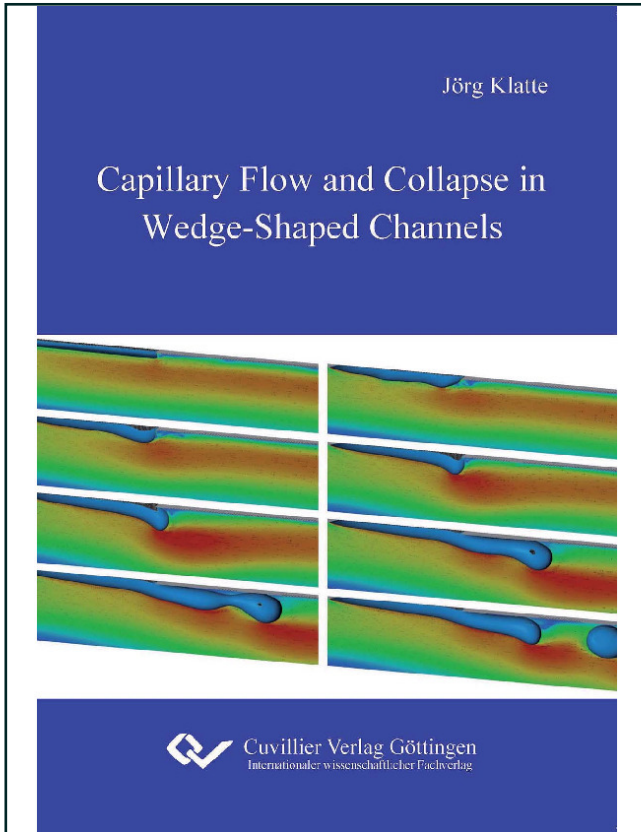




Jörg Klatte (Autor)
Capillary Flow and Collapse in Wedge-Shaped Channels



<https://cuvillier.de/de/shop/publications/127>

Copyright:
Cuvillier Verlag, Inhaberin Annette Jentsch-Cuvillier, Nonnenstieg 8, 37075 Göttingen,
Germany
Telefon: +49 (0)551 54724-0, E-Mail: info@cuvillier.de, Website: <https://cuvillier.de>

Contents

List of Symbols	xi
1 Introduction	1
1.1 Motivation	3
1.2 Scope of this Work	3
2 State of the Art	5
2.1 Basic Equations	8
2.2 Characteristic Numbers and Scaling	10
2.3 Geometric Equations	14
2.4 Fully-Developed Velocity Profiles	16
2.5 Pressure Loss in Closed Ducts	20
2.6 Speed Index	22
3 Theory	25
3.1 One-Dimensional Analysis (steady state)	25
3.2 Flow Rate Limit I: Speed Index	27
3.3 Flow Rate Limit II: Ingestion Index	30
3.4 Approximation of the Flow Rate Limit	34
3.5 Characteristic Velocities and Physical Regimes	39
4 Numerical Solutions	43
4.1 Surface Evolver (SE)	43
4.2 OpenFOAM (OF)	49
4.3 ccFlow (CF)	53
5 Drop Tower Experiments	57
5.1 Setup	57
5.2 Inlet Conditions	58



5.3	Experimental Results	63
5.4	Numerical Results	68
6	Terrestrial Experiments	75
6.1	Setup	75
6.2	Inlet conditions	78
6.3	Experimental and Numerical Results	80
7	ISS Experiments	85
7.1	Setup	86
7.2	Scientific Outlook	90
7.3	Numerical Predictions	92
8	Parametric Study	95
8.1	Inlet Conditions	95
8.2	Parameter Space	96
8.3	Numerical Settings	96
8.4	Characteristic Flow Profiles	98
8.5	Results	99
9	Summary	107
A	Scaling and General Equations	113
A.1	Dimensional Equations	113
A.2	Non-Dimensional Equations	116
B	Numerical Results: SE	119
B.1	Capillary Driven Flows	119
B.2	Viscous Dominated Flows: Wedge	121
B.3	Inertia Dominated Flows: Groove	121
C	Numerical Results: OF	123
C.1	Dynamic Interface Responses	123
	List of Figures	125
	List of Tables	126
	Publications	129



<i>CONTENTS</i>	xi
Teaching	133
Bibliography	133