

Table Of Contents

Abstract	iii
Zusammenfassung (German abstract)	v
1 Introduction	1-1
1.1 Objective of the thesis	1-1
1.2 On pollutant transport modeling in the planetary boundary layer	1-2
1.3 Natural variability of pollutant concentrations	1-7
1.4 Adapting continuous plume models to urban environments	1-11
2 A Novel Approach to Atmospheric Dispersion Modelling: the Puff-Particle Model (PPM)	2-1
2.1 Introduction	2-1
2.2 Principles of the PPM	2-2
2.3 Reduction of the large-scale contribution as puff sizes grow	2-12
2.4 Validation	2-17
2.5 Summary and conclusions	2-26
3 The Treatment of Relative Dispersion Within a Combined Puff-Particle Model (PPM)	3-1
3.1 Concept of the PPM	3-1
3.2 Relative vs. absolute dispersion	3-2
3.3 Reduction of the trajectory variability as puff sizes grow	3-4
3.4 Validation	3-7
3.5 Summary and conclusions	3-10
4 On the Use of Density Kernels for Concentration Estimations Within Particle and Puff Dispersion Models	4-1
4.1 Introduction	4-1
4.2 Concentration estimation by box-counting	4-4
4.3 Density kernels	4-8
4.4 Bandwidth estimation	4-13
4.5 Kernel sensitivity	4-15
4.6 Analogy of density kernels and puffs	4-22
4.7 Summary and conclusions	4-24

5	Prediction of Higher Moments of Near-Source Concentration by Simulating the Meandering of Pollutant Puffs.....	5-1
5.1	Introduction.....	5-2
5.2	Relative and absolute dispersion.....	5-4
5.3	The CALPUFF model.....	5-7
5.4	The Puff-Particle Model.....	5-8
5.5	The Puff-Plume meandering scheme.....	5-9
5.6	Introduction of the PPM into CALPUFF.....	5-12
5.7	Determination of concentration probability density functions.....	5-15
5.8	Characteristics of concentration pdf's.....	5-17
5.9	Summary and conclusions.....	5-18
6	Extension of an Operational Short-Range Dispersion Model for Applications in an Urban Environment.....	6-1
6.1	Introduction.....	6-1
6.2	The modification of an operational model.....	6-3
6.3	Application to the city of Zurich 1990.....	6-8
6.4	Summary and conclusions.....	6-11
7	Modification of an Operational Dispersion Model for Urban Applications.....	7-1
7.1	Introduction.....	7-1
7.2	Adaptation of the OML dispersion model to urban conditions.....	7-4
7.3	Zurich 1990 case study.....	7-10
7.4	Results.....	7-16
7.5	Summary and conclusions.....	7-21
	Curriculum Vitae.....	8-1