

Content

<u>ABSTRACT</u>	I
<u>ACKNOWLEDGMENTS</u>	II
<u>CONTENT</u>	III
<u>ABSTRACT</u>	I
.....	III
<u>ACKNOWLEDGMENTS</u>	II
.....	III
<u>1. REPRESENTATION OF URBAN LAND IN A REGIONAL MODEL: MODIFICATION OF THE LAND SURFACE SCHEME IN THE PSU/NCAR MESOSCALE WEATHER PREDICTING MODEL (MM5)</u>	1
1.1. INTRODUCTION	1
1.2. MATERIALS AND METHODS	2
1.2.1. REGIONAL MODEL MM5.....	2
1.2.2. MODIFICATIONS OF THE LAND SURFACE MODEL.....	3
1.2.3. MODELLING PROTOCOL	6
1.3. RESULTS AND DISCUSSION	9
1.3.1. SIMULATION OF SURFACE ENERGY BALANCE BY THE STANDARD LSM AND THE MODIFIED URBAN LAND SURFACE SCHEME UCM	9
1.3.2. SIMULATION OF NEAR-SURFACE TEMPERATURE BY THE STANDARD MM5-LSM AND MM5-UCM MODELS	11
1.4. SUMMARY AND OUTLOOK	13
<u>2. EFFECTS OF URBAN LAND MODIFICATIONS ON PRECIPITATION AND NEAR-SURFACE TEMPERATURE IN EUROPE</u>	15
2.1. INTRODUCTION	15
2.2. MATERIALS AND METHODS	16
2.2.1. REGIONAL MODEL MM5.....	16
2.2.2. MODIFICATIONS OF THE LAND SURFACE MODEL	17
2.2.3. MAPPING URBAN AREAS	18
2.2.4. MODELLING PROTOCOL.....	20
2.2.5. ANALYSIS OF SIMULATIONS.....	21
2.3. RESULTS AND DISCUSSION	23
2.3.1. CORROBORATION OF MODEL RESULTS	23
2.3.2. EFFECTS OF URBAN LAND COVER ON NEAR-SURFACE TEMPERATURE	25
2.3.3. EFFECTS OF URBAN LAND COVER ON PRECIPITATION.....	30
2.4. SUMMARY AND OUTLOOK	33
<u>3. EFFECTS OF URBAN AREAS EXPANSION ON PRECIPITATION AND NEAR- SURFACE TEMPERATURE IN EUROPE</u>	35

3.1. INTRODUCTION.....	35
3.2. MATERIALS AND METHODS.....	36
3.2.1. REGIONAL MODEL.....	36
3.2.2. MAPPING URBAN AREAS	36
3.2.3. MODELLING PROTOCOL.....	40
3.2.4. ANALYSIS OF THE SIMULATIONS	40
3.3. RESULTS AND DISCUSSION.....	41
3.3.1. EFFECTS OF URBAN GROWTH ON NEAR-SURFACE TEMPERATURE	41
3.3.2. EFFECTS OF URBAN GROWTH ON PRECIPITATION	49
3.4. SUMMARY AND OUTLOOK.....	53
 4. SENSITIVITY OF URBAN TEMPERATURES AND PRECIPITATION TO “GREEN” URBAN PLANNING STRATEGIES.....	55
 4.1. INTRODUCTION.....	55
4.2. MATERIALS AND METHODS.....	55
4.2.1. THE MODEL SIMULATIONS	55
4.2.2. ANALYSIS OF MODEL RESULTS	57
4.3. RESULTS AND DISCUSSION.....	57
4.3.1. EFFECTS OF URBAN GRASSLAND VERSUS FOREST ON NEAR-SURFACE TEMPERATURE ..	57
4.3.2. EFFECTS OF VEGETATION COVER ON PRECIPITATION	60
4.4. SUMMARY AND OUTLOOK.....	61
 5. THE RESPONSE OF THE TERRESTRIAL BIOSPHERE TO URBANIZATION- DRIVEN CHANGES IN LAND USE, CLIMATE AND CO₂ AND NO_x POLLUTION.	63
 5.1. INTRODUCTION.....	63
5.2. MATERIALS AND METHODS.....	64
5.2.1. MODEL OF THE TERRESTRIAL ECOSYSTEM	64
5.2.2. THE MODEL SIMULATIONS	64
5.2.3. THE URBAN CO ₂ DOME	67
5.3. RESULTS AND DISCUSSION.....	69
5.4. SUMMARY AND OUTLOOK.....	71
 SUMMARY.....	73
 APPENDIX 1	74
 APPENDIX 2	75
 APPENDIX 3	76
 APPENDIX 4	77
 APPENDIX 5	78
 REFERENCES	79