LIST OF TABLES

TABLE 2.1 Total SO_2, NOx and NH_3 emissions in the world and on European and American scales separated into natural and anthropogenic emissions (Whelpdale, 1987) 25
TABLE 2.2 Source contribution of sulphur dioxide, nitrogen oxides, and ammonia to anthropogenic emissions (Hov *et al.*, 1987; Asman, 1992) 25
TABLE 2.3 Emissions of reduced sulphur compounds to the atmosphere in Tg (S) a^{-1} 26
TABLE 2.4 Dutch total annual emissions 1980 - 1993 expressed in kton SO_2, kton NO_2 for NOx 28
TABLE 2.5 Overview of the ammonia emission in the Netherlands from 1980 to 1993 30
TABLE 2.6 Annual average concentrations of acidifying components measured for the Netherlands in 1993 ($\mu g\ m^{-3}$) 43
TABLE 3.1 Ratios of wet deposition fluxes obtained by wet-only and bulk samplers according to Ridder *et al.* (1984) and Van Leeuwen *et al.* (1995) 53
TABLE 3.2 Precipitation monitoring networks in Europe 54
TABLE 3.3 Schmidt and Prandtl number correction in Eqn. 6 for several gases (Hicks *et al.*, 1987) 60
TABLE 4.1 The number of meteorites above a certain mass retrieved by the earth's surface as predicted by Hughes (1992) 95
TABLE 4.2 Internal resistance, R_i, to be used for estimating the stomatal resistance for different seasons and land-use types using Eqn. (4.4), with entities of 9999 indicating no air—surface exchange via that resistance pathway (Adopted from Wesely, 1989) 100
TABLE 4.3 Average R_c values for SO_2 and NH_3 observed under different conditions; negative values denote emissions (Erisman and Wyers, 1993) 102
TABLE 4.4 R_{ext} for NH_3 ($s\ m^{-1}$) over different vegetation categories in Europe, negative values for R_{ext} denote emission for estimating a net upward flux 103
TABLE 4.5 R_c values for soil surfaces, snow-covered surfaces and water surfaces (negative values denote emission) 107
TABLE 4.6 Parametrisations of E values for different components and conditions 108

TABLE 4.7 Surface resistances for different gases during daytime under different pollution climates. 110
TABLE 5.1 Number of grid cells (10 x 10 km) in the Netherlands with median critical loads, divided into classes, and the average and standard deviation of the acid loads for the grid cells in each class 114
TABLE 5.2 Country average dry, wet and total deposition of SOx, NOy, NHx, total nitrogen and potential acid in 1980 - 1993 (mol ha^{-1} a^{-1}) 122
TABLE 5.3 Individual roughness elements as z_0 values, with h = the average tree height in m 127
TABLE 5.4 Average deposition to forests in the Netherlands in 1993 (mol ha^{-1} a^{-1}) 128
TABLE 5.5 Deposition of SOx, NOy, NHx, total nitrogen and total potential acid deposition for each acidification area in the Netherlands in 1980 (mol ha^{-1} a^{-1}) 139
TABLE 5.6 Deposition of SOx, NOy, NHx, total nitrogen and total potential acid deposition for each acidification area in the Netherlands in 1993 (mol ha^{-1} a^{-1}) 140
TABLE 5.7 Dry, wet and total deposition of base cations for each acidification area in the Netherlands in 1993 (mol ha^{-1} a^{-1}) 144
TABLE 5.8 Background wet, dry and total deposition in the Netherlands (mol H^+ ha^{-1} a^{-1}). 177
TABLE 6.1 Average, minimum and maximum measured parameters, and measured and modelled V_d, F and R_c values, with correlation coefficients between modelled and measured values, as well as SD (in parentheses 200
TABLE 6.2 Average dry deposition velocities (m s^{-1}) and correlation coefficients between modelled and measured V_d for dry/wet and daytime and night-time periods, with SD in parentheses 202
TABLE 6.3 Average net throughfall fluxes, and dry and fog deposition estimates for the Speulder forest, along with wet deposition at Speulder Veld (mol $ha^{-1}a^{-1}$) 214
TABLE 6.4 Comparison of net throughfall fluxes with atmospheric deposition (% difference calculated as in Table 6.1) for four periods for which complete wash-off of deposited material was expected 216
TABLE 6.5 Canopy uptake or leaching in Speulder forest estimated using results of different experiments (+ = uptake; - = leaching; 0 = inert or negligible; x = not estimated) 218
TABLE 6.6 Throughfall estimates and total deposition estimates averaged over different locations (mol ha^{-1} a^{-1}) 220
TABLE 6.7 Net throughfall estimates and dry deposition estimates averaged over 30 different locations (mol ha^{-1} a^{-1}) 224
TABLE 6.8 Flux measurements and estimates for different locations in the Netherlands in mol ha^{-1} a^{-1} using different methods 226
TABLE 6.9 Average dry deposition fluxes) for the Speulder forest (mol ha^{-1} a^{-1}) based on measurements (November 1992 - September 1993) and calculated using DEADM (January 1993 - September 1993 228
TABLE 6.10 Total systematic uncertainty (%) in yearly average total deposition flux on different spatial scales for all individual components (1993) 233

TABLE 6.11 Range in annual average R_c values (s m^{-1}) for forests, heathland and agricultural areas 235
TABLE 6.12 Summary of total uncertainty in wet deposition per average grid cell of 50 x 50 km for different areas in the conservative and the worst cases..... 243
TABLE 6.13 Uncertainty of key factors influencing deposition estimates of S and oxidised and reduced N in different pollution regions in Europe 247
TABLE 7.1 Overview of methods and equipment used during the Elspeetsche Veld experiment. 255
TABLE 7.2 Criteria for acceptance of observations and no. of observations rejected (total no. of measurements: 5298 two hourly average periods). 256
TABLE 7.3 Average SO_2 R_c (4 m) values (± uncertainty estimates) for selected daytime and night-time and dry and wet conditions at Elspeetsche Veld. 257
TABLE 7.4 Annual average dry deposition parameters for SO_2 at Elspeetsche Veld (4 m height). For the resistances the harmonic averages (± uncertainty estimates) are presented. 259
TABLE 7.5 Annual average SO_4, NO_3 and NH_4 throughflow fluxes and bulk deposition (mol ha^{-1} a^{-1}). The standard deviation is given between brackets (Bobbink *et al.*, 1990)..... 263
TABLE 7.6 Overview of stand structure characteristics of the 30 forest stands 281
TABLE 7.7 Overview of stand structure characteristics of single tree species 282
TABLE 7.8 Mean dimensions of needles from Douglas fir and Scots pine trees, with *SD* in parentheses (n = 150)..... 283
TABLE 7.9 Correlation matrix between net throughfall fluxes and canopy structure characteristics for the 30 forest stands 284
TABLE 7.10 Interrelationships between the individual canopy structure characteristics of the 30 forest stands 287
TABLE 7.11 Canopy and edge structure characteristics of the eight forest edges, showing averages of 7 or 8 recordings (structure characteristics were determined around each throughfall gutter) with the exception of porosity and the roughness length of the upwind terrain..... 291
TABLE 7.12 Whole-edge integrated net throughfall enhancement (*WEINTE*) factors for the eight forest edges (x = mean of all edges)..... 297
TABLE 7.13 Ratio between the net throughfall flux at x/h = 0.25 and that at x/h = 5 for the eight forest edges 298
TABLE 7.14 Correlation matrix between whole-edge integrated net throughfall enhancement (*WEINTE*) factors and canopy/edge structure characteristics for the eight forest edges 299
TABLE 7.15 Whole-edge integrated net throughfall enhancement (*WEINTE*) factors in relation to the edge aspect..... 303
TABLE 7.16 Soil chemical and texture data for the Speulder forest (Van Breemen and Verstraten, 1991) 313
TABLE 7.17 Correction factor for flux profile functions over the Speulder forest (Bosveld, 1991). 316

TABLE 7.18 Selection criteria for gradients measured over the Speulder forest and the percentage of measurements left after selection (total remaining: 2345 hours of continuous SO_2 measurements, 220 hours NO_2 measurements and 756 hours continuous NH_3) 319
TABLE 7.19 Average deposition parameters for SO_2, with standard deviations in parentheses 320
TABLE 7.20 Average deposition parameters for NH_3, with standard deviations in parentheses 325
TABLE 7.21 An overview of experiments performed at the Speulder forest site to quantify particle dry deposition 329
TABLE 7.22 Characteristic features of some models describing the dry deposition of particles to vegetation and water surfaces (Ruijgrok *et al.*, 1994) 331
TABLE 7.23 Component specific-size distributions (mass median diameter, *MMD*, and geometrical standard deviation, σ_g) derived from measurements in the Netherlands.... 334
TABLE 7.24 Model performance indicators[a] and averages for the different comparison studies 335
TABLE 7.25 Average uptake and leaching amounts at the Speulder forest derived from field experiments and modelling (mol ha^{-1} a^{-1}) (Draaijers *et al.*, 1994) 337
TABLE 7.26 Average fluxes at Speulder forest in 1987-1993 (mol ha^{-1} a^{-1}) 339
TABLE 7.27 Estimates of the deposition of acidifying components between 1950 and 1994 for the Speulder forest site (mol ha^{-1} a^{-1}) 340
TABLE 7.28 Critical levels for forests in Europe 342
TABLE 7.29 Critical acid loads for Speulder forest based on different effects (mol ha^{-1} a^{-1}) 343
TABLE 7.30 Critical N loads for Speulder forest based on different effects (mol ha^{-1} a^{-1}) .. 343
TABLE 7.31 Possible effects on forest ecosystems of increased atmospheric N+S loading and exposure to SO_2, NOx, NH_3 and/or O_3 345
TABLE 7.32 Critical loads, exceedances and effects observed at Speulder forest 347