

Contents

Vegetation	13
1.1. Introduction	13
1.2. The Electrostatic Charged Aerosol Monitor (ECAM)	14
I.3. The Atmospheric Aerosol Observatory (AAO) at Nocé	16
I.4. The updrift-downdrift cycle	20
I.5. The acid rain problem	21
I.5.1. The fog period	25
I.5.2. The thunderstorm period	25
I.5.3. The chemical signals	26
I.5.4. Analysis	29
I.5.5. Selective deposition	30
I.6. Pesticide spraying	36
I.7. Vegetation under very high electric stress	39
I.7.1. The crown removal mechanism	47
I.7.2. The Leaves	51
I.7.3. Pisciculture	53
I.7.4. Types of trees involved	59
I.8. Vegetation under natural electric stress	61
I.8.1. Forests	63
I.8.2. Deserts	66
I.8.3. Hedges	69
I.9. The world of pollen and spores	74
I.9.1. Introduction	74
I.9.2. Observations	75
I.9.3. Particle charging	80
I.9.4. Pollen as air cleaner	83
I.9.5. Pollen sampling	84
I.10. Conclusion	86
The habitat puzzle	89
II.1. Historical	89
II.2. The clean air syndrome	91
II.2.1. Introduction	91
II.2.2. The respiratory system	93
II.2.3. The coexistence between particles	94
II.2.4. The vacuum cleaner	96
II.2.5. The particle-free habitat	98

II.3. Electricity	100
II.3.1. Introduction	100
II.3.2. Distribution	100
II.3.3. Lighting	102
II.3.4. Some remarks on comfort	105
II.3.5. Electrical heating	109
II.4. Electrical fields	114
II.4.1. Introduction	114
II.4.2. Open fire	114
II.4.3. The TV set	119
II.4.4. Upholstery	126
II.5. Electrostatic air cleaners and ionizers	132
II.5.1. Introduction	132
II.5.2. What do they have in common?	133
II.5.3. What is the difference?	139
II.6. Health effects	141
II.6.1. Introduction	141
II.6.2. Air conditioning and climate control	142
II.6.3. Equipment	148
II.6.4. Charged particles and health	152
II.7. Conclusion	161

The atmosphere is not what it is popularly believed to be 163

III.1. Introduction	163
III.2. Particles in the atmosphere	166
III.2.1. General	166
III.2.2. Particles and albedo	167
III.2.3. Condensation nuclei	167
III.3. Pollution sources	170
III.3.1. General	170
III.3.2. Forest fires	171
III.3.2. Car emissions	177
III.3.3. The electrostatic precipitator	184
III.4. Transport and sinks	193
III.4.1. General	193
III.4.2. Dust	194
III.4.3. Selective deposition	199
III.4.4. Visibility, ozone layer, and nitrates	206
III.4.5. Torrential rains	209

III.4.4. Visibility, ozone layer, and nitrates	206
III.4.5. Torrential rains	209
III.5. Interesting atmospheric phenomena	212
III.5.1. Self-sustained electrical storms	212
III.5.2. Fair weather lightning	222
III.5.3. Aircraft accidents	225
III.5.4. Earthquakes	229
III.5.5. The dino climate	232
IV. References	235
Section 2	237
Vertical potential gradients and electric fields	239
1.1. History	239
1.2. Definition	242
1.3. Earth's Vertical Potential Gradient	244
1.3.1. The electrosphere	244
1.3.2. Fair weather variations	244
1.3.3. Thunderstorm variations	245
1.3.4. Normal weather variations	246
1.4. Consequences of high electric fields	248
1.5. Triboelectricity	250
1.6. Space charges	254
1.7. Field-free space	256
1.8. High voltage lines	259
1.9. Outdoor and indoor fields	261
1.9.1 In general a house resembles a Faraday Cage.	261
1.10. Other indoor fields	263
1.11. Field variations through motion	267
1.12. Electrical field measurements	269
1.13. References	275
Gas and electricity	279
2.1. Ionization	279
2.2. Cosmic rays	284
2.3. Radioactivity	286
2.4. Electrical gas discharges	290
2.4.1. Collection of atmospheric charges	290
2.4.2. The Townsend regime	290

2.5. Photoionization	299
2.6. Ionization by combustion	301
2.7. Various effects of ionization	309
2.7.1. The Lenard effect	309
2.7.2. Zeleny's observations	309
2.7.3. The Wilson's observations	312
2.7.4. Mühleisen's observations	313
2.7.5. Possible coherence	315
2.8. Measuring Methods	316
2.8.1. General	316
2.8.2. The ion counter	317
2.8.3. The ion counter and a combustion space charge	318
2.9. References	320

The electric field, mixture of ions and airborne particles 323

3.1. Introduction	323
3.1.1. What's in a name?	323
3.1.2. Definitions	324
3.1.3. Particle sizes	325
3.1.4. Particle modification and activation	327
3.2. Electrical activation	328
3.2.1. Extra particle activation	328
3.2.2. Electrostatic forces	331
3.2.3. Mobility	332
3.2.4. Particle Charging	334
3.3. Natural extra activation of airborne particles	335
3.3.1. Energy rich particles	335
3.3.2. The Boltzmann charge equilibrium	338
3.3.3. Gaseous discharges	342
3.3.4. Vegetation	343
3.3.5. Photoactivity	347
3.4. Artificial extra activation of airborne particles	348
3.4.1. Electrostatic precipitation	348
3.4.2. Diffusion charging	349
3.4.3. Field or bombardment charging	350
3.4.4. Back discharge	358
3.4.5. Conversion and selective deposition	361
3.4.6. Electrode behaviour	364

3.5. Measuring methods	374
3.5.1. General	374
3.5.2. Measuring capacitor	374
3.5.3. The filter method	376
3.5.4. The induction method	377
3.5.5. The discharge variation method	377
3.6. References	379
INDEX	381