Tananyagfejlesztés idegen nyelven

Készítette:
Prof. Anda Angéla, egyetemi tanár

Prevention of the atmosphere (45 lessons, 3 credits)

1. lesson The spheres, the atmosphere included. Components of the atmosphere
2. lesson Traces in the air. Some calculations of the physical properties of the atmosphere
3. lesson The vertical stratification of the atmosphere. Characterization of the air layers
4. lesson The atmospheric pressure
5. lesson Actual weather in cyclone and anticyclone. Drawing an iso-map
6. lesson Basics in air temperatures. The gas laws
7. lesson Air motion types with their impacts (some examples)
8. lesson The advection – global and local level. Forces of forming the advection I. Pressure gradient force
9. lesson Forces of forming the advection II. Coriolis force. Gravitational force. The equation of air motion
10. lesson The convection. Types and influence on the environmental processes. Turbulent diffusion
11. lesson Study the turbulent diffusion. The turbulent coefficient. Impact of air temperature in air pollution – the air stability I.
12. lesson Impact of air temperature in air pollution – the air stability II. Pressure systems and air pollution
13. lesson Definition of environmental pollution.The environmental load. Processes of air contamination.
14. lesson Air pollutant groups: gaseous materials with their features. SO_2 and NO_x I.
15. lesson Air pollutant groups: gaseous materials with their features NO_x II. The ammonia
16. lesson Gas pollutants is the air: - carbon-oxides, VOC and methane
17. lesson Methane II. Secondary pollutant in the air - PAN
18. lesson Aerosols in the atmosphere. Their size and distribution. Sources of particulates
19. lesson Persistent Organic Pollutants with their protocol. Emission source configurations
20. lesson Estimation of environmental loads. Scaling of the atmospheric processes timescales included
21. lesson Vertical transport in the air – the turbulent diffusion. Residence time in the atmosphere – groups of traces
22. lesson Basics in radiation studies (emission, absorption). Radiation laws I. Planck's law Wien's law
23. lesson Radiation laws II. The Stefan-Boltzmann's law. The Kirchoff's law. The scattering I. The Raleigh scattering
24. lesson The scattering II. (The Mie scattering). Consequences of scattering in air quality. The albedo – values, sizes. Radiation transfer equation
25. lesson Solar radiation types. Radiation absorption in the air – consequences. Passive remote sensing. Radiation balance (short wave)
26. lesson Radiation balance (long wave). Net radiation. Energy balance of the Earth-Atmosphere system
27. lesson The components of the heat balance. The radiative forcing (values). Climate sensitivity parameter. GWP
28. lesson Direct impact of clouds and aerosols on global warming process. The whitehouse effect
29. lesson Dilemmas in global warming. Impact of black carbon
30. lesson Indirect influence of atmospheric aerosols. The ABC, their impact. Size of danger. Dilemmas again…
31. lesson Calculation of the size of greenhouse effect
32. lesson The carbon cycle. Global carbon budget and its members

33. lesson Reservoirs and their role in the Earth atmosphere system (carbon cycle). Air – see also the earlier lesson. Biosphere. Oceans. Earth crust
34. lesson Chemical (photochemical) reactions of the air. The role of oxygen (ozone)
35. lesson The history of ozone transformations (stratosphere). The Chapman cycle
36. lesson The Crutzen pathway (ozone-oxygene cycle). The effect of CFCs on upper air layer – the ozone harm
37. lesson Environmental contamination: from local to global level. Impact of ground level ozone – introduction of photochemical smog formation
38. lesson Catalyzed tropospheric ozone formation
39. The Los Angeles smog with its leisure
40. lesson History of great London smog (1952) – some facts. The weather during the great London smog I.
41. lesson The weather during the great London smog II. The impact of smog compounds (SO_2). Last step of London smog – the acidification
42. lesson Chemical reactions leading to increased acidity of the air (rainfall)
43. lesson The Janus faced influence of regional level acid rains: local impacts are also included. Different attacking points locally
44. lesson Impacts on land ecosystems. Effects on aquatic ecosystems
45. lesson Modeling the transport of pollutant in the air. Gaussian model. Euler model. Lagrange model

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http://en.wikipedia.org/wiki/Polar_stratospheric_cloud
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Questions (scheme of the study)

1. Definition of the atmosphere
2. The blue planet
3. Role of the spheres
4. Composition of the “clear” atmosphere
5. The most important traces in the air
6. The mass of the air
7. The upper limit of the atmosphere
8. Vertical structure of the atmosphere; the air stratification
9. Optical properties of the atmosphere
10. The state variables of the atmosphere
11. Pressure formations in the atmosphere
12. Pressure formations and the associated weather
13. Role of iso-maps in evaluation of atmospheric contamination
14. Air temperature – surface temperature
15. Air density
16. Relationship between the state variables – gas laws
17. Dry air properties
18. Wet air properties
19. Relationship between the atmosphere and environmental (atmospheric) pollution
20. Different types of air motion
21. Air motion groups on the basis of direction of air, in connection to air contamination
22. Horizontal air motion – local level
23. Horizontal air motion- global level
24. Forces of forming advection
25. Wind direction deflection in the two Hemispheres
26. Impact of surface roughness and gravitation
27. Importance of advection in transport of pollutants
28. The 2nd type of air motion: the convection
29. Types of convection
30. Importance of convective transport of air pollutants

31. The turbulent diffusion
32. Importance of turbulent diffusion in pollutant mixing
33. Impact of air temperature on pollution: Stability of the air
34. Adiabatic lapse rates and their role
35. Vertical temperature variations
36. Pressure systems and air pollution connection
37. Environmental pollution: definition
38. The pollutant release – the emission
39. Transmission of the pollutant
40. Role of the weather in contamination of the atmosphere
41. Immission (ambient air quality)
42. Deposition of pollutants
43. The sulphur compounds in the air
44. The role of NOx in the air
45. the ammonia in the air
46. Carbon oxides in the air
47. Volatile Organic Compounds (VOCs); non-methane VOC
48. Methane in the air
49. Secondary pollutants in the air: the troposheric ozone
50. Secondary pollutants in the air: the PAN
51. Aerosols – particles in the atmosphere
52. Distribution curve of aerosols – the three modes
53. natural sources of particles
54. Antropogen sources of particles
55. Persistent Organic Pollutants (POPs)
56. Air Pollution Protocol for POPs
57. Pollutant source configurations
58. Emission estimations
59. Timescales in environmental pollution and their impacts
60. Horizontal and vertical scaling of the atmosphere (timescales)
61. Vertical transport in the air
62. Atmospheric residence time (definition)
63. Residence time of the most important air species (contaminants)
64. Calculation of residence time of methane
65. Importance of radiation in air contamination
66. Fundamentals to radiation transfer (Electromagnetic spectrum of the Sun with light spectra)
67. The emission and absorption of energy
68. The black body
69. Planck's radiation law
70. Stefan-Boltzman law
71. The role of scattering in atmospheric pollution
72. Types of scattering . The albedo
73. Radiation transfer equation
74. The passive remote sensing
75. Radiation balances in the air
76. The heat balance and its components
77. Energy balance of the Earth-Atmosphere system
78. Definition of radiative forcing
79. Climate sensitivity parameter

80. Feedbacks in the forming of our climate
81. Global warming potential (GWP)
82. The uncertainties in assessing the global warming
83. Clouds – direct effect in process of warming
84. Direct impact of aerosols – whitehouse effect
85. The effect of albedo on climate
86. Dilemmas in evaluation of size of global warming
87. Influence of black carbon (aerosol)
88. Aerosol mixing variations
89. Indirect effect of aerosols
90. ABC – atmospheric brown clouds
91. Temperature definitions and calculations
92. The size of greenhouse effect
93. The global carbon cycle
94. The role of the atmospheric reservoir
95. CO_2 sources
96. The methane as a member of carbon cycle
97. Role of the biosphere in carbon budget
98. Role of the oceans in carbon budget
99. The Earth crust as the slowest reservoir
100. Chemical reactions in the air
101. Processes of photochemical reaction
102. Oxygen in the atmosphere
103. Ozone in the troposphere and in the stratosphere (the Janus face…)
104. Sink and reservoir species in the air
105. History of ozone study in the ozonosphere. The processes in the Antarctic
106. Ozone-oxygen cycle – the Chapman cycle
107. The Crutzen pathway
108. Impact of CFCs and halon on ozone depletion
109. From global to local level environmental effects
110. Ozone in the troposphere
111. Ozone precursors in the lower atmosphere
112. Formation and depletion of tropospheric ozone
113. The role of VOC in ozone reactions
114. Term smog and it's history
115. Scheme of Los Angeles smog formation
116. Assumptions of smog formation
117. Areas strongly affected by Los Angeles smog
118. Influences of Los Angeles smog (crops, humans)
119. Brief history of London smog
120. Most important components of London smog
121. The weather happenings in London (1952)
122. The impact of London smog on health
123. The Clean Air Act – role and success
124. Regional environmental problem: Acid rains (acid deposition)
125. Mass transfer between gases and cloud droplets
126. Components of acid deposition
127. PH of the air; reasons and consequences
128. Reactions forming the components of acid deposition
129. Touched areas in the world (acid deposition)

130. Local impacts: the man-made environment
131. Effects on the human health
132. Regional impact of acid rains: land ecosystems – forests
133. Regional impact of acid rains: water ecosystems -lakes
134. Pollutant transport in the air. The Gaussian model
135. Pollutant transport in the air. The Lagrange model
136. Pollutant transport in the air. The Euler model