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Numerical Models and Methods of Atmospheric Parameters Originating in the Formation of the Earth's Climatic Cycle

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Abstract

Atmospheric models are physical equations based on the ideal gas law. Applied to the atmosphere, this law yields equations for water, vapor (gas), ice, air, humidity, dryness, fire, and heat, thus defining the model of key atmospheric parameters. The distribution of these parameters across the entire planet Earth is the origin of the formation of the climatic cycle, which is a normal climatic variation. To do this, the Earth is divided into eight (8) parts according to the number of key parameters to be defined in a physical representation of the model. Following this distribution, numerical models calculate the constants for the formation of water, vapor, ice, dryness, thermal energy (fire), heat, air, and humidity. These models vary in complexity depending on the indirect trigonometric direction and simplicity in the sum of neighboring models. Note that the constants obtained from the equations yield 275.156˚K (2.006˚C) for water, 273.1596˚K (0.00963˚C) for vapor, 273.1633˚K (0.0133˚C) for ice, 0.00365 in/s for atmospheric dryness, 1.996 in^2/s for humidity, 2.993 in^2/s for air, 1 J for thermal energy of fire, and 0.9963 J for heat. In summary, this study aims to define the main parameters and natural phenomena contributing to the modification of planetary climate.

Keywords

Atmospheric Parameter 1, Climatic Cycle 2, Numerical Models 3

1. Introduction

The climatic variations of planet Earth can be attributed to natural processes resulting from cycles or eruptions of atmospheric parameters. However, the main cause of climatic cycles dates back to the very creation of Earth to support life [1] [2]. The planet generates atmospheric parameters, namely air, water, gas, ice, dryness, humidity, fire, and heat, which are partially the nuclei of climatic cycle formation. The correlation of these parameters can influence the planet by dividing it into main and medium climatic cycles [3] [4]. This article aims: to determine the main atmospheric parameters and climatic cycles of Earth, according to a physical model (**Figure 1**); to define the correlations of formation of the main climatic cycles and their terrestrial locations (**Table 1**); to derive the equations of the numerical model of the defined atmospheric parameters in **Figure 1** (**Table 2**); and finally, to calculate the formation constants of the parameters governing planet Earth [5] [6]. This study also includes an analytical part on two figures highlighting the triple point of gas, water, and ice temperature and the special distribution of the flow of dry, humid, and air parameters. However, the major concern of physicists and researchers focuses on climates, emphasizing the heterogeneity of environments on the surface of the Earth [7] [8].

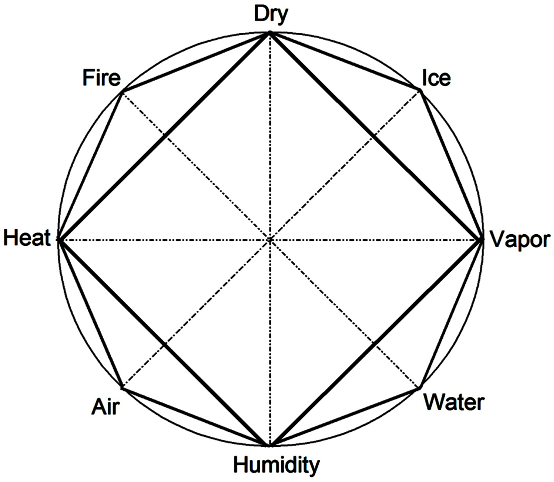


Figure 1. Physical model of atmospheric parameters and climatic cycle.

Table 1. Main parameters and climatic cycle of planet earth.

CLIMATES					
Type	**Cold**	**Temperate**	**Desert**	**Tropical**	**Equatorial**
Origin Stimulating Parameters	Dry + Vapor	Dry + Heat	Heat + Vapor	Humid + Vapor	Heat + Humid
Specific Characteristic Parameters	Ice	Fire (frequent bushfires)	- Day: Dry (high temperature) - Night: Humid (low temperature)	Water (abundant rainfall)	Air (warm and humid air)
Location	- Polar regions - Mountainous regions	Polar circles	Tropics	Near equator	Equator

+: mixture.

Table 2. Constants of atmospheric parameters formation.

Parameters	Vapor (gaseous body) (˚K)	Ice (solid solid) (˚K)	Water (liquid body) (˚K)	Dry (in/s)	Humidity (in^2/s)	Air (in^2/s)	Fire (J)	Heat (J)
Constants	273.1596 (0.00963˚C)	273.1633 (0.0133˚C)	275.156 (2.006˚C)	0.00365	1.996	2.993	1	0.9963
Altitude (Km)	[0 - 4.25]	[1.5 - 4]	[0 - 3.75]	[0 - 4.5]	[0 - 8]	[0 - 2.25]	[0 - limit atmospheric]	[0 - 4.5]

2. Description of Physical Model

The physical model of atmospheric parameters defines the set of climatic variations that occur within the Earth's atmosphere. Figure 1 presents eight key parameters that come together to form the Earth's climatic cycle. Indeed, climate varies differently across geographical scales.

3. Numerical Results

3.1. Combination of Parameters

There are five (5) major types and regions of climates, depending on the combination of parameters (Table 1). Thus, each type of climate is represented by its stimulating origin parameters and its specific parameters that characterize it. The localization of the climatic model divides the planet Earth into five (5) climatic regions according to each type of climate, namely the polar and mountainous region which hosts the cold climate, the polar circle for the temperate climate, the equator for the equatorial climate, the near equator for the tropical climate, and the tropics for the desert climate.

3.2. Mathematical Formulation of Equations Governing of Atmospheric Parameters

The following numerical models represent the equations of atmospheric parameters derived from the physical model in Figure 1.

Equations are as follows:

Equation for vapor (gas),

$$E_{vapor} = \frac{PM}{\rho R} \quad (1)$$

Equation for dry

$$E_{dry} = \frac{1}{1+\frac{PM}{\rho R}} \quad (2)$$

Equation for heat

$$E_{heat} = \frac{1}{1+\frac{\rho R}{PM}} \quad (3)$$

Equation for humidity

$$E_{hum.} = 1 + \frac{1}{1 + \frac{\rho R}{PM}} \tag{4}$$

Equation for ice

$$E_{ice} = 1 + \frac{1}{\frac{\rho R}{PM} + \left(\frac{\rho R}{PM}\right)^2} \tag{5}$$

Equation for fire

$$E_{fire} = \frac{1}{1 + \frac{PM}{\rho R}} + \frac{1}{1 + \frac{\rho R}{PM}} \tag{6}$$

Equation for air

$$E_{air} = 1 + \frac{2}{1 + \frac{\rho R}{PM}} \tag{7}$$

Equation for water

$$E_{water} = 3\left(1 + \frac{1}{\frac{\rho R}{PM} + \left(\frac{\rho R}{PM}\right)^2}\right) \tag{8}$$

With:

P: pression for air (Pa);

M: molar mass for air (Kg/mol);

R: universal constante for gaz (J/K·mol);

ρ: volumic mass for air (Kg/m^3).

Proof of theorems.

Proof of Theorem 1. Note that $\exists x P(x)$ it is enough to expose a value x which satisfies $P(x)$. For $\forall x P(x)$ to be $\neg\exists x \neg P(x)$ it is necessary that. Theorem 1 is true if $E_{vapor} \le 273.1596\neg$;

Proof of Theorem 2. Note that $E_{vapor} \to E_{dry}$ is equivalent to its contrapositive $\neg E_{dry} \to \neg E_{vapor}$. Which means that the integral $\int E_{vapor} \to E_{dry};\neg$. Theorem 2 is true if $E_{dry} \le 0.00365\neg$;

Proof of Theorem 3. Note the fact that $E_{dry} \to E_{heat}$ is equivalent to its contrapositive $\neg E_{heat} \to \neg E_{dry}$. Which means that the integral $\int E_{dry} \to E_{heat}\neg$ and the equivalent $\iint E_{vapor} \to E_{heat};\neg$. Theorem 3 is true if $E_{heat} \ge 0.9963\neg$;

Proof of Theorem 4. Note the fact that $E_{heat} \to E_{hum}$ is equivalent to its contrapositive $\neg E_{heat} \to \neg E_{hum}$. Which means that the integral $\int E_{heat} \to E_{hum}\neg$ and the equivalent à $\iiint E_{vapor} \to E_{hum};\neg$. Theorem 4 is true if $E_{hum} \ge 1.996\neg$;

Proof of Theorem 5. Note that $\left(E_{vapor} \vee E_{dry}\right) \to E_{ice}\neg$ is equivalent to $\left(E_{vapor} \to E_{ice}\right) \wedge \left(E_{dry} \to E_{ice}\right);\neg$. Theorem 5 is true if $E_{ice} \cong 273.1633\neg$;

Proof of Theorem 6. Note that $\left(E_{dry} \vee E_{heat}\right) \to E_{fier}\neg$ is equivalent to

$\left(E_{dry} \to E_{fier}\right) \wedge \left(E_{heat} \to E_{fier}\right); \neg$. Theorem 6 is true if $E_{fier} = 1\neg$;

Proof of Theorem 7. Note the fact that $\left(E_{heat} \vee E_{hum}\right) \to E_{air}\neg$ is equivalent to $\left(E_{heat} \to E_{air}\right) \wedge \left(E_{hum} \to E_{air}\right); \neg$. Theorem 7 is true if $E_{air} \ge 2.993\neg$;

Proof of Theorem 8. Note that $\left(E_{hum} \vee E_{vapor}\right) \to E_{water}\neg$ is equivalent to $\left(E_{heat} \to E_{water}\right) \wedge \left(E_{hum} \to E_{water}\right); \neg$. Theorem 8 is true if $E_{water} \ge 275.156\neg$.

4. Discussion

Considering temperature and atmospheric pressure, the triple point is the point on the temperature-pressure phase diagram of liquid, gas, and solid bodies. The thermodynamic triple point temperature of the three phases is at 273.16˚K, which is 0.01˚C. The liquid, gas, and solid phases coexist, hence the temperature for the formation of water (rain) is 275.1559˚K (or 2.006˚C for the liquid state), for vapor is 273.1596˚K (or 0.00963˚C for the gas state), and finally, the temperature for the formation of ice is 273.1633˚K (or 0.0133˚C for the solid state). Figure 2 illustrates the coexistence of the three states at particular points. These curves separating stability domains between phases converge at points where water can exist in three states (liquid, gas, and/or solid). At the Earth's surface, at sea level ambient pressure (101.325 kPa), water is stable as a solid state below 273.15˚K and as a liquid state above 273.15˚K. The gaseous state is never the stable state of water at the Earth's surface (Figure 3(d)).

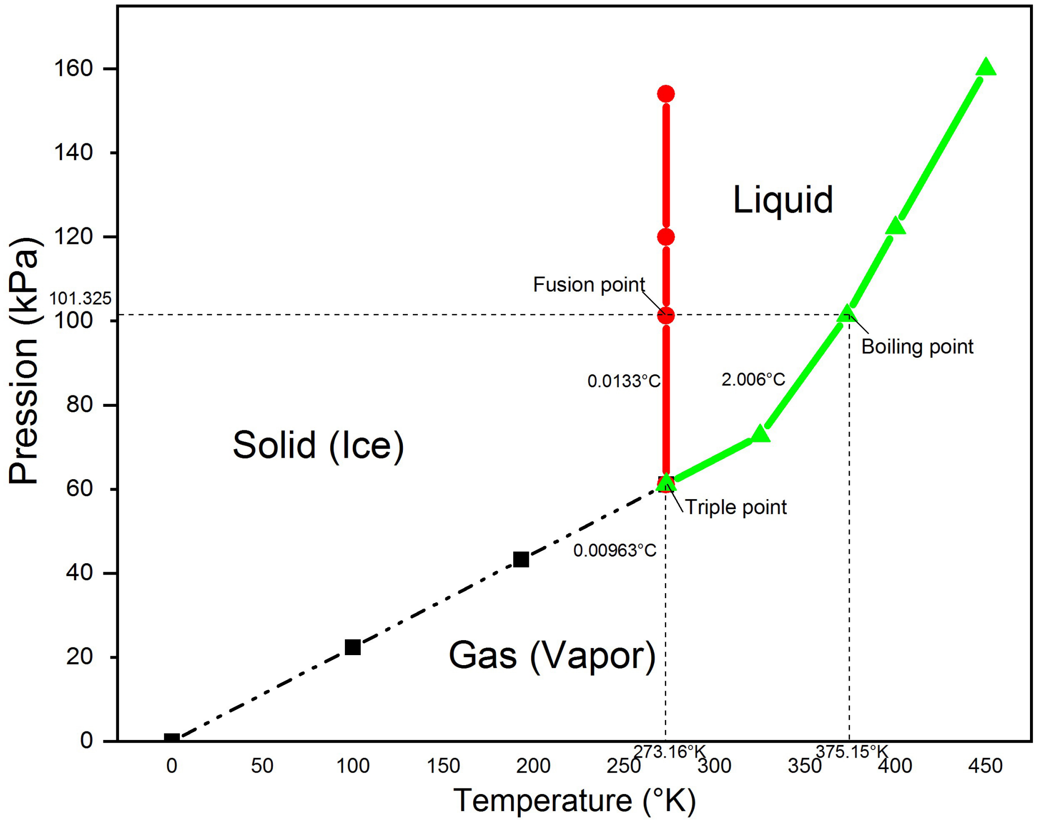
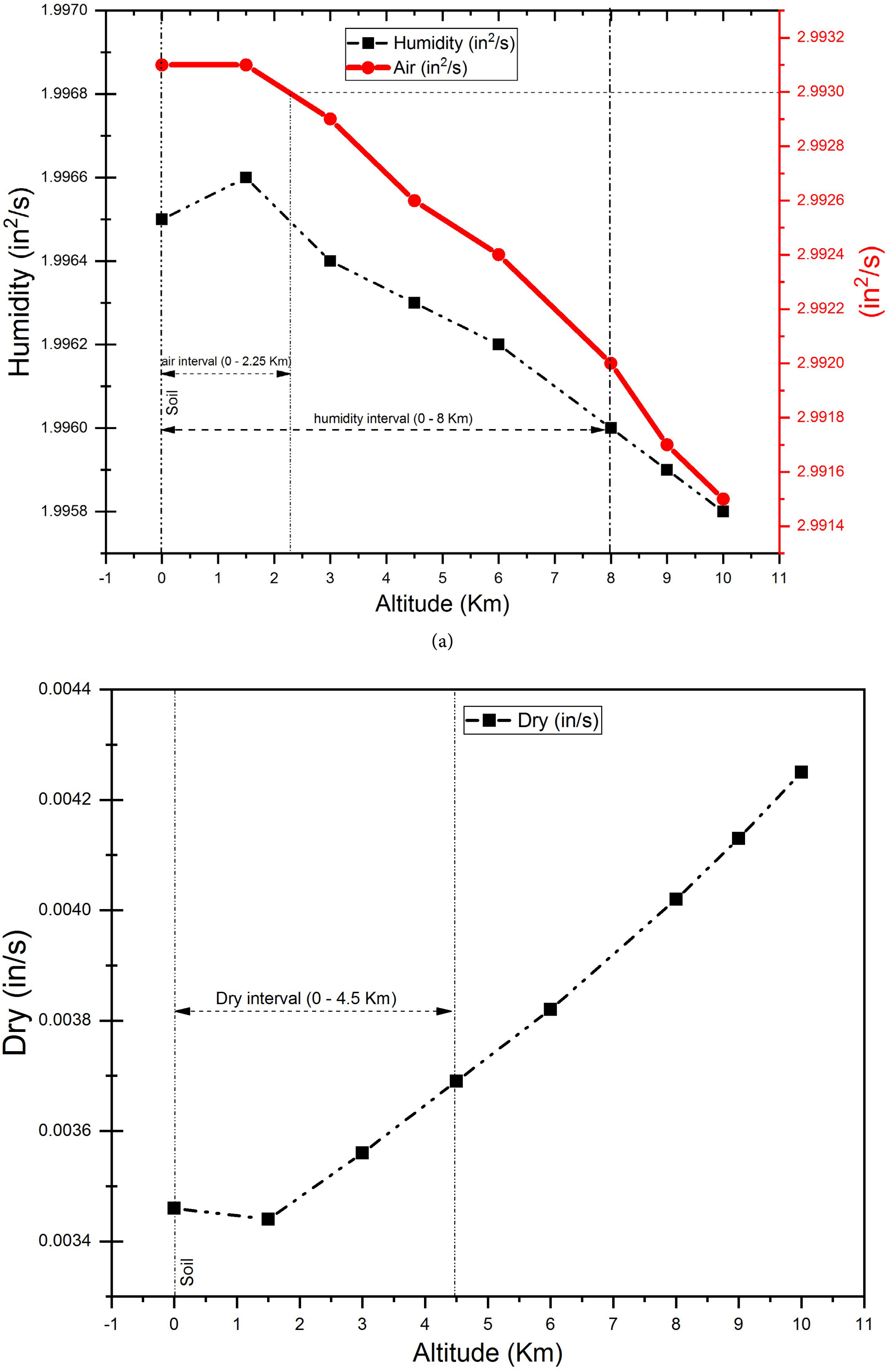
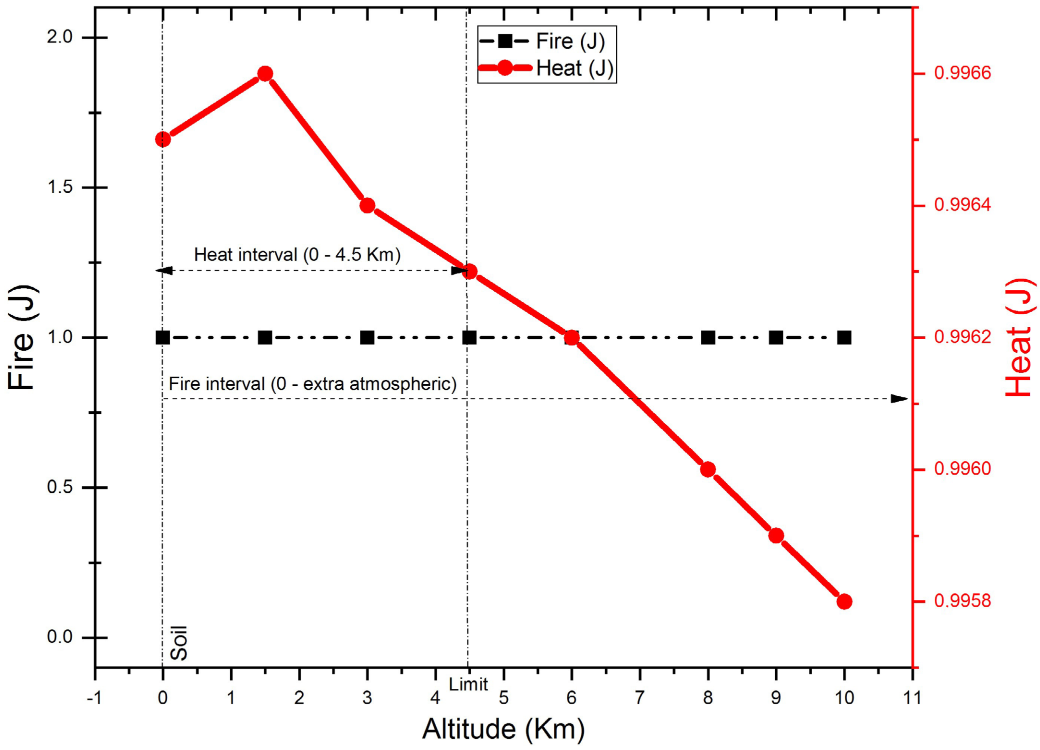


Figure 2. The triple point of atmospheric temperature.

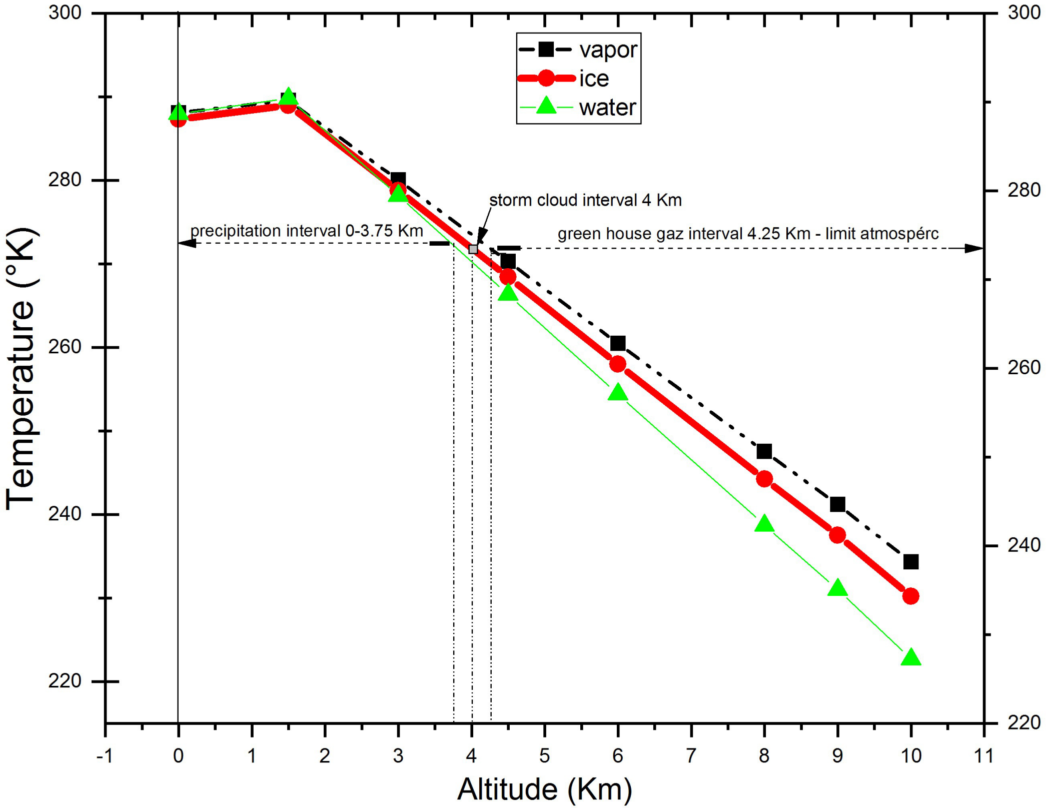

Humidity (in^2/s)
Air (in^2/s)
Humidity (in^2/s)
(in^2/s)
1.9970
1.9968
1.9966
1.9964
1.9962
1.9960
1.9958
2.9932
2.9930
2.9928
2.9926
2.9924
2.9922
2.9920
2.9918
2.9916
2.9914
air interval (0 - 2.25 Km)
humidity interval (0 - 8 Km)
Soil
-1
0
1
2
3
4
5
6
7
8
9
10
11
Altitude (Km)
Dry (in/s)
Dry (in/s)
0.0044
0.0042
0.0040
0.0038
0.0036
0.0034
Dry interval (0 - 4.5 Km)
Soil
-1
0
1
2
3
4
5
6
7
8
9
10
11
Altitude (Km)

(a)

(b)



(c)



(d)

Figure 3. Spatial distribution of atmospheric parameter fluxes.

Similarly, considering the flow of parameters, the dry atmosphere, humidity, and air coexist within the atmosphere at disparate formation points. At the Earth's surface, with an ambient pressure of 101,325 Pa, the flow (velocity) of dry atmosphere or dryness is 0.00365 in/s. This value represents the rapidity of ignition in dry and temperate zones of the Earth's environment. The values 1.996 in^2/s and 2.993 in^2/s represent the viscosity of the flow at the formation of humidity and air parameters, respectively (**Table 2**). Thus, the curves in **Figure 3** show the variations in the flow of the three atmospheric parameters in the Earth's space. Since atmospheric pressure decreases with increasing altitude, the curves show a considerable decrease in the three parameters. In the range from 0 to 15 km altitude (marking the troposphere), the presence of air, humidity, and dryness is relatively significant from the Earth's surface according to the interval 0 to 2.25 for Km air, 0 to 8 Km for humidity, and 0 to 4.5 Km for dry; and becomes rare when we gain height to the troposphere's limit (**Figure 3(a)** and **Figure 3(b)**). Air, humidity, and dryness do not reach into the stratosphere (15 to 50 km altitude), the mesosphere (50 to 80 km altitude) and the ionosphere the extra-atmospheric zone (**Figure 3(a)**).

The atmospheric warming is defined by the thermal energy of fire propulsion and heat in the Earth's atmosphere. This energy is activated by the agitation of atmospheric parameters, dryness, and heat. The higher the temperature of a body, the higher the movement of its constituent molecules. The thermal energy in temperate regions, which stimulates bushfires, is 1 J with a heat transfer of 0.9963 J, resulting in a difference of 0.0037 J at a pressure of 101,325 Pa (**Table 2**). The decrease in atmospheric pressure leads to a decrease in these parameters (**Table 3**). Thus, the vertical evolution towards the atmospheric limit results in a progressive decrease in thermal energy from heat (**Figure 3(c)**). But the thermal energy of the fire remains invariable depending on the altitude. Thus, fire is a parameter which has an indefinite limit interval. Fire and heat are two coexisting parameters of the very low atmosphere.

Table 3. Values of the distribution of atmospheric parameters according to altitude.

	Atmospheric Parameters							
Altitude (Km)	0	1.5	3	4.5	6	8	9	10
Vapor (˚K)	288.099	289.602	280.052	270.279	260.469	247.541	241.210	234.349
Ice (˚K)	288.103	289.605	280.055	270.283	260.472	247.545	241.215	234.354
Dry (in/s)	0.00346	0.00344	0.00356	0.00369	0.00382	0.00402	0.00413	0.00425
Fire (J)	1	1	1	1	1	1	1	1
Heat (J)	0.9965	0.9966	0.9964	0.9963	0.9962	0.9960	0.9959	0.9958
Air (in^2/s)	2.9931	2.9931	2.9929	2.9926	2.9924	2.9920	2.9917	2.9915
Humidity (in^2/s)	1.9965	1.9966	1.9964	1.9963	1.9962	1.9960	1.9959	1.9958
Water (˚K)	290.096	291.598	282.048	272.276	262.465	249.537	243.206	236.345

Table 2 contains the values of constants of atmospheric parameters calculated from numerical models. The units of measurement for these values are in degrees Kelvin (˚K) for the temperature of vapor, ice, and water parameters; in inch/second (in/s) for the velocity (linear speed) of dryness parameter; in in^2/s for the viscosity of humidity and air parameters, and finally in Joule (J) for the thermal energy of fire and heat parameters.

5. Conclusion

The climate of the planet, considered as a whole, is primarily determined by atmospheric parameters. However, the division of the Earth into latitudinal and longitudinal zones creates regional climates such as glacial, temperate, desert, tropical, and equatorial climates. These regions and climatic cycles are the only phenomena where variations in atmospheric pressure lead to the formation of specific climatic parameters, and vice versa. Indeed, fluctuations in atmospheric pressure result in significant changes in temperature, flow, and warming of the Earth's parameters. Thus, on the Earth's surface, variation changes the state of surface water into ice and water vapor and alters the state of soil and vegetation by producing droughts and bushfires. In the Earth's atmosphere, the formation of air, humidity, heat, and the process of condensation of water vapor and precipitation are also produced due to pressure variation. However, from process to process, the Earth's climate varies naturally, with or without human intervention, following cycles and punctual events.

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Author Contributions

Conceptualization, I. W. D. A.; methodology, I. W. D. A., and K. W. N. D.; formal analysis, I. W. D. A.; investigation, O. I.; writing—review and editing I. W. D. A.; visualization, I. W. D. A. and Y. K. All authors have read and agreed to the published version of the manuscript. Please turn to the CRediT taxonomy for the term explanation. Authorship must be limited to those who have contributed substantially to the work reported.

Conflicts of Interest

The authors declare no conflicts of interest.

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