The $2^n$ Geometric Space Model of the Earth's Atmosphere and the Periodic Table of Vertical Changes the Laws of Mathematical Geometry Distribution of Atmospheric Sphere

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Submitted: 2023, Oct 06; Accepted: 2023, Oct 13; Published: 2023, Oct 30

Abstract
The atmosphere makes up of many sphere-layers. Could this sphere-layered contain new laws of physics that we have yet to discover? Here we study the spatial positional relationship of each sphere-layer of the Earth's atmosphere, hoping to find a mathematical geometric formula for the atmospheric distribution of the atmosphere as the vertical height changes. The formula can unify the internal correlation of the sphere-layered of the atmosphere. You can use this geometric space to predict and to subdivide to share the Earth's atmosphere, this article uses the $2^n$ methods to build the geometric space of the atmosphere. This geometric space corresponds to the sphere-layered of the Earth's atmosphere. It is found of the atmosphere satisfying the $2^n$ geometric space distribution and has a vertical height the periodicity of changes. This article uses $2^n$ geometry to establish a brief internal sphere-layered model of the earth's atmosphere and a 'periodic table' that changes with height. The 'periodic table' may reveal the interior of the sphere-layers of the atmosphere of the laws of mathematics and geometry.

Keywords: Table of Vertical Changes, Atmospheric Sphere, Atmospheric Vertical Distribution, Atmospheric Periodic Table, Atmospheric Structure, Atmospheric Vertical Structure

1. Introduction
We observe the temperature, composition, density, pressure, and motion of the atmosphere, and divide it into the troposphere, stratosphere, mesosphere, thermosphere, and dissipation based on its vertical variation with altitude. Are there internal logical between the Atmospheric sphere? Is there a geometric law in to formation their extent? Have we ever thought about why the Karman line of the earth is around 80-100 kilometers? Why is the height of the stratosphere '12—55km' instead of '22—66km'? The traditional theory holds the exosphere is the outermost sphere-layer of the atmosphere at more than 800 km from the ground. The exosphere is also the sphere-layer that gradually transitions from the atmosphere to interstellar space. It can regard as the boundary area between the earth's atmosphere and outer space. There are different opinions on the exosphere. You enter outer space at an altitude of about 80 kilometers or 100 kilometers or more - depending on which standard you use. There is very little gas here, only slightly more than a vacuum a little. For a long time, people have believed the Earth's atmosphere has this range, to form this Atmospheric sphere is a random distribution affected by the compose the atmosphere and the gravity of the Earth.

The upper atmosphere about 1,000 kilometers above the ground is mainly compose of hydrogen and helium. It calls the geocorona because it emits very weak radiation. The upper limit of the geocorona considers to be about 200,000 kilometers away from the earth because it is the solar radiation pressure that exceeds the earth point of gravity. Constantly updated research has broken through the limits of the traditional theory one after another. According to satellite detection, there is a thin plasma sphere near '22000' km. Latest study from the Russian Space Research Institute (SrI) shows the Earth's atmosphere has extended to a depth of 630,000 kilometers, like a huge ellipsoid structure, deeply surrounding the moon[1]. This research can detect the outer boundary of the Earth's atmosphere with higher precision than ever before. The Russian Space Research Institute found the scope of the geocorona exceeds...
6 times previously thought. What's more, our moon moves in the earth's 'atmosphere'? This shows the original atmospheric composition and evolution theories has errors or limits and need development and innovation. Why is there a thin plasma sphere near '22000' km? Why is there still an ellipsoidal geocorona at 63,000 kilometers, and its range is more than 6 times beyond what previously thinks [1].

What theory uses to explain these problems? Is it because we have not found the laws of changes and composition of the atmosphere? This article believes the $2^n$ geometric distribution is consistent with to distribute the atmosphere summarized by observations, and can predict and explain the internal logical and causes of various sphere-layers of the earth's atmosphere. The vertical distribution of the atmosphere has geometric rules, which satisfies a $2^n$ geometric space distribution [2-8]. The $2^n$ geometry is a geometric space in which circle (sphere) $R$ is the diameter, 2 times the space is tangent and expands linearly.

### 2. A general overview of $2^n$ geometry

The $2^n$ geometry is a geometric space formed by a circle (sphere) with a diameter of '$\phi$' as the starting circle (sphere). During the expansion or contraction of each $2^n$, 6-8 levels of tangent circle (sphere)s form (n sphere-layers 6 or 8 periods and enter the imaginary space. This article only describes the space range from periods 8 to periods 10). The center of each circle (sphere) is on a straight line and expand and enlarged by 2 times. The $2^n$ geometric space can divide into two forms ($R_\phi$ represents the radius of the earth):

- One is $2^n\phi$ without a starting circle (sphere), $n=(0,1,2,3,4,5,6,7,8,9i)$. Symmetrical expansion ($\phi^a$ type), $\phi^a=R_\phi/(2^n)$;
- One is $\phi(1+2^n)$ with a starting circle (sphere), $n=(0,1,2,3,4,5,6,7,8,9i)$. Symmetrical expansion ($\phi^b$ type), $\phi^b=[R_\phi/(2^n+1)]$.

$\phi_0$ is the starting diameter, $\phi_0=(\phi^a \text{ or } \phi^b)$.

**Figure 1:** Is an enlarged view of the $A_{\phi}^0 \sim A_{\phi}^3$ starting circle (sphere) of the $2^n$ geometric space of the earth (saw Supplementary Information FIG 5, 9, 11, 12, 13, 14). There are two types of starting circle (sphere)s. Among them, the $2^n$ expansions of $\Phi^a$ are a $2^n$ symmetrical without the 'starting circle (sphere)' [5]. It can also be considered as: the 'starting circle (sphere) is embedded in a symmetrical mirror image'. The starting point of type a symmetrical expansion is the symmetry point. The distance from the starting point of each 'n' match to the intersection of the symmetry axis and the far end of the starting point is denoted as $ZR_{an}$ (the diameter of $A_{nN}$) equal to: $ZR_{an}=2^n\phi^a$.
The inner and outer boundaries of the ring formed by the trajectory of each n A\(n\) rotating around the center of the earth correspond to a boundary of the atmosphere (see Supplementary Information FIG 7).

The \(\Phi^b\) type \(2^n\) extension is a \(2^n\) symmetrical structure with an independent 'starting circle (sphere)'. Therefore, the starting point of the \(b\)-type symmetrical expansion is the point tangent to the starting circle (sphere). Therefore, starting from the symmetry point, the distance \(\mathbf{R}^n\) between the arrow from the starting point to the symmetry axis and the \(A\n\) corresponding to each \(n\) value is equal to 

\[\mathbf{ZR}^n = 2^n \Phi^b + \Phi^b.\]

From the perspective of the starting circle (sphere), taking the center of the starting circle (sphere) as the 'axis of demarcation', the two sides of the symmetry axis indicate the way of symmetry. Which is a broken way, half of which is the 'negative number object attribute' or the 'positive imaginary number object properties', half is 'Negative imaginary number object properties' [8].

### 3. The specific application of the \(2^n\) geometric methods and mathematical deduction [5-8].

First, we divide the diameter of the earth (6371 km) by \(2^n\) to get 24.789km, which calls the base diameter \(a\). Use \(\Phi^a\) to represent the base diameter:

\[\Phi^a \approx 24.88671875 \text{ km}, \text{ or } \approx 24.8867 \text{ km}\]

Then we divide the diameter of the earth (6371 km) by \(2^n+1\) to get 24.789km, which calls the base diameter \(b\). Use \(\Phi^b\) to represent the base diameter:

\[\Phi^b \approx 24.78988327 \text{ km}\]

We use \(R^n\) to represent the height of the atmosphere from the horizontal plane, and \(n\) represents the number of sphere-layers (period). The superscript \(y\) of \(\Phi\) represents the type, \(y = (a, b)\).

- \(\Phi^b\) represents the starting quantum unit:
  \[\Phi^b = 6371/(2^n+1) \approx 24.789 \text{ km};\]

- \(R^n\) means: the distance from the sea level (the range of the circle (sphere) and the diameter of the dividing lines);

\[\mathbf{ZR}^n = 2^n \Phi^a + \Phi^b.\]

\(\mathbf{E}^R\) means: the distance from the main sequence to the sea level (the range of the circle (sphere) and the diameter of the dividing line);

\[\mathbf{F}^R = \frac{3}{2} \times 2^n \Phi^a \text{ or } \mathbf{F}^R = \Phi^b = (1 + \frac{3}{2} \times 2^n).\]

\(\mathbf{F}^R\) (child sequence, referred to as sub-sequence). It is the average value of the 'sum value' of the main sequence and the companionship main sequence. \(\mathbf{F}^R\) is the product of the combination of the main sequence and the companionship main sequence to form families. It belongs to the offspring: 'sub-sequence' to Distance from the sea level (diameter of circle (sphere) sphere-layer and dividing lines):

\[\mathbf{E}^R\mathbf{a} = (2^n - 1)\Phi^a + 3/2 \times 2^n - 1\Phi^a \text{ or } \mathbf{E}^R\mathbf{b} = \Phi^b + 5/2 \times 2^n - 1\Phi^b\]

\(\mathbf{F}^R\mathbf{n}\) (anti-starting point circular sub-sequence), with \(\mathbf{F}^R\mathbf{n}\) as the starting point, returning to the sea level; \(\mathbf{F}^R\) has the opposite symmetry Forward of the main sequence. This article only studies the case of \(n \leq 10\).

\[\mathbf{F}^R\mathbf{n} = 210 - n\Phi^a - 210 - n\Phi^a/2 = (1 + 2^{10} - nx7/8)\Phi^b\]

\[\mathbf{F}^R\mathbf{n} = 22298.5 \text{ km} \text{ or } \mathbf{F}^R\mathbf{n} = (1 + 2^{10} - ox7/8)\Phi^b = 22236.5 \text{ km}.\]

### 4. Results

**The \(2^n\) Geometric Space of the Earth’s Atmosphere and the Geometric Principle Diagram of Structural Space of Mathematical Logic.**

Due to the issues with paper size and graphic proportions, this paper expands the \(n = (0/1/2/…/8)\) in sections.

FIG 2 is an expanded view of the principle of structure of \(\Phi^b\) with \(n = (0, 1, 2, 3, 4, 5, 6, 7)\). From the FIG, we can easily saw: the structure of the atmosphere derived from the geometry of \(2^n\) at \(n = (-1, 0, 1, 2)\), it is consistent with the observations, and the error is small. After \(n > 2\), the errors of other theoretical values and observations gradually increase, there is controversy. Saw the periodic table below.
the observations, and the error is small. After $n > 2$, the errors of other theoretical values and observations gradually increase, there is controversy. Saw the periodic table below.

Due to issues with paper size and graphic proportions, this article expands $n = (0, 1, 2\ldots 8)$ in sections.

<table>
<thead>
<tr>
<th>Sequence</th>
<th>Value</th>
</tr>
</thead>
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<td>Main sequence</td>
<td></td>
</tr>
<tr>
<td>Companion main</td>
<td></td>
</tr>
<tr>
<td>Subsequence</td>
<td></td>
</tr>
</tbody>
</table>

24.7899 km, ozoneosphere 1

2007.909 km, upper atmospheric boundary 1

$2^1: 1611.3462$ km, density is $10^{14}$ of the atmospheric density at sea level

1214.7069 km, ionosphere and upper atmospheric limit

1016.349 km, upper limit of oxygen and lower limit of helium

819.748 km, ionospheric boundary 1

520.969 km, upper limit of the ionosphere 1

322.692 km, temperature 1000°C

272.688 km, upper limit of mesosphere

86.7628 km, mesosphere

24.7899 km, ozoneosphere 1

Figure 2: A geometric "diagram" of the corresponding $n$ values of $\phi^n$ and $b^n$ and $\phi^n$ and $f^n$ derived from the $2^n$ rule, resulting in theoretical derivation of the $2^1 \sim 2^7$ circles (sphere). The bottom red line represents the sea level, the blue line represents the stratospheric boundary, and the green part is a magnification of the red circle (sphere). Starting from the sea level, a $2^n$ expanded geometric distribution map make with $\phi^n$ as the starting circle (sphere).
Figure 3: It is obvious the stratosphere form by two different laws, so the temperature and material composition are different. The lower part divides and down by the center of the starting circle (sphere), and the lower part is also the troposphere. The upper part is the isothermal zone of the stratosphere. The formation laws of the stratosphere at 24.789-49.5789 km come from the properties of the 0-sphere-layer symmetrical circle (sphere) system. To form of stratospheric position 24.789 ~ 49.5789 km comes from the attribute of the 0-level symmetrical circle system. The 0-sphere-layer symmetrical circle is stratified from the inner and outer parts of the circle center, and the position from the center to the lower symmetrical point is the position of the ozone sphere-layer region. The position from the upper part of the 0-sphere-layer symmetry circle (sphere) center to the outer symmetry point on the circumference is the position of thermal inversion sphere-layer.

In the stratosphere by 2ⁿ change rule, in 37 km and 24.79 km and down, naturally divided into two levels of inverse temperature sphere-layer, isothermal sphere-layer, and the error is very small.
Figure 4: Is the distribution map of the Earth’s atmosphere when n=9i.

In the stratosphere by 2n change rule, in 37 km and 24.79 km and down, naturally divided into two levels of inverse temperature sphere-layer, isothermal sphere-layer, and the error is very small.

Figure 4. The 27~28~29i circle (sphere) theory derived from 2n rules. The 27~28 are the real number field; 29i are the imaginary field, is the imaginary end and the "reverse inverse" starting sphere-layer.

Figure 5 is an expanded space of the atmospheric sphere with n=(0,1, ----10i), where the 'i' of the numerical subscript represent the properties of the digital region.
Figure 5: The imaginary of limit value [1, 2, 3] derived from $3^\varnothing$ where $n=(7)$ $i$ am the 'inverse starting point' sphere-layer, and the $2^i \sim 2^{10}i$ imaginary circle (sphere) theory derived from $2^i$ in $3^\varnothing$ imaginary limit value. The $2^i \sim 2^{10}i$ forms a imaginary number halo sphere-layer (Geocorona) $12717.211km \sim 25408.725km$ in the outermost sphere-layer of the earth. It is also imaginary number inversion or inversion ending at $37i$ $[2-8]$. 

- Inner atmosphere (this article refers to the atmosphere from 0km to 3197.89km above the sea level as: inner atmosphere).
- The outer atmosphere (this paper refers to the atmosphere from 3197.89km to 6371km from the sea level as the outer atmosphere).
- Inner geocorona (this paper refers to the atmosphere from 6371km to 12717.211km from the sea level as: inner geocorona).
- External atmospheric imaginary state halo (this article refers to the atmosphere from 12717.2km to 25408.725km from the sea level as: external geocorona).
Figure 6 is the construction principle diagram of $\varnothing a$ for $2^n$ with $n=(0,1,2,3,4,5)$.

**Figure 6:** Shows the observation values and theoretical values. The boundary or changing position of each circle (sphere) is the value of the sequence corresponding to a symmetrical circle (sphere) in a $2^n$ geometric space. Each symmetrical point is the peak of the atmospheric sphere-layer structure, or the position of temperature, density, and other changes. The actual observation error is relatively small, and the entire system rotates around the center of the Earth, forming a spherical sphere-layer corresponding to the Earth's atmospheric sphere-layer.
4.1. A Periodic Table of the Mathematical Geometry of the Position of the Earth's Atmosphere.

\[ \Omega^* - Type \text{ Mathematical Periodic Table.} \]

Table 1: Shows the corresponding n values expanded by \( \frac{1}{\Omega_b n}, \frac{1}{\Omega_b n}, \frac{1}{\Omega_b n}, \text{ and } \frac{1}{\Omega_b n}. \)
The shaded part is the imaginary number sphere-layer. When \( n=9 \) it enters the Imaginary state, so the mark \( i \) below \( 9i \) indicate the imaginary state **. To represent the imaginary state of the thin atmosphere of \( 9i \) at the real number level [2-4].

The geometric relations in this table correspond to FIG 1, FIG 2, FIG 3, FIG 4, FIG 5, FIG 6.
The hierarchical position of red and green background is important positions, and the position of gray background is the halo position deduced in this paper.

<table>
<thead>
<tr>
<th>n</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10i</th>
<th>theory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory ( \Omega_b n )</td>
<td>49.58</td>
<td>74.4</td>
<td>123.9</td>
<td>223.1</td>
<td>421.4</td>
<td>818.0</td>
<td>1611.3</td>
<td>3197.9</td>
<td>6371</td>
<td>---</td>
<td>12717.2</td>
<td>25409.6</td>
</tr>
<tr>
<td>Observe</td>
<td>50</td>
<td>--</td>
<td>120</td>
<td>--</td>
<td>--</td>
<td>800</td>
<td>1600</td>
<td>3000</td>
<td>6300-6400</td>
<td>inner</td>
<td>outside</td>
<td></td>
</tr>
<tr>
<td>State</td>
<td>Ozone sphere-layer</td>
<td>* Sound limit</td>
<td>inference</td>
<td>( \Omega_b n )</td>
<td>10^{-15}</td>
<td>( \Omega_b n )</td>
<td>10^{-15}</td>
<td>( \Omega_b n )</td>
<td>inference (geocorona)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deviation</td>
<td>-0.42</td>
<td>--</td>
<td>+3.9</td>
<td>Ned annihilation</td>
<td>+18</td>
<td>+113</td>
<td>+197.9</td>
<td>71-29</td>
<td>Imaginary geocorona (HALO state)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Theory ( \Omega_b n )</td>
<td>62.0</td>
<td>99.2</td>
<td>173.5</td>
<td>322.3</td>
<td>619.7</td>
<td>1215</td>
<td>2404.6</td>
<td>4784.4</td>
<td>9544</td>
<td>19063.4</td>
<td>38102</td>
<td></td>
</tr>
<tr>
<td>Observe</td>
<td>60</td>
<td>100</td>
<td>175</td>
<td>300</td>
<td>600</td>
<td>1200</td>
<td>2400</td>
<td>***</td>
<td>***</td>
<td>***</td>
<td>***</td>
<td></td>
</tr>
<tr>
<td>State</td>
<td>O State Stratosphere Mesosphere</td>
<td>*4 ( \Omega_b n )</td>
<td>10^{-10}</td>
<td>( \Omega_b n )</td>
<td>10^{-10}</td>
<td>( \Omega_b n )</td>
<td>10^{-10}</td>
<td>( \Omega_b n )</td>
<td>inference</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deviation</td>
<td>+2</td>
<td>--</td>
<td>+0.8</td>
<td>+1.5</td>
<td>+22.3</td>
<td>-19.7</td>
<td>+15</td>
<td>+4.6</td>
<td>Need to confirm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Theory ( \Omega_b n )</td>
<td>55.78</td>
<td>86.8</td>
<td>148.7</td>
<td>272.7</td>
<td>520.6</td>
<td>1016.4</td>
<td>2080.0</td>
<td>3991.2</td>
<td>7957.6*</td>
<td>15890</td>
<td>15890.7*</td>
<td></td>
</tr>
<tr>
<td>Observe</td>
<td>55</td>
<td>85</td>
<td>150</td>
<td>270</td>
<td>500</td>
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<td>2000</td>
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<td>***</td>
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</tr>
<tr>
<td>State</td>
<td>Stratosphere</td>
<td>Mesosphere</td>
<td>*4 ( \Omega_b n )</td>
<td>10^{-10}</td>
<td>( \Omega_b n )</td>
<td>10^{-10}</td>
<td>( \Omega_b n )</td>
<td>inference</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Deviation</td>
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<td>+1.3</td>
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<td>+20.6</td>
<td>+16.4</td>
<td>+8</td>
<td>Need to confirm</td>
<td></td>
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</tr>
</tbody>
</table>

\( \Omega_b n, \Omega_b n, \Omega_b n, \text{ and } \Omega_b n. \)

\( \Omega_b n \) is greater than 6317 and enters virtual state.

\( \Omega_b n \) is less than 6317 and enters virtual state.

The result of sufficient mixing is to maintain the proportion of various components in dry air unchanged.

\( \Omega_b n \) is the imaginary state **. To represent the imaginary state of the thin atmosphere of \( 9i \) at the real number level [2-4].

Molecular diffusion and photolysis and ionization are dominant above the height of 120km. Although the atmosphere still moves, it is very weak, and the atmosphere is in a diffusion equilibrium state.

The result of sufficient mixing is to maintain the proportion of various components in dry air unchanged.

\( \Omega_b n \) is greater than 6317 and enters virtual state.

\( \Omega_b n \) is less than 6317 and enters virtual state.

\( \Omega_b n \) is the imaginary state **. To represent the imaginary state of the thin atmosphere of \( 9i \) at the real number level [2-4].

** There is no difference between 6 and 8 in arithmetic, its just the difference property, the others are the same.

The green \( \Omega_b n \) ~ 8 represent to represent the imaginary state of the thin atmosphere at the real number field.

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OA J Applied Sci Technol, 2023

Volume 1 | Issue 2 | 143
Table 3: is the hierarchical division of the inner atmosphere of $\phi^i$. The $\phi^i$ there is 'starting Circle' without (sphere), so there is 'starting Circle' without (sphere) $\phi^i$ hierarchical division table.

<table>
<thead>
<tr>
<th>n</th>
<th>$2^a$</th>
<th>$2^b$</th>
<th>$2^c$</th>
<th>$2^d$</th>
<th>$2^e$</th>
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<td>49.8</td>
<td>99.5</td>
<td>199.1</td>
<td>398.2</td>
<td>796.4</td>
<td>1592.8</td>
<td>3185.5</td>
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<tr>
<td>observes $\phi^a_n$</td>
<td>25</td>
<td>50</td>
<td>100</td>
<td>200</td>
<td>400</td>
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<td>3000</td>
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<tr>
<td>state</td>
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<td>tropopause</td>
<td>troposphere</td>
<td>bottom troposphere</td>
<td>Ekman sphere-layer</td>
<td>ground plane</td>
<td></td>
<td></td>
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<tr>
<td>deviation</td>
<td>+0.1</td>
<td>+0.2</td>
<td>+0.5</td>
<td>+0.9</td>
<td>-1.8</td>
<td>-3.6</td>
<td>-7.2</td>
<td>+185.5</td>
</tr>
</tbody>
</table>

$\phi^a$-type mathematical table

Table 4: Expand the matching n values of $Z\phi^i$, $B\phi^i$, $E\phi^i$, and $F\phi^i$. The shaded part is the imaginary number sphere. When $n=9$ it enters the imaginary state, the subscript ‘i’ of $9i$ represents the imaginary state **. Mapping of the imaginary state of the thin atmosphere $9i \sim 11i$ at the real number field [4].

The geometric this table corresponds to: Figure 1, Figure 2, Figure 3, Figure 4, Figure 5, and Figure 6.

The hierarchical position of the red background and green background are important positions, and the position of the gray background is the halo state (geocorona) position derived in this article.

<table>
<thead>
<tr>
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<th>0</th>
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<th>$9i$</th>
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<td>49.8</td>
<td>99.5</td>
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<td>398.2</td>
<td>796.4</td>
<td>1592.8</td>
<td>3185.5</td>
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<td>observes $\phi^a_n$</td>
<td>25</td>
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<tr>
<td>state</td>
<td>ozonosphere</td>
<td>tropopause</td>
<td>troposphere</td>
<td>bottom troposphere</td>
<td>Ekman sphere-layer</td>
<td>ground plane</td>
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<td>deviation</td>
<td>+0.1</td>
<td>+0.2</td>
<td>+0.5</td>
<td>+0.9</td>
<td>-1.8</td>
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</table>

$\phi^a$-type mathematical table

*Oxygen ion ionization boundary 1; there is an obvious peak between 200 and 400 solar activity years. **Ionospheric boundary 2; the boundary between ion temperature and electron temperature. ***The dividing line between molecules and atoms. *4 Solar static and dynamic temperature decomposition lines. *8 Inner Van Allen Radiation Belts. *Molecular diffusion and photolysis and ionization are dominant above the height of 120km. Although the atmosphere still moves, it is very weak, and the atmosphere is in a diffusion equilibrium state. *Temperature inflection. *Irradiation dissociation. *Thermosphere upper limit boundary 1. *exosphere outer boundary 1. *1 > 6317 enter virtual state.
Table 5: Shows the average values of ($\phi^n_0$) -1 and ($\phi^n_0$-1) -1. It is saw in practice there is a thin ionosphere near 22000. The existence of a thin ionosphere near 1400 km is to inference of this paper.

<table>
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<tr>
<th>n</th>
<th>+0</th>
<th>-1j</th>
<th>-2</th>
<th>3j</th>
<th>+4</th>
<th>-5j</th>
<th>-6</th>
<th>7j</th>
<th>+8</th>
<th>(-9j</th>
<th>(-10j</th>
<th>yj</th>
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</thead>
<tbody>
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<td>2787.3</td>
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<td>696.9</td>
<td>348.4</td>
<td>174.2</td>
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</table>

The negative number state is the opposite of the property of the real number state. The real number state is a space area where the density of matter gradually increases from both sides to the middle, which is the most concentrated area. The negative number state is a space area where the density is smallest from the middle area and gradually increases toward both sides [21]. The outer boundary of the geocorona.

3. Imaginary state (halo state or geocorona): This article classifies the atmosphere beyond the radius of the earth (6371km) as a halo atmosphere, referred to as 'halo sphere-layer' about 4000~25000.

5.1. Comparison of Observation Results and Deduced Results. Comparison of upper tropospheric results.
The average height of the troposphere we saw and summarized is 10~12km. We analyzed the position of the $\phi^n$ internal sequence $\phi^n/2=12.395$, and theoretically predicted troposphere height is close to the average height of 12km.

5.2. Comparison of the Range of the Stratosphere.
Ozone reaches its maximum value at 20~25km or 20~30. We know: The diameters of the starting circle (sphere) $\phi^2$ and $\phi^3$ are both 25km. The diameter of the starting circle (sphere) is just close to the height range of the maximum value of the ozone sphere-layer. $\phi^n/31=3$ is close to another max 30. Starting from an altitude of 25km to 36km, as the vertical height increases, the temperature gradually increases. At the stratosphere, the temperature can be close to 273.15K, which calls the temperature inversion sphere-layer.

We know:
- $\phi^2\approx 24.8867$km and $\phi^2\approx 24.78988$km. Just close to the lower limit of the temperature inversion sphere-layer of 25km, deviation 0.1133~0.21km.
- $\phi^3/21=37.33$km and $\phi^3/2=37.18$km. Just close to the upper limit of the temperature inversion sphere-layer of 36km, deviation 1.33~1.18km.

We know:
- $\phi^3/21=37.33$km and $\phi^3/2=37.18$km. Just close to the upper limit of the ozone sphere-layer, deviation 2.18~2.33km.

The stratosphere is the sphere-layer of the atmosphere above the troposphere to about 50km (upper limit 1) to 55km (upper limit 2) above the ground.
Upper limit of 50km in the stratosphere 1: 50km is the same as in Table 1, when n=0, $\phi_0 = 49.58$, deviation $\approx 0.42$km.

The upper limit of 55km in the stratosphere 2: 55km is the same as in Table 1. When n=0, $\phi_4 = 55.78$, deviation $\approx 0.78$km.

The positions of the two boundaries the stratosphere deviate slightly from the positions gained from $z\phi n$ and $E_\phi n$.

5.3. Comparison of the Results for the Range Of Mesosphere.

The mesosphere is a sphere-layer above the stratosphere, with the top about 80km to 85km above the ground.

The upper limit of 85km in the middle sphere-layer is close to the value when n=1 in Table 1, $\phi_1 \approx 86.8$, deviation≈1.8k.

Above an altitude of 60km, atmospheric molecules begin to dissociate under sunlight. The position of the dissociation sphere-layer is in Table 1. When n=0, $\phi_0 = 62$, and the illumination decomposition deviation position at the same saw the height of 60km is only $\approx 2$km.

5.4. The Results Of Thermosphere Range Are Compared.

Thermosphere (also known as the warm sphere-layer) is a sphere-layer above the mesosphere about 500 to 800km above the Earth's surface.

Upper limit of thermosphere 1, about 500; the upper limit of thermosphere 2, about 800km.

Upper limit 500km, in Table 1, when n=4, $\phi_4 = 520.6$, deviation≈20.6km.

Upper limit 55km, in Table 1, when n=4, $\phi_4 = 497.8$, deviation≈2.2km.

The upper limit is 800km, in Table 1, when n=5, $\phi_5 = 818.0$, deviation≈18km.

$\phi_5 = 796.4$, deviation≈3.6km.

5.5. Comparison of results for exosphere extent

It is generally consider the exosphere above 800km is the exosphere. Appearance of the aurora at 1200km, it is consider to be an upper limit of the atmosphere. According to 80 to 1000km, nitrogen and oxygen are dominant, and oxygen becomes dominant around 1000km.

It becomes dominated by oxygen around 1000km, which is shown in Table 1. When n = 5, $\phi_5 = 1016.3$, deviation≈16.3km.

There is an aurora appearing at 1200km, which is shown in Table 1, when n=5 $\phi_5 = 1215$, deviation≈15km.

$\phi_5 = 1194.6$, deviation≈5.4km.

Continuing up to around 2400km, helium is the main component. Show in Table 1. When n=6 $\phi_6 = 2404.6$, deviation≈4.6km.

$\phi_6 = 2389.1$, deviation≈10.9km.

Further above 3000km, it is similar to interstellar matter. It is considered that it has entered interstellar space. However, the sounding rocket still found a thin atmosphere at an altitude of 3000km. Shown in Table 1, when n=7 $\phi_7 = 3197.8$, deviation≈197.8km.

$\phi_7 = 4778.3$, inference (needs to confirm by observation).

The upper limit of the atmosphere is about 6400km. This is in table 1 when n=8 $\phi_8 = 6370.8$, deviation≈29.2km.

5.6. Comparison of Results for the Extent of the Geocorona

The geocorona is the outermost bright region of Earth's atmosphere. Sounding rocket data shows there is a thin sphere-layer of ionized gas outside the Earth's atmosphere that can extend to an altitude of 22,000km.

There is a thin sphere-layer of ionized gas extending 22000km, which is shown in Table 1, when n=2 $\phi_2 = 22236.7$, deviation≈236.7.

$\phi_2 = 22298.0$, deviation≈298km.

A latest study by the Russian Space Research Institute (SrI) shows that the earths atmosphere has extended to a depth of 630,000 kilometers, like a huge ellipsoid structure, deeply surrounding the moon. This illustrates the previous impact on the earth. The cognitive theory of the atmosphere needs to be developed. This theory recognizes $2^\phi$ geometric space: it becomes the end position at 25409.6 $\sim$ 25484km [4-5]. The subsequent distribution will enter the imaginary state and follow other mathematical laws. We know from actual observations that when vertically stratifying the atmosphere, there will be intervals such as 8~17, 25~36, 50~55, 80~85, 200~300. How is this interval formed? Woolen cloth? We can see from the table that these intervals form by two different starting methods, $\phi_1 \sim \phi_2$, which shows that our earths atmosphere control by two different 'distribution' rules.

6. Summary and Prospect

People have drawn vertical distribution maps of the Earth's atmosphere through observation results, and everyone is accustomed to using the laws of ground physics to study the reasons and internal laws of these atmospheric stratifications. In this paper, the $2^\phi$ geo-
metric space theory is physicalized, and the vertical distribution of the atmosphere is studied and analyzed with this new geometric space physicalization method. The structure of the atmospheric sphere is derived with $2^n$ geometric space, and the mathematical space table of the Earth's atmospheric sphere model is established. The $2^n$ geometric space and atmospheric sphere location are a co-incidence? Or is it a real law of physics? Although $2^n$ geometric space is in good agreement with the observation, it still has deviation that we need to improve and develop.

References