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Movement of Polar Vortices and Its Close Relationship with Global Climate Change

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Abstract: The abnormal change of global climate and its serious consequences are attracting more and more attention all over the world, and how to deal with global climate change has aroused wide debate and research. Although many people believe that global warming is caused by releasing too much greenhouse gas, there are still controversies in the scientific community. Thus, the author analyzes various factors affecting global climate change, and concludes that the movement of polar vortices is the main reason of global climate change, and therefore puts forward corresponding reasonable countermeasures to prevent global climate change.

Keywords: Polar Vortex, Movement, Global Climate Change, Cause, Countermeasure

1. Introduction

Global climate changed rapidly in the past decades. As a result, ice sheets and glaciers are melting and shrinking, precipitation is increasing, sea-levels are rising, atmosphere and ocean are acting abnormally, and species are being endangered. Global climate change has also caused frequent natural disasters and abnormal weathers in many countries around the world, which has a significant impact on human beings and ecosystems [1]. For example, in recent years, the United States has been attacked by super strong hurricanes, particularly violent mountain fires and extremely cold weather; many adjacent areas have also been influenced by different degrees. Global climate change and its serious effects have aroused world-wide attention, and how to cope with climate change has been widely debated and studied.

In order to effectively cope with global climate change, we should first find out the real reason for it, then decide the corresponding effective strategy. However, the scientific community has different opinions on the reasons of global climate change [2]. Hence, the author has researched deeply into various factors that could affect climate change, and found that the movement of polar vortices is the main reason of global climate change, therefore has put forward corresponding reasonable countermeasures to prevent abnormal climate change.

2. Existing Research Results About Global Climate Change

According to the current research findings, factors that can shape climate include solar output, Earth's orbital variations, volcanism, magnetic field strength, ocean variability, and human influences.

(1) Orbital variations: Slight variations in Earth's orbit lead to changes in the seasonal distribution of sunlight reaching the Earth's surface and how it is distributed across the globe. There is very little change to the area-averaged annually averaged sunshine; but there can be strong changes in the geographical and seasonal distribution. The orbital variations have a large impact on climate and are notable for their correlation to glacial and interglacial periods [3, 4].

(2) Solar output: Since 1978, output from the Sun has been precisely measured by satellites. These measurements indicate that the Sun's output has not increased since 1978, so the warming during the past 30 years cannot be attributed to an increase in solar energy reaching the Earth [5].

(3) Volcanism: Volcanic eruptions release gases and particulates into the atmosphere. Eruptions large enough to affect climate occur on average several times per century, and cause cooling (by partially blocking the

transmission of solar radiation to the Earth's surface) for a period of a few years [6].

(4) Magnetic field strength and Ocean variability: Some recent (2006+) analysis suggests that global climate is also correlated with the strength of Earth's magnetic field and ocean variability [7].

(5) Human influences: Climate changes are in part caused by human activities. Of most concern in these anthropogenic factors is the increase in CO_2 levels due to emissions from fossil fuel combustion, followed by aerosols (particulate matter in the atmosphere) and cement manufacture. Other factors, including land use, ozone depletion, animal agriculture and deforestation, are also of concern in the roles they play - both separately and in conjunction with other factors - in affecting climate, microclimate, and measures of climate variables [8].

From above, it can be seen that at present people tend to believe the emission of greenhouse gases is the primary factor in global warming. But many scientists are skeptical about this viewpoint, they have refuted this view with plenty of evidence, and they believe natural driving is the main factor for global climate change, but they haven't found such a convincing natural driving yet. Hence, the author has reexamined all the elements that constitute the earth system, and found the main cause of global climate change, therefore has put forward corresponding countermeasures to prevent abnormal climate change.

3. New Discoveries on Global Climate Change

In recent years, parts of North America have been hit by unprecedented extreme cold weather. Temperatures in the Midwestern United States even dropped below - 50 degrees Fahrenheit (about - 45.6℃). Experts attributed the extreme cold weather to "the southward shift of the polar vortex ". Hence, it is suggested that the shift of the polar vortex is an important factor causing climate change. But why does the polar vortex tend to move in North America or Eurasia rather than in other directions? Why has the striking of polar vortex intensified in recent years? What is the real relationship between polar vortex movement and global climate change? These problems still perplexed the scientific community. Fortunately, the author has recently studied the formation and movement mechanism of polar vortex [9, 10], which can be used to solve these problems.

3.1. Formation of Polar Vortex and Its Current Driving Warm Core Structure

It is well known that Earth has a dense atmosphere. Due to the effect of centrifugal force, the rotation of earth around its axis has caused it to bulge around the Equator, making the earth become an oblate spheroid with the radius of the two poles of the earth is less than the radius of the equator and other places, while the gravitational force is inversely proportional to the square of the distance. When the earth rotates quickly, the rotation will produce strong centrifugal force, making the clouds over the equator and low latitudes tend to move away from their orbits to the South pole or the North Pole. Because the gravitational attraction of the polar position is greater than that of other locations, when clouds move above the polar regions, they are easily attracted by the gravitational pull of the polar regions, after inhaling cold air, they condense into thick clouds and sink gradually. Many polar-plunging clouds form a strong circulation around the pole as the Earth rotates, that is polar vortex, as is shown in Figure 1. The earth has two group of vortices, located at the South pole and the North pole respectively, which can span troposphere and stratosphere. This kind of vortex structures exist throughout the four seasons, reaching maximum strength in winter. When the Arctic is in summer and its vortex structure become weaker than in winter, the Antarctic is in winter and its vortex become stronger than in summer, and vice versa. So these two vortex structures have complementary advantages [11, 12].

Figure 1. *Earth's polar vortex.*

Figure 2. *Earth's polar spiral currents.*

Since the clouds involved in polar vortex are numerous and revolve downward rapidly in a spiral manner, a series of parallel thick spiral cloud bands can be formed, which facilitate not only the downward flow of heavier negatively charged water droplets but also the transfer of charge, as is shown in Figure 1 and Figure 2. Hence, this kind of cloud band is a good circuit with excellent electrical conductivity. Since the clouds involved in polar vortex are numerous and

revolve rapidly, it is easy to have violent frictions and collisions among clouds, making the vortexes filled with positive ions and negative ions. Water droplets in the cloud must first absorb negative ions in the atmosphere, causing the droplets to be negatively charged, and the larger cloud droplet falls toward the lower part of the cloud or even the lower portion of the vortex along a spiral cloud band, while the lighter positive ions are gradually brought up by the updraft to the upper part of the cloud or even the upper portion of the vortex along the spiral cloud band, forming a current from the lower portion of the vortex to the upper portion of the vortex along the spiral cloud band, as is shown in Figure 2. In addition, since the clouds along the spiral cloud path are numerous and revolve rapidly, it is easy to have violent frictions and collisions among clouds, producing frequent electrical discharge or thunderstorms. Each electrical discharge or thunderstorm acts as an electrostatic motor, which can send currents to the upper portion of the vortex and the lower portion of the vortex, forming a series of electrical circuits along the spiral cloud bands. Because of the frequent flow of currents in these cloud band circuits, huge amounts of heat are generated, therefore the warm-core structure of the vortex is formed. Consequently, the air of the warm-core expands and rises; when the warm vapor rises to the condensation section of the eye-wall, it condenses into droplets, enhancing the conductivity of spiral cloud bands and increasing the intensity of current, therefore the rising speed of air in the warm-core is further accelerated and the condensation of rising water vapor becomes more and more intense. When water vapor condenses into droplets, its volume decreases by more than 1000 times, therefore a low-pressure center is formed, and the cooler air around it flows rapidly to it, forming a violent atmospheric vortex [9, 10].

3.2. The Relationship Between Polar Vortex Movement and Global Climate Change

Polar vortices are persistent, large-scale cyclones that originate in the Earth's polar regions, and are generally located in the middle and upper troposphere and the stratosphere. Usually they move around the North (or South) Pole, and can not easily go out of the polar basin. But the distribution of Arctic vortices has two centers: one is located at Baffin Island in Canada, another is over northeastern Siberia. Polar vortex usually strengthens in winter and decreases in summer. When the polar vortex is not destructed by the outside world, it can control the cold air of the polar circle well, but when the polar vortex break apart due to external destruction, cold air can be brought to the middle and low latitudes [11, 12].

Since the Antarctic ice sheet is thick, the temperature is very low, and the Antarctic vortex is surrounded by highlands, less disturbed by external wind, Antarctic polar vortex is more pronounced and last longer than Arctic polar vortices. Due to the opening of the Arctic Channel and the exploration and exploitation of oil and as, Arctic sea ice has dwindled rapidly, Arctic ice cover and permanent permafrost has fallen obviously, the edge of polar basin has subsided gradually, and the sea-level and atmospheric equipotential surface in Arctic area have significantly decreased, causing the Arctic vortex to become thin and weak, unable to produce a strong wind, finally leading to global warming [13].

Just as the Moon can cause ocean tides, the Moon can also pull the vortices floating in the air. It is well known that the southward movement of the Arctic Vortex is the result of lunar traction. As the Moon moves southward above the Arctic, the polar vortex will be split into two or more vortices by the gravitational force of the Moon, thus it's weakened. At this time, the Arctic is warming and the temperatures in the middle and low latitudes are decreasing. So when there is only one polar vortex, it is in a strong state, producing strong wind; when the Arctic Vortex splits into two or more vortices, the strongest one is located at Baffin Island in Canada and another is in northeastern Siberia. The trajectory of the Moon is shown in Figure 3.

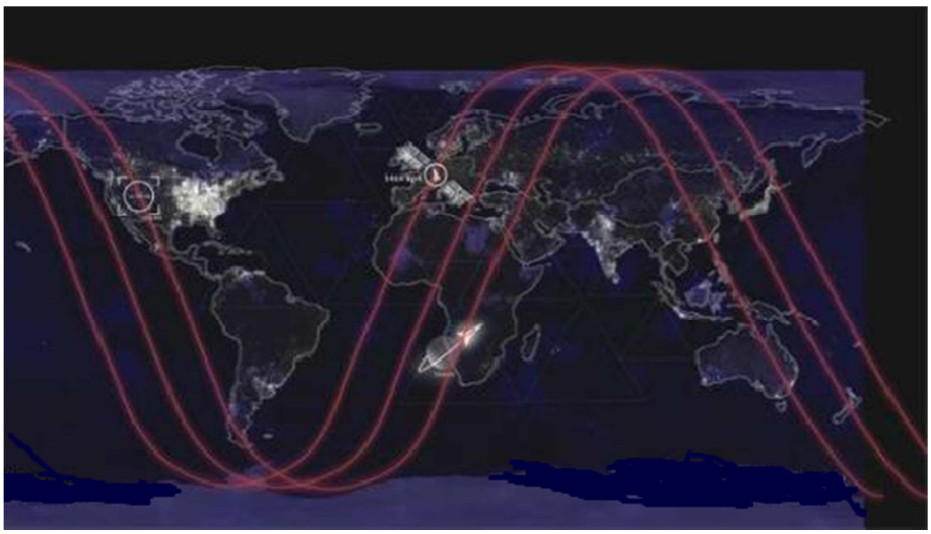

Figure 3. *The trajectory of the Moon around the Earth.*

Usually from the seventh to tenth day of every lunar month, when the moon passes above the Arctic Pole to go down South,

as shown in Figure 3 and Figure 4, it would pull some vortices southward. Because the warm and humid air in the south is replaced by dry and cold air, the people in the south feel unusually cold, and the weather stays gloomy and rainy for several days. When the moon passes over the Antarctic Pole to go North, similar weather phenomena can also occur. Hence, the movement of polar vortices is the direct cause of global climate change, and the two poles are the air conditioners of the whole planet.

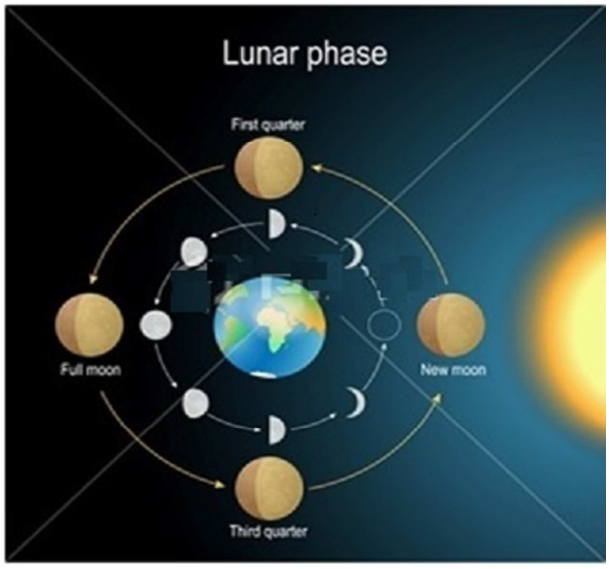

Figure 4. *Lunar phase.*

In late winter (December) or early spring (January and February), whenever the moon passes above the Arctic Pole to go down South, polar vortices move southward under the lunar attraction, leading to a sharp drop in temperature in the middle and low latitudes, even an extremely cold weather. Along with the moon pulling polar vortices one after another out of the central basin, the thick forests and overlapping peaks along the way were gradually flattened by the wind, rain and thunder of the polar vortices, making the obstruction of the vortices moving down to the South be reduced and the impact of the polar vortices on middle and low latitudes become more and more intense. In addition, due to the opening of the Arctic Channel and the exploration and exploitation of oil and gas, Arctic sea ice dwindles quickly, Arctic ice cover and permanent permafrost fall obviously, and the edge of polar basin subsides gradually, making the obstruction of the vortices moving down to the South be reduced and the eye walls of the vortices be cut less, therefore the vortices become more violent, which has also led to unusual cold weather in North America and other places in recent years [14-16].

Every year from March to May, some vortices from northeastern Siberia move southward under the lunar attraction. Because the airflow velocity in the upper troposphere can reach 50 m/s, a vortex floating in the upper troposphere, driven by the Moon at 1020 m/s, can move southward at a speed no less than 50 m/s. But because the temperature in North Asia is still low this season, lack of water vapor over land, the vortices can't be immediately intensified into strong atmospheric vortices, only drifting in high altitude for a long time. But by the end of March, temperatures in south-central Asia is rising, deep valleys evaporate a lot of water vapor, blocked by the surrounding mountains, these vapors are hard to escape, only forming clouds above the valley. Therefore, as a vortex drifts above the valley, it immediately absorbs the evaporated clouds from the valley to intensify into a strong atmospheric vortex. When such a strong atmospheric vortex fall into a forest, it's diminished into a fire tornado, setting off a big wildfire, such as the Muli Forest Fire in Liangshan Prefecture of Sichuan Province in 2019 is a typical case.

Every year from April to August, some vortices from northeastern Siberia move southward with the pull of the Moon. But the temperatures in North Asia began to rise this season, some great lakes like Lake Baikal are beginning to evaporate a lot of water vapor. When a vortex drifts above such a great lake, it immediately absorbs the evaporated clouds to intensify into a strong atmospheric vortex, which easily falls into a nearby forest or grassland to become a fire tornado, setting off a big wildfire to destroy a large area of forest or grassland. Typical examples include the forest fires in southern Russia in July-August 2010 and the grassland fire on the Sino-Russian border in mid-April 2019.

Every year from May to November, some Arctic vortices, born in northeastern Siberia, cross the Eurasian Continent to the South with the pull of the Moon, but because of the lack of water vapor over land, when the vortices drifted over the Northwest Pacific, they are reduced to small cyclones. Later, however, the high-temperature airflow over the Northwest Pacific Ocean turn them into strong typhoons [17, 18]. Although typhoons may cause some damage to local residents, they can lower temperatures over a wide area, eliminate the heat and promote the change of season.

In August and September every year, some vortices near Baffin Island, driven by the Moon, enter the Atlantic Ocean, and soon are able to reach over the southeastern waters of USA, which is located at about 20 degrees north latitude. Since in the autumn equinox season the sea surface temperature in southeastern waters is above 26.5 °C, when the vortices encounter high-temperature currents on the sea surface, they immediately intensify into super-strong hurricanes. Since the vortices moving down to the South along the ocean are less blocked and their eye walls are cut less, adding that they can absorb plenty of water vapor along the way, the hurricanes over the sea in southeastern Florida are stronger than those elsewhere [19].

Every November, some vortices near Baffin Island often move southward. But, due to the low temperature in winter, there is a lack of water vapor along the way, when the vortex moves to the Central Valley of California, USA, it immediately absorbs a large amount of water vapor evaporated from the valley and is reinforced into a fire tornado. But now because the moon is far away from the fire tornado, there is no other power to lift the fire tornado up and move it away, so it can only move around the deep valley, and finally

hits a cliff and falls into a forest to set off a big wildfire, such as Camp Fire (2018), which is the most destructive wildfire in California history to date [20, 21].

Antarctic polar vortices are more pronounced and last longer than Arctic polar vortices. When the Moon travels northward below the Antarctic, it can pull the Antarctic polar vortices northward. When the vortices drift to the South Indian Ocean or the Bay of Bengal, due to the influence of high temperature airflow over the ocean surface, they become cyclones sweeping thousands of miles in an instant, making the neighboring area suffer terrible disaster [22, 23].

According to the route of moon's movement, it can be seen that when the moon moves northward from the Antarctic, the Antarctic vortices pulled by the Moon are blocked by the African continent and the Eurasian continent, only when these vortices fall in the southern tip of Africa, the Indian Ocean, the Bay of Bengal, the Arabian Sea or the Mediterranean Sea can they become terrible cyclones. Hence, the South Atlantic Ocean rarely experiences tropical cyclones [24].

4. Strategies to Prevent Abnormal Global Climate Change

From the above analysis of the causes of abnormal global climate change, we can see that the polar is the air conditioner of the whole planet, the movement of polar vortices is the direct cause of global climate change and human activity in the polar region is the real reason for the abnormal movement of polar vortices. Therefore, to prevent abnormal global climate change, we must control human behavior.

(1) To prevent the recurrence of unusually cold weather in North America, the embankments along the Arctic Channel should be strengthened to prevent glacier loss; to prevent the fall of the Arctic ice cap and permafrost, the exploration and mining holes should be solid with stone, silt or vegetation; to prevent the subsidence of the edge of the polar basin and the destruction of the roadblocks along the southward movement of the polar vortices, which causes the moon to draw easily the polar vortices away from the polar basin, people should measure the usual paths of the moon carrying the polar vortices, then along these paths lay multiple high walls to stop the slipping vortices or cut off the eye walls of the slipping vortices.

(2) People's blind activities (such as blind exploitation of oil and gas as well as unnecessary tourism) in the polar regions should be reduced to prevent the fall of the Arctic ice cap and permafrost or to thicken the Arctic ice cap and permafrost, then arctic vortices can be strengthened in summer, and the separated vortices carried by Moon can also be strengthened, which will reduce global temperature and solve the problem of global warming.

(3) For hurricanes that may rage along the eastern coast of the United States or cyclones that may cause wildfires in the western United States, the potentially dangerous vortex genesises in northeastern Siberia and Baffin Island should be monitored and weakened in the month before they prevail.

(4) For typhoons that may rage in the Northwest Pacific or South China Sea, the potentially dangerous vortex genesises in northeastern Siberia should be monitored and weakened in the month before they prevail.

(5) For cyclones that may rage in the South Indian Ocean or the Bay of Bengal, the potentially dangerous vortex genesises in Antarctic should be monitored and weakened in the month before they prevail.

(6) Similarly, in order to avoid abnormal cold in late winter or early spring in the Northern Hemisphere, the potentially dangerous Arctic cold vortex genesises in Baffin Island and northeastern Siberia should be monitored and weakened in the month before they prevail, weakening the vortices that may be pulled out by the moon, thus avoiding the extremely bad weather in the south.

5. Conclusions

Global climate warming and frequent occurrence of extreme weather make people feel more and more anxious. In order to effectively cope with global climate change, we should first find out the real cause for it, then decide the corresponding effective strategy. However, the scientific community has different opinions on the causes of global climate change. Hence, the author has researched deeply into various factors that could affect climate change, and found that the movement of polar vortices is the main cause of global climate change, therefore has put forward corresponding reasonable countermeasures to prevent abnormal climate change.

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