Proposal for sunlight shield system to decrease cyclone's power

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1. INTRODUCTION

In recent years, the Earth is getting warmer because of excess carbon dioxide in the Earth's atmosphere. We are concerned that cyclone's power is also getting bigger. In order to decrease cyclone effect on human lives, cyclone characteristics have been studied, measured and analyzed. Movement of a cyclone is predicted and broadcasted. On the basis of the cyclone movement prediction, banks are constructed and people take refuge. However we have no system which can decrease a cyclone's power.

This paper makes a proposal for decreasing cyclone's power by means of the Sunlight Shield System which floats in the air at an altitude of H1 meters, almost the same alititude as the eye of a cyclone. The Sunlight Shield System is composed of movement function, sunlight shield function and float function. For example, length, width and thickness of the Sunlight Shield System are 10,000 meters, 10,000 meters and 1 meter, respectively. The Sunlight Shield System reflects the sunlight to the sky, resulting in a shadow on the Earth, where the sunlight energy does not reach. As a result, the shadowed portion of the Earth is cooled. Then a center of a cyclone has higher atmospheric pressure in comparison to other part where the Sunlight Shield System is not applied, and cyclone's power decreases. An amount of cooling energy is equal to the reflected sunlight energy, or about 10^8 kilo watt per hour. In other words, this energy is the same as about 2.2×10^6 dry ice ton/day.

2. PROPOSAL FOR SUNLIGHT SHIELD SYSTEM

The Earth is always heated by the sunlight during daytime. For example in Fukuoka of Japan, the maximum sunlight power is equal to about 800 watt per one meter square per hour, and the maximum sunlight power on the Earth is equal to about 1,300 watt per one meter square per hour. Energy of 1,000 watt x hour is equal to about 0.86×10^6 calories, which can increase temperature of one cubic meter water

about 0.9 degree centigrade. In other words, temperature of only 10 cm thickness of surface water in the sea can be heated up about 9 degrees centigrade by the sunlight energy per one hour.

In a tropical region, about 1,000 watt of sunlight energy per one meter square per one hour of daytime is given and always heated by the sunlight. When the sunlight in the region is shielded by some means, the region is cooled by 1,000 watt per one meter square per one hour.

The eye of a cyclone may be grown to a 100 km in diameter. In the eye of a cyclone at an altitude of H1 meters, we put the Sunlight Shield System which floats in the air, and the Sunlight Shield System moves along with a movement of the cyclone eye. The Sunlight Shield System is not affected by the cyclone wind because it is set at a high attitude. It shields sunlight and makes a shadow of which area is equal to a part of the cyclone eye. When length and width of the Sunlight Shield System are equal to 10,000 meters, respectively, the shadowed area is cooled by energy of 10^8 kilo watt x hour per one hour.

This paper makes a proposal for decreasing cyclone power by means of the Sunlight Shield System which floats in the air at an altitude of H1 meters, the same altitude as the eye of a cyclone as shown in Figure 1. The Sunlight Shield System is composed of movement function, sunlight shield function and float function, respectively. The float function is realized by a flat broad air mattress made of vinyl which is filled with helium gas instead of air.

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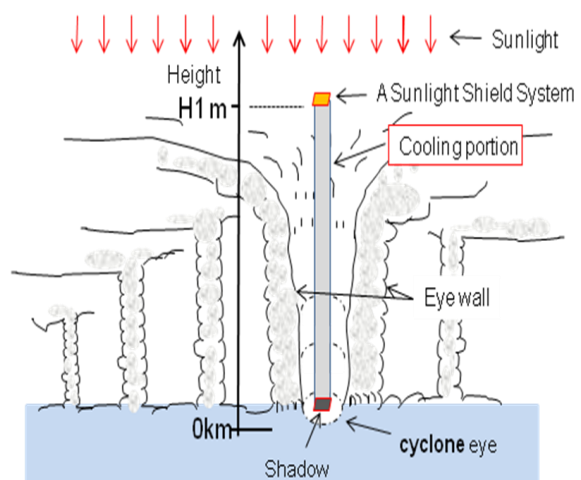e-mail: muroku@oregano.ocn.ne.jp

Figure 1   Cooling principle by means of A Sunlight Shield System

For example, length, width and thickness of the air mattress are 10,000 meters, 10,000 meters and 1.1 meters, respectively. The movement function is realized by a remotely-controlled electric propeller which is connected to a center of the air mattress. The sunlight shield function is realized by an air mattress surface material. For example, the air mattress surface has aluminum film in order to reflect sunlight to the space. Therefore, the Sunlight Shield System makes a shadow on the earth and the sunlight energy does not reach the Earth. As a result, the shadowed portion of the Earth is cooled. Then a center of the cyclone eye has higher atmospheric pressure in comparison to other part where the Sunlight Shield System is not applied, resulting in decrease of a power of the cyclone. An amount of the cooling energy is equal to the reflected sunlight energy, and about 10^8 kilo watt per hour. In other words, this energy is as same as about 3.2×10^6 dry ice ton/day cooling energy. This value is derived, assuming that daytime has 5 hours of 1,000 watt sunlight.
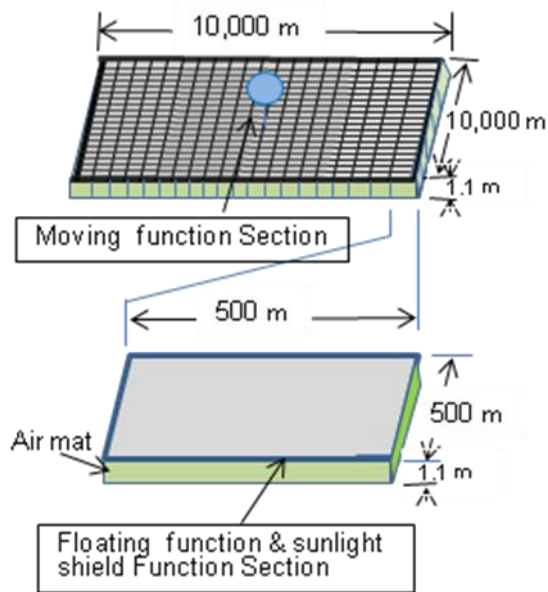

Figure 2 A Sunlight Shield System

In order to decrease bigger cyclone's power, many or a lager size of the Sunlight Shield Systems may be required.

2.1 SYSTEM REQUIREMENT

The Sunlight Shield System should satisfy the following conditions.
(1) The Sunlight Shield System has an enough cooling power to cool an area of the cyclone eye and decrease cyclone's power.
(2) A cyclone is assumed not to disturb operation of the Sunlight Shield System.
(3) The Sunlight Shield System does not produce CO_2, nor cause damage to circumstance before or after when the Sunlight Shield System is set.
(4) A total cost of the Sunlight Shield System cost and its operation is lower.

The Sunlight Shield System should have the following functions in order that the Sunlight Shield System satisfies the above mentioned conditions.

(i)   The Sunlight Shield System should have a capability of floating at an altitude in the sky, where it may be about 100 hpa and -60 degrees centigrade.
(ii)   The Sunlight Shield System should have a capability of shielding more than 95 % of sunlight power.
(iii) The Sunlight Shield System should have a capability of moving faster than a cyclone. For example, it may be 60 km per hour.
(iv)   The Sunlight Shield System should have a capability of moving by means of remote control without power supply for more than two weeks.

2.2 CONFIGURATION OF SUNLIGHT SHIELD SYSTEM

The Sunlight Shield System is composed of the following three function blocks: Floating Function, Sunlight Shield Function and Moving Function, as shown in Table1.

Table 1   Function of Sunlight Shield System

Function	Content
Floating Function	• Size : Length=10,000m, width =10,000m • 400 air mattress cells • Floating on a **cyclone** eye
Sunlight Shield Function	• Size : Length=10,000m, width =10,000m • It reflects sunlight to the Space and makes a shadow on the Earth
Moving Function	• It has a GPS, telecommunication equipment, a solar battery and an electric propeller • Moving speed: 60 km/hour

2.2.1 FLOATING FUNCTION

The first function block is the Floating Function. For example it has many air mattress cells made of vinyl. The vinyl air mattress cell is filled with helium gas, and has flat shape. In the case that length and

width of the air mattress cell are equal to 500 meters, respectively, the Floating Function for the above mentioned Sunlight Shield System is composed of 400 air mattress cells. These 400 air mattress cells are connected to each other, and serve as one sheet.

Weight of the air mattress cell is equal to about 26,000 kg. Total vinyl weight is equal to 25,000 kg (= 500m x 500m x100g) and 1,500kg for the other part. Therefore, it is necessary that buoyant force of the air mattress cell is more than about 26,000 kg. It is nearly equal to weight of the air mattress cell. A capacity of helium gas in the air mattress cell is more than 260,000 m^3 (For example: 500 m x 500m x 1.1 m). Weight and buoyant force distribute over the air mattress cell.

2.2.2 SUNLIGHT SHIELD FUNCTION

The second function block is the Sunlight Shield Function, which is realized on a surface color of the Floating Function cell. The surface color effects on the sunlight shield rate of the Sunlight Shield System. For example, the surface color serves as if aluminum film. Then the surface reflects sunlight to the space and makes a shadow on the Earth, when the Sunlight Shield Function receives the sunlight. For example, the Sunlight Shield System is composed of 400 air mattress cells, and length, width and thickness of he Sunlight Shield System are equal to 10,000 meters, 10,000 meters and 1.1 meters, respectively, producing a 10,000m x 10,000m square shadow on the Earth.

2.2.3 MOVING FUNCTION

The third function block is the Moving Function which has a GPS, telecommunication equipment, a solar battery and an electric propeller for moving the Sunlight Shield System. It can detect self position, transmit information to a control office on the Earth and can move according to control information from the office.

An electric propeller is set at a center of the Sunlight Shield System, and moves according to the control information. The maximum moving speed of it is about 60 km/hour.

The Sunlight Shield System can have enough solar battery on a part of the Floating Function cell to move an electric propeller. When a large Sunlight Shield System is realized, many electric propellers may be required.

2.3 COST

The Sunlight Shield System may have 10-year life time, and is reusable many times during the life time. A total cost of the Sunlight Shield System and Operation Cost may be less than 10,000,000 USD/year.

2.3.1 SUNLIGHT SHIELD SYSTEM COST
:5,320,000 USD/year
(1) vinyl material for Air mattress Cost
:5,000,000 USD/year
=2 x10,000m x 10,000m x 0.25 USD /10
(Life time is 10 years)

(2) Helium gas cost :220,000 USD/year
=10,000 x 10,000 x 0.11 x 2 USD x 0.01
(Helium consumption rate =1% per year, 1 cubic meter helium cost= 2 USD)

(3) Moving Function cost :100,000 USD/year
=1,000,000 USD/10
(Life time is 10 years)

2.3.2 OPERATION COST

When a cyclone appears, the Sunlight Shield System is set at a center of it by many people. In order to set it at the right position, we get detailed data of the cyclone, analyze them, prepare, carry and set the Sunlight Shield System.. An operation of these actions may be done 2 times during one year. A cost of these operations may be smaller compared with the cost of the Sunlight Shield System.

3. CONSIDERATION

(1) How to decrease cyclone's power is proposed by means of the Sunlight Shield System. It is necessary that we should experiment with the Sunlight Shield System and confirm how it effects on decreasing cyclone' power.
(2) In order to decrease bigger cyclone's power, many or a lager size of the Sunlight Shield Systems may be required. with an area of the cyclone's eye, and temperature of it may decrease about 0.9 degrees centigrade per hour. Then in a few days it cools down an area of the cyclone eye, where there is high atmospheric pressure compared with other part that the Sunlight Shield System is not applied. Because of high atmospheric pressure, a cool wind may blow from the sky to a surface of the Earth, making the sea water cooler.
(3) A total cost of the Sunlight Shield System and Operation may be less than 10,000,000 USD per year. It is clear that a benefit of decreasing cyclone's power is larger than this cost.
(4) The Sunlight Shield System does not produce CO_2 , nor cause damage to circumstance before or after when the Sunlight Shield System is set.
(5) The Sunlight Shield System is useful and has many other applications. For example, it may be able to stop getting the Earth warmer. This application presentation requires another paper.

(6) In this paper, a fundamental configuration of the Sunlight Shield System is described. A shape of the Sunlight Shield System is a square.   In order to study what shape is best, further study is required.   For example, a circle shape of the Sunlight Shield System may be desirable from a steady point of view.

4.   CONCLUSION

The Sunlight Shield System is useful and effective to decrease cyclone's power. It should be developed urgently.   A computer simulation and an experiment are required in order to confirm an effect of the Sunlight Shield System in detail.