



Marine Solar Power Plant as a Way to Prevent Tropical

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Abstract

Tropical cyclone is devastating which human has nothing to do when one came onto the land. However, cyclone contains enormous energy, and such energy comes from the sun overall. It is when large region of the ocean was heated by the sun, the warmth makes the air above rise and then the cool air surrounding the region began to sink into this region where the water is heated and the air is rising, and the flow of sinking cool air forms cyclone under the effect of Coriolis force. Therefore, it can prevent the formation of tropical cyclone to apply large floating solar farm in the region where the tropical cyclone frequently forms. The solar power generating devices and system used in such floating solar farm should also be resistant to tropical cyclone therefore be modified.

Keywords: Tropical cyclone, Energy conservation, Coriolis force, Floating solar farm, Bernoulli equation

Introduction

The formation of tropical cyclones is when the superfluous solar power was absorbed by the ocean, which heated the water, and then the tremendous warm air heated by the ocean raised up, therefore a low pressure area above the water in the region where it is being heated is formed, then the cool air around the warm region begins to sink into this region, like the water in a pool falling down through a hole downside, a vortex of the sinking air forms and it is the tropical cyclone, which is devastating if it moves to the area where people are living. The vortex is caused by the Coriolis force on the earth as the cool air is sinking into the low-pressure region above the warm water, and Coriolis force is a supposed force on the reference of the earth caused by the spin of the earth, it could be derived mathematically.

As shown in Figure 1, a point P moving on a rotating reference with velocity \vec{v} , the rotating reference has an angular velocity of $\vec{\omega}$, the positive direction is up and the direction of the rotation and the vector $\vec{\omega}$ is of right-hand rule, then its velocity in static space \vec{V} and the velocity in the rotating reference has a relation of

$$\vec{V} = \vec{v} + \vec{\omega} \times \vec{r} \quad (1)$$

where \vec{r} is the position of the point, the original point is at the center of the circle on the rotating axis. Applying Galileo transformation (more precisely it should use Lorentz transformation), then the acceleration of this point in static space and the rotating reference has a relationship of

$$\frac{d\vec{V}}{dt} = \frac{d}{dt} \vec{v} + \frac{d}{dt} (\vec{\omega} \times \vec{r}) \quad (2)$$

$$\vec{v} = v_i \vec{e}_i$$

$$\vec{\omega} = \text{const}$$

$$\vec{r} = r_i \vec{e}_i$$

$$\frac{d}{dt} \vec{v} = \frac{d}{dt} (v_i \vec{e}_i) = \vec{e}_i \frac{dv_i}{dt} + v_i \frac{d\vec{e}_i}{dt} = \vec{a} + \omega v_1 \vec{e}_2 - \omega v_2 \vec{e}_1 = \vec{a} + \vec{\omega} \times \vec{v}$$

$$\begin{aligned} \frac{d}{dt} (\vec{\omega} \times \vec{r}) &= \vec{\omega} \times \frac{d\vec{r}}{dt} = \vec{\omega} \times r_i \frac{d\vec{e}_i}{dt} + \vec{\omega} \times \vec{e}_i \frac{dr_i}{dt} = \vec{\omega} \times (\omega r_1 \vec{e}_2 - \omega r_2 \vec{e}_1) + \vec{\omega} \times \vec{v} \\ &= \vec{\omega} \times (\vec{\omega} \times \vec{r}) + \vec{\omega} \times \vec{v} \end{aligned}$$

$$\frac{d\vec{V}}{dt} = \vec{a} + 2\vec{\omega} \times \vec{v} + \vec{\omega} \times (\vec{\omega} \times \vec{r}) \quad (3)$$

Therefore, if a mass point of P which the mass is m in the rotating reference with and has a velocity of \vec{v} must get extra forces of $2m\vec{\omega} \times \vec{v} + m\vec{\omega} \times (\vec{\omega} \times \vec{r})$ despite its external force $m \frac{d\vec{v}}{dt}$ if it was accelerating with the acceleration \vec{a} . Equivalently, the mass

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point in such state of motion would get supposed accelerations of $-[2\vec{\omega} \times \vec{v} + \vec{\omega} \times (\vec{\omega} \times \vec{r})]$, one could think these accelerations are provided by some supposed fields, where $-\vec{\omega} \times (\vec{\omega} \times \vec{r})$ is the inertial centrifugal force field and the $-2\vec{\omega} \times \vec{v}$ is the Coriolis force field, if the mass of the mass point is m , then the corresponding Coriolis force is $-2m\vec{\omega} \times \vec{v}$, and since our earth is such a rotating reference, the flowing air or water on the earth got no force in

the space, therefore they would get Coriolis force of $-2m\vec{\omega} \times \vec{v}$ despite the inertial centrifugal force, then this force will always bend the flow to the right side of its moving direction on the northern hemisphere while to the left side on the southern hemisphere, as Figure 2 shows, forming counterclockwise cyclone on the northern hemisphere while clockwise cyclone on the southern hemisphere.

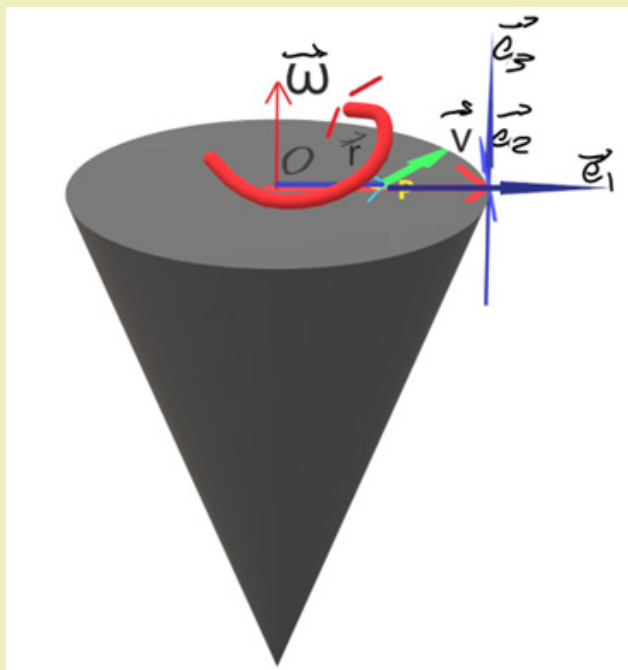


Figure 1: A rotating reference. $\vec{\omega}$ is the vector of the angular velocity of the reference, the original point O is contained in its axis, \vec{r} and \vec{v} are position and velocity vectors of the mass point P , \vec{e}_i is a set of orthogonal unit bases, \vec{e}_1 is in same direction of \vec{r} , and the directions of other is of right-hand rule with \vec{e}_1

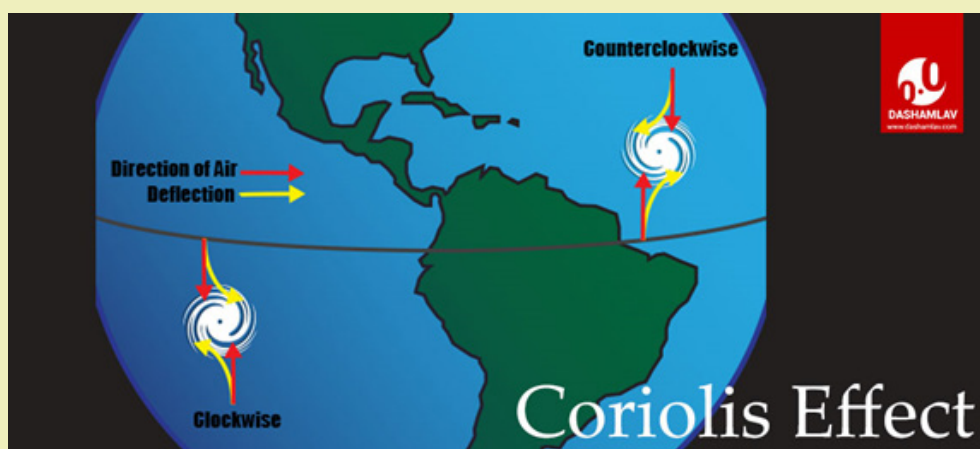


Figure 2: Coriolis force on the earth, the flow on the northern hemisphere would turn right side while the flow on the southern hemisphere would turn left side, forming counterclockwise and clockwise on the northern and southern hemispheres respectively

Tropical cyclone could have formidable power as we can see in our real life; however, it is just powered by the warm water which is heated by the sun, energy is still conservative despite the energy-time uncertainty relation when there is probability, probability is where consciousness comes in, when there is only material the energy must still be conservative, therefore we can utilize this energy to produce power for human instead of powering huge cyclones. Heat can't be converted into useful energy if there is nothing else changed, but solar panel can directly absorb photons from the sunlight before they become heat, hence we could build marine solar panel groups to generate electricity for people while preventing the formation of tropical cyclones.

Currently, there are already many floating solar farms on the world, and we need floating solar farms in further region of the ocean from the lands to absorb the heat that causes tropical cyclones to produce electricity or any kind of useful power for human, such design must be resistant to the tropical cyclones. Single solar panel would be easily taken by the tropical cyclones, Bernoulli's equation shows with same fluid flux, the faster the fluid, the less pressure it is, it is how plane was made, and may also be used to make cyclone resistant solar power devices.

As Figure 3 shows, the device to produce solar power would be made as such shape to float on the sea, the upper side is the solar cell and the lower side is advanced storage battery, such as the kind shown in reference 7, it should be of large energy density, able to release and recharge energy fast as well. Thereafter, when large group of such devices are floating on the sea, the group could absorb solar energy and lower the temperature, preventing cyclone as the heat is absorbed, reducing potential which leads to cyclone. Each device should be self-driving but controlled by its group, the group should have a central plant to gather the energy stored in each device and then yield the energy out. The lower side of the device is heavier than the upper side, while the device could float on the sea, and when a cyclone had already come, they may drive themselves back into the central plant which has better cyclone resistance, the central plant could be a fixed station or a heavy huge vehicle that can both stay on and under water, even could fly. The designed shape of each device shown in Figure 3 can also prevent them from being whirled when the cyclone comes, since the air flow would be much faster between the upper side and lower side of the device than above the device, such pressure produced when a device would be whirled out of the water will drag it back, the shape should also make the device hard to fly in the air, must drop back into the water even the device was taken into the air, and it is better if its self-driving could drive itself back if it was once pulled

out of the water into the air, adjusting its position not to be hit by the strong wind. To prepare for the worst condition, such marine solar power plant should also be deployed far from the land in the ocean where cyclones are formed, making there be no risk that a cyclone will whirl some devices to threaten the human living on the land.¹⁻¹⁰

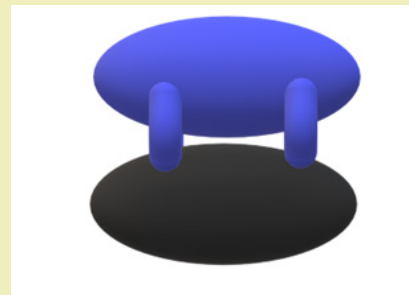


Figure 3: Cyclone resistant solar power device, the upper side is solar cell, and the lower side is storage battery, and downside is much heavier than the upper side while the device can float on the sea

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Conflicts of Interest

Regarding the publication of this article, the author declares that he has no conflicts of interest.

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