Atmospheric Heating as a Research Tool: Link to Space-Based Solar Power

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Summary:

Throughout history, mankind has sought to minimize the impact of the unpredictability and severity of violent storms such as tornadoes. To date, solutions have focused on early warning and on development of fortified buildings made to withstand the strong forces that are the hallmark of these atmospheric events. Sophisticated prediction methods have been developed to warn populations of potential storm danger. These "warn and seek shelter" mechanisms have clearly reduced the loss of life and, to a lesser extent, property damage associated with these natural events. However, despite our best efforts, loss of life and costly property damage are still strongly associated with severe weather phenomenon.

This paper describes concepts that use either ground or space based platforms for generating beams of microwave radiation to provide localized thermal heating or ionization of the atmosphere. It is further suggested that these heating techniques could initially be used as research tools for improving computer simulations of atmospheric phenomena. The ultimate goal is to utilize such tools for prevention of severe storm phenomena and eventually for the manipulation of the jet stream for alleviation of draught and floods. The experimental techniques include a) heating of rain droplets with microwaves between 26 and 35 Ghz, **b) Heating of atmospheric oxygen with microwave frequencies of about 54 Ghz and c) creation of artificial ionization plasma patterns in the atmosphere which can be heated with microwaves to produce acoustic or gravitational waves and can interact with electrical phenomena by adjustments in atmospheric electrical conductivity. New experimental techniques similar to "ink drop" experiments to determine the diffusion of chemicals in a liquid can be applied to the atmosphere to study heat transport and electrical properties. Weather research concepts are discussed.**

The microwave heating technologies suggested in this paper provide methods for rapidly heating - well-defined regions of a weather system. Ground or satellite based microwave phased arrays, focused on specific locations in the atmosphere, will be used to heat the atmosphere and to create useful artificial ionized plasma patterns. Initial experiments would correlate heating in a specific region of a weather system with computer simulations. Weather modification of tornadoes and of the jet stream is also discussed. One such application is to prevent concentration of rotational energy in a mesocyclone by heating the cold rainy downdrafts. The anticipated result is to prevent the precise rotation geometry that can produce a tornado and thus interrupt tornado formation. Methods of influencing the jet stream are also discussed. A new approach to influencing hurricanes and typhoons by influencing the position of the jet stream and the behavior of atmospheric gravitational waves is also discussed. Development of space-based solar power as a clean, renewable energy source for the world's needs is dependent on an evolutionary approach. Dual use of such systems for weather research and control will increase the economic value of solar power satellites. Understanding the weather and computer simulation of storm systems is necessary before attempting interaction to mitigate storms. When that has been achieved, the initial investment can save lives and reduce property damage. In the process, the fundamentals of space-based solar power are demonstrated, leading to development of commercial energy systems as well as systems for modifying the weather and the effects of global warming on weather.