Investigation into the Feasibility of Triggering Lightning with High-Pressure Conductive Water Jets

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Preliminary studies and calculations of the feasibility of triggering lightning utilizing high-pressure water jets have been conducted and are reported. In this concept a lightning stroke is triggered by a high-pressure electrically conductive water jet is trained upward from the ground toward a cloud system to create a conducting path through the atmosphere and to induce a lightning discharge or stroke. This is achieved by directing the jet upward from a protected enclosure to induce the collection of charges in the clouds to stream downward through the jet, into the enclosure, and harmlessly into the ground. The conducting water jet channel may reach heights of several hundred meters. By diverting the charges from a cloud system in a known path to a harmless conclusion, other structures or objects may be protected.

The conductive material can comprise, for example, water that is made electrically conductive by a solute of a mild acid or salt. In theory, pressures below a hundred atmospheres would generate a jet several hundred meters high. However, windage, or friction from the atmosphere, and breakup into droplets reduces that distance by a significant amount. In concept the jet will be produced only for a time necessary to generate a conductive ion trail to the desired altitude, and then will be halted. The actual volume of water that is consumed to produce the jet will equal the product of the area of the nozzle and the height of the fountain or plume. This volume could equal as few as several liters. The unit would be triggered by threshold determination on an electric field meter in a manner similar to rocket triggered lightning experiments carried out at Camp Blanding.

Preliminary calculations show that deployable units could be sold for less than the price of an automobile, could operate in almost any weather condition and could yield significant economic advantages over other schemes for triggering lightning. It would also be significantly less risky and costly than rocket triggered lightning for research purposes. Initial laboratory studies have shown: 1) that it is feasible to trigger electrical discharges with water jets with an ion source such as a salt or mild acid; 2) the jet design to achieve significant height for low volume is challenging and must be assisted by using a harmless polymer solution to hold the stream together; 3) height ratios on the order of several thousand nozzle diameters are feasible; 4) environmental hazards, outside of the lightning discharge would be minimal; and 5) it may be not be necessary to have a continuous stream to create an effective conduction channel to initiate a lightning stroke to the apparatus.