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Modern and prospective technologies for weather modification activities: Developing a framework for integrating autonomous unmanned aircraft systems

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Abstract

This paper builds upon the processes and framework already established for identifying, integrating and testing an unmanned aircraft system (UAS) with sensing technology for use in rainfall enhancement cloud seeding programs to carry out operational activities or to monitor and evaluate seeding operations. We describe the development and assessment methodologies of an autonomous and adaptive UAS platform that utilizes in-situ real time data to sense, target and implement seeding. The development of a UAS platform that utilizes remote and in-situ real-time data to sense, target and implement seeding deployed with a companion UAS ensures optimal, safe, secure, cost-effective seeding operations, and the dataset to quantify the results of seeding. It also sets the path for an innovative, paradigm shifting approach for enhancing precipitation independent of seeding mode. UAS technology is improving and their application in weather modification must be explored to lay the foundation for future implementation. The broader significance lies in evolving improved technology and automating cloud seeding operations that lowers the cloud seeding operational footprint and optimizes their effectiveness and efficiency, while providing the temporal and spatial sensitivities to overcome the predictability or sparseness of environmental parameters needed to identify conditions suitable for seeding, and how such might be implemented. The dataset from the featured approach will contain data from concurrent Eulerian and Lagrangian perspectives over sub-cloud scales that will facilitate the development of cloud seeding decision support tools.

1. Introduction

Present-day weather modification technologies are scientifically based and have made controlled technological advances since the late 1990's, early 2000's. The technological advances directly related to weather modification have primarily been in the decision support and evaluation based software and modeling areas (Axisa and DeFelice, 2016). There have been some technological advances in other fields that might now be almost ready for successfully optimizing weather modification science and seeding methodology. Weather modification technologies may be

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