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英文题目: Extra-Area Effect in Operational Cloud Seeding During Winter in Jiangxi Province, East China

作者: WANG Weijian, YAO Zhanyu*, GUO Jianping, Tan Chao, et al.

英文摘要: The effects of weather modification operations on precipitation in target regions have been widely reported, but little is specifically known about the downwind (extra-area) effects in China. We estimated the extra-area effect of an operational winter (November–February) aircraft cloud-seeding project in northern Jiangxi province in eastern China using a revised historical target/control regression analysis method based on precipitation data for winter. The results showed that the overall seasonal average rainfall at the downwind stations increased by 21.67% ($p=0.0013$). This enhancement effect was detected as far as 120 km away from the target area. Physical testing was used to compare the cloud characteristics before and after seeding on November 29, 2014. *A posteriori* analysis with respect to the characteristics of cloud units derived from operational weather radar data in Jiangxi was performed by tracking cloud units. The radar features in the target unit were enhanced relative to the control unit for more than two hours after operational cloud seeding, which is indicative of the extra-area seeding effect. The findings could be used to help relieve water shortages in China.

中文题目: 江西省冬季增雨作业对下游地区影响的研究

作者: 王伟健, 姚展予*, 郭建平, 谭超

研究人工增雨作业的效果时通常只关心作业目标区的降水是否变化, 很少关注作业对目标区以外的区域的影响, 尤其是在一个固定区域的长期增雨作业。本文采用改进后的事后区域历史回归方法对江西省北部 2008-2014 年冬季飞机增雨作业对目标区及下游区的影响做了统计评估, 发现在此期间的播云作业很有可能为目标区增加了 17.30% 的降水, 为下游区域增加了 21.67% 的降水。随后选取 2014 年 11 月 29 日的飞机增雨作业个例为研究对象, 应用雷达追踪和识别技术合理选择与作业单元极其相似的对比单元, 分别对回波顶高、回波体积、最大反射率、垂直累积液态水含量、降水通量这 5 个雷达观测物理量作业前后的变化进行了对比分析。本文的研究对科研和社会经济都有着重要的意义。

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