气象与环境学报 2006 22 (2): 18-21 ISSN: 1673-503X CN: 21-1531/P

一次新型液态CO_2播撒效果的数值模拟

刘健,纪瑛英,蒋彤,陈知新,米长树,汪晓梅

吉林省人工影响天气办公室 长春130062

收稿日期 2005-12-1 修回日期 2006-3-28 网络版发布日期 接受日期

摘要 利用三维积层混合云人工增雨数值模式对2002年7月11日的一次天气过程进行了由播撒液态CO2引起的微物理量变化及云动力影响的数值模拟。结果表明:播撒后,云中最大上升气流速度增大,由未播撒时的0.37 m/s增大到播撒后的0.54 m/s,播撒使云中出现最大上升速度W的时间比未播撒提前了4 min,表明播撒液态CO2影响了云的动力过程。同时与未播撒相比:云中雨水含量最大值由1.04 g/kg增加到1.40 g/kg;冰粒子含水量的出现提前了88 min,最大值的出现提前了76min;冰粒子浓度的出现提前了72 min,最大值的出现提前了72 min;雪粒子含水量的出现提前了72 min,最大值的出现提前了128 min;云水含量最大值由1.21 g/kg减小到0.87 g/kg。证明了播撒液态CO2后可影响云的微物理过程,从而导致地面降水的增加。

关键词 液态CO2播撒 微物理量 数值模拟

分类号

Numerical simulation on seeding effect of a new kind of liquid CO_2

LIU Jian JI Yingying JIANG Tong CHEN Zhixin MI Changshu WANG Xiaomei

Weather Modification Office in Jilin Province;Changchun 130062

Abstract The micro-physical amount change and cloud dynamical effect caused by seeding liquid CO_2 on July 11,2002 was simulated by three-dimensional cumulus mix cloud artificial rain enhancement numerical model in this paper.The result showed that the velocity of the maximum updraft increased after seeding from 0.37m/s(before seeding) to 0.54m/s(after seeding),and the appearing time of the maximum ascending velocity(W) in cloud after seeding advanced 4 minutes than that before seeding.It implied that seeding liquid CO_2 affected the dynamical process of cloud.Meanwhile compared with no seeding,the maximum value of rain water content in cloud increased from 1.04g/kg to 1.40g/kg.The appearing time of ice particle water content advanced 88 minutes,and that of the maximum value is 76 minutes ahead of time.The appearing time of the ice particle concentration advanced 72 minutes,and that of the maximum value is 72 minutes ahead of time.The appearing time of snow particle water content advanced 72 minutes,and that of the maximum value is 128 minutes ahead of time.The maximum value of rain water content in cloud decreased from 1.21g/kg to 0.87g/kg.All of these showed that seeding liquid CO_2 affected the micro-physical process of cloud,thus it caused the increase of rainfall on the ground.

Key words Seeding liquid CO_2 Micro-physical amount Numerical simulation

DOI:

通讯作者