P1.3 FOG AEROSOL ANALYSIS AND CLOUD SEEDING EXPERIMENTS AT DAEGWALRYOUNG, KOREA

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1. INTRODUCTION

The dry season in the Korean peninsula starts in late February and continues until the end of May. During this period Korea often suffers from severe droughts, and natural disasters related droughts such as the wild fire. Thus an efficient water management and possible precipitation enhancement is urgently required in Korea.

Weather modification research in Korea started in 1965 by the Korea Meteorological Service. Meteorological Research Institute (METRI) / Korea Meteorological Administration (KMA) resumed a project of cloud seeding once again in March 1995 in the occasion of severe local drought during 1994 and 1995, continuing up to 1998. In 2001, a serious spring drought led to a commencement of a precipitation enhancement study.

METRI/KMA carried out ground-based experiments in the middle of Korean peninsula 11 times and aircraft experiments in the southwestern part of Korean peninsula 2 times from 1995 to 2002.

Recently, we have started the project 'Development on the Weather Modification Techniques over the Korea peninsula' supported by KMA for 2003-2005. The project focuses on improving the understanding of microphysical cloud characteristics in the peninsula and on developing the infrastructure in the monitoring system, as well as on developing fundamental weather modification techniques.

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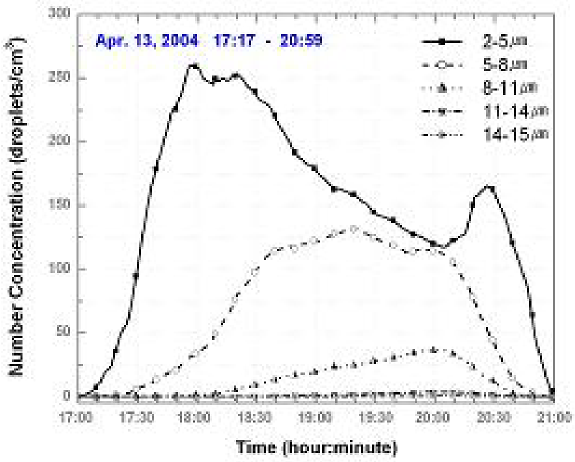
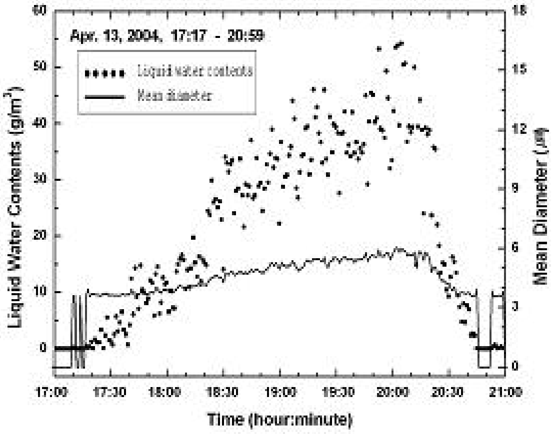
2. CLOUD OBSERVATIONAL INSTRUMENT

For the monitoring of cloud physics and ground seeding experiments we have recently installed two equipments, the Forward Scattering Spectrometer Probe (FSSP-100) and two channels microwave radiometer (MWR-1100) at DaeGwalRyoung weather station 0f 842 m above sea level in the east mountain region. The FSSP-100 measures the cloud droplets size distribution, and calculates the number concentration of cloud droplets by size range and integrated cloud liquid water contents (Baumgardner *et al*., 1985) as shown in Fig. 1.

(a)



(b)



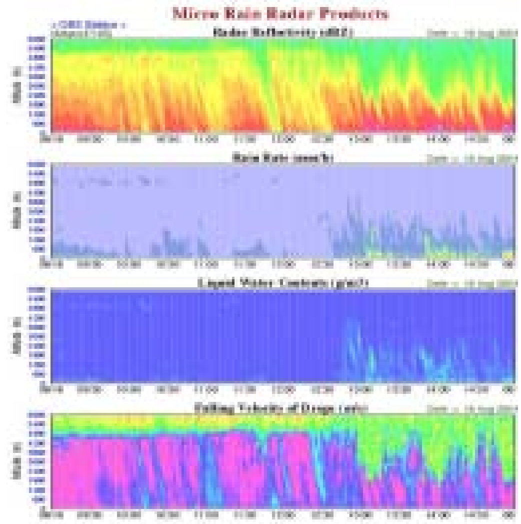
(c)

Fig. 1. The Forward Scattering Spectrometer Probe (FSSP-100) (a), time series of number concentration with size (b), liquid water contents (dot) and mean diameter (solid line) (c) for fog droplets, April 13, 2004.

Fig. 1 shows the variations of number concentration and liquid water contents of cloud droplets at different channel size when a cloud was observed at ground base of the DaeGwalRyoung site during the evening hours between 17:00 and 21:00 LST at April 13, 2004. We understand the fine droplets dominated at early time of the cloud but the number of large cloud droplets increase with time from the condensation and coagulation. The cloud did not show an environment at water saturation for rain droplets growing.

MWR-1100 measures the vertical total precipitable water vapor and cloud liquid water path in a column cloud. MRR-2 is observes the drop size distribution, integral radar reflectivity, rain rate, and liquid water contents by vertical layers as shown in Fig. 2.

(a)

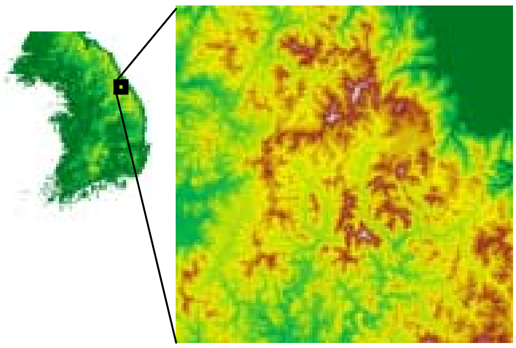


(b)

Fig. 2. MRR installed at Mokpo (a), the outputs from this equipment; time series of droplets number concentration with size, radar reflectivity, rain rate and liquid water contents (b).

3. CLOUD SEEDING EXPERIMENT

Numerical experiment for wind fields was simulated to decide a place for the cloud seeding experiments that will be conducted by an unmanned helicopter and a ground-based generator in the eastern mountain area of Korea. The winds over the experimental area were simulated in three dimensional wind fields using a Computer Fluid Dynamic (CFD) model (v 3.0, Sievers and Zdunkowski, 1994). Fig. 3 shows the topography around DaeGwalRyoun seeding site area.



Fig,3. The topographical feature around DaeGwalRyoung, Gangwon province in Korea.

For the wind simulation initial wind has SW at 10m above ground. Cloud seeding experiments were carried out in the mountain region around the site using an unmanned helicopter and silver iodide generators from 00UTC to 03UTC on February 1, 2004. Although it was a preliminary experiment, we could find a possibility of an unmanned helicopter and the ground silver iodide generator for cloud seeding. We also observed the vertical profiles of meteorological elements using radio-sonde and the particle size distribution of collected air samples around ground-based AgI generator a using aerosol profiler in order to verify the effect of this experiment.

4. CLOUD MODEL SIMULATION

For understanding the cloud seeding possibility, the two-dimensions Takahashi and Kawano cloud model (Takahashi and Kawano, 1998) had been applied to the seeding site, where cloud seeding experiments were simulated on both continental and maritime clouds. Also we operated the Clark-Hall cloud model simulation (Clark, 1977; Bruintjes *et al.,* 1995) for predicting weather changes over the cloud seeding areas. Those models play a major role in determining the location and time of the seeding experiment. In order to quantify the spatial and temporal variations of cloud parameters related to cloud seeding, the time series of cloud and precipitation development was analyzed on the case in February 6, 2001.

5. ACKNOWLEDGEMENTS

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6. REFERENCE

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