

## NUMERICAL SIMULATION OF LONG DISTANCE TRANSPORTATION OF VOLCANO ASH FROM PINATUBO

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### 1. INTRODUCTION

More than 100 jet aircrafts have encountered volcanic ash clouds in the past. In these cases, volcano ash had caused serious damage to the aircraft engines, control surfaces, windshields, and landing lights. In most cases, volcano ash clouds, transported by atmospheric winds far from its source, are not detectable by the present generation of radar instrumentation carried aboard aircraft. Here we employ a long distance transport model to simulate the concentration field of volcano ash. After averaging the trajectories for 168 cases both in summer and spring we obtain four routines for volcano ash clouds to move toward China. A typical case study show that if Pinatubo volcano in Philippine erupt in summer, the seven-day long distance transport process cause volcano ash cloud move away to Shangdong province. The highest concentration center can reach 2.8 km altitude above the surface. Another typical case study show that if Pinatubo volcano in Philippine erupt in spring, the seven-day long distance transport process cause volcano ash cloud move away to the coast of Fujian province. The highest concentration center can reach 1.6 km altitude above the surface.

### 2. STATISTICAL AVERAGING OF THE TRAJECTORIES

Figure 1 summarizes averaging trajectory map for the 320 cases during the period both from 1983 to

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2003. From the map, we have four main routines:

The first routine goes toward the southern west and arrives at west point of the boundary of Malaysia in 7 days; the second routine goes toward the west and arrives at India ocean in 7 days. The third routine goes toward northern west and arrives at southern east part of China. The fourth routine goes all the way over west Pacific ocean. According to the simulation cases, the weather pattern, both during the end of March and the beginning of July would be dangerous for volcano Pinatubo to affect China.

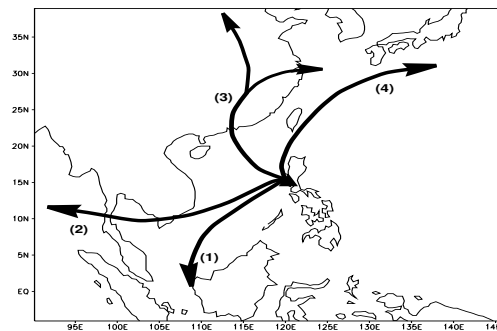


Figure 1

### 3. CASE STUDY BOTH IN 1998 AND 2003

#### 3.1 A Case In July of 1998

Starting time at 00UTC, July 1, 1998, seven -day simulation have been done to simulate volcano ash at supposing that Pinatubo volcano erupts with same scenario as its latest erupted in 1991. Figure 2 is the concentration field of volcano ash between the 500m-1500m air layer. From these figures, we could

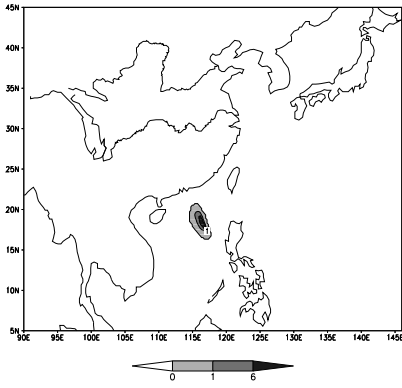
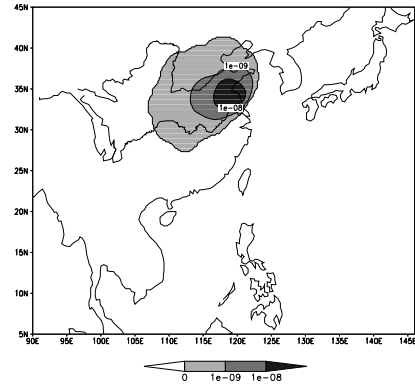


Figure 2(a)



2(d)

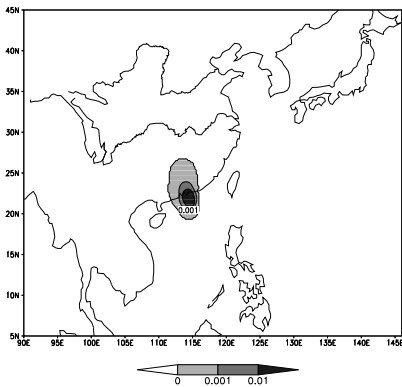


Figure 2(b)

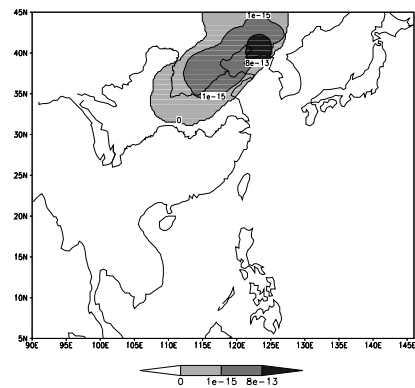


Figure 2(e)

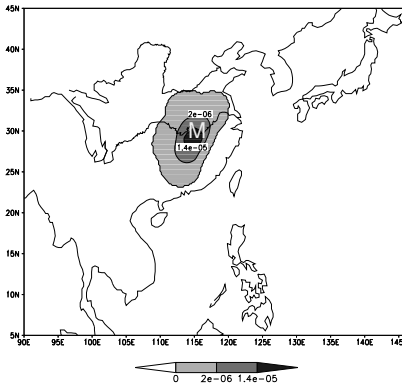


Figure 2(c)

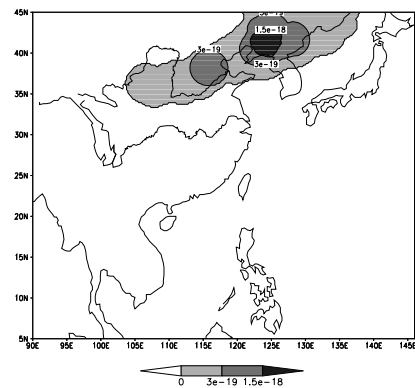
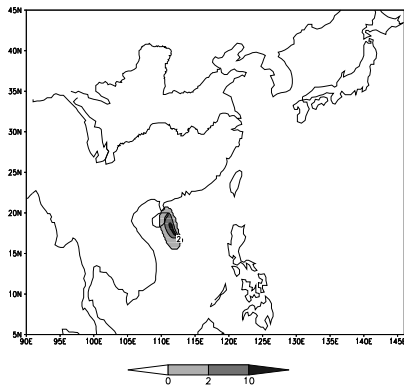


Figure 2(f)

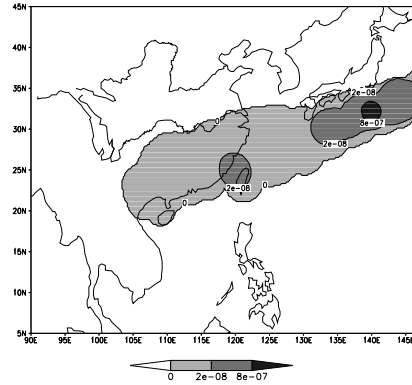
Figur  
e

see that in the weather situation from July 1 to July 8, 1998, the volcano ash cloud move away to Shangdong province. The highest concentration center can reach 2.8 km altitude above the surface.

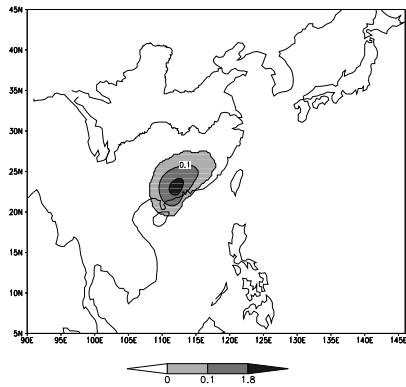
### 3.2 A CASE IN MARCH OF 1998



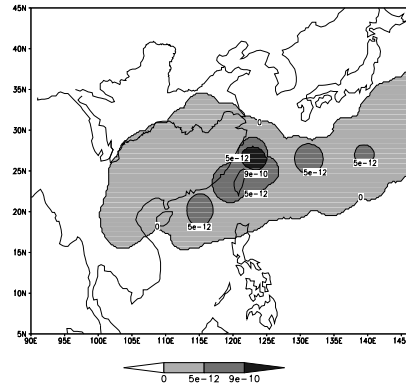
(a)



(d)



(b)



(c)

Figure 3 is the concentration field of volcano ash between the 500m-1500m air layer. From these figures, we could see that in the weather situation from March, 2003, the volcano ash cloud move away to Shangdong province.

Figure 3 The distribution of the concentration field of volcano ash between 500—1500m air layer (g/cc) ,

### 3.2 A CASE IN MARCH OF 1998

The highest concentration center can reach 2.8 km altitude above the surface In July 3, 1998. Another typical case in March 1998 shows that if Pinatubo volcano in Philippine erupt in spring, the seven-day long distance transport process cause volcano ash

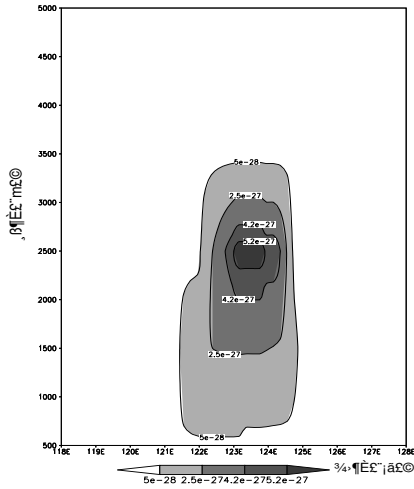


Figure 4(a)

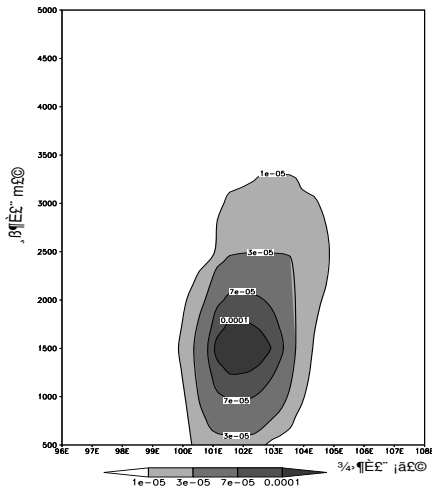


Figure 4b

cloud move away to the coast of Fujian province. The highest concentration center can reach 1.6 km altitude above the surface.

#### 4. CONCLUSION

In this paper, we employ a long distance transport model, Hysplit-4, to simulate the concentration field of volcano ash. After averaging the trajectories for 168 cases both in summer and spring we obtain four routines for volcano ash clouds to move toward China. A typical case study show that if Pinatubo volcano in Philippine erupt in summer, the seven-day long distance transport process cause volcano ash cloud move away to Shangdong province. The highest concentration center can reach 2.8 km altitude above the surface. Another typical case study show that if Pinatubo volcano in Philippine erupt in spring, the seven-day long distance transport process cause volcano ash cloud move away to the coast of Fujian province. The highest concentration center can reach 1.6 km altitude above the surface.

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