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USING ATMOSPHERIC TRANSPORT MODELLING FOR THE PREDICTION OF VOLCANIC ASH FOR PUBLIC SAFETY

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Summary and purpose of document

This document describes the recent experience at RSMC Tokyo. RSMC Tokyo developed an atmospheric transport model (ATM) that predicts the advection of volcanic gas released from Mt. Oyama on Miyake Island of Tokyo. Japan Meteorological Agency issues every day the volcanic information including the forecast message on volcanic gas transport based on the ATM.

This document is given for information only.

1. Introduction

Mt. Oyama on Miyake Island erupted in July 2000 and has been active since then. The island is 180 kilometers south of Tokyo. Not only volcanic ash but also toxic volcanic gas has been frequently released from its crater for one year. The total release amount of volcanic gas is the largest of the world volcanoes ever erupted.

The sulfur dioxide began to be observed at Tokyo from 28 August 2000, and it was often reported to smell nasty in the wide area of Japan. The sulfur dioxide is frequently observed at many monitoring stations in Japan. It was considered that the sulfur dioxide originated from the volcanic activity. The Ministry of the Environment warned the public that the volcanic gas might be harmful to the health.

The release of volcanic gas at Miyake Island continues today. RSMC Tokyo developed an atmospheric transport model (ATM) that predicts the advection of volcanic gas from Miyake Island since the public forecast for the volcanic gas transport was expected. Now JMA issues every day a volcanic gas forecast, which is included in the public volcanic information.

2. Transport Modelling

When the sulfur dioxide was observed at Tokyo on 28 August 2000, RSMC Tokyo tried running a routine EER model with the default condition in which source location was Miyake Island (Figure.1). Our transport model was able to predict the advection of volcanic gas from Miyake Island to the Kanto district (Tokyo area). Then, we changed the meteorological data from GSM (global model: 55km grid) to RSM (regional model for Japan area: 20km grid) to input more realistic wind data with fine topography, and improved the transport model for high resolution data. We evaluated the new ATM with the 1-hourly observational data at monitoring stations. The new ATM was able to predict the flow of volcanic gas more accurate (Figure.2). Since June 2001, a 36 hours forecast with the new ATM has been performed operationally after the 00UTC RSM run.

Figure.1 Trajectory map of routine EER model

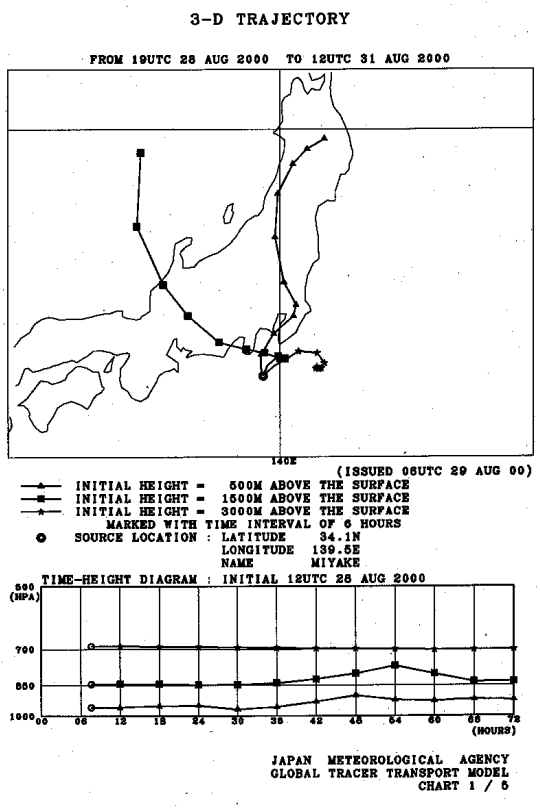
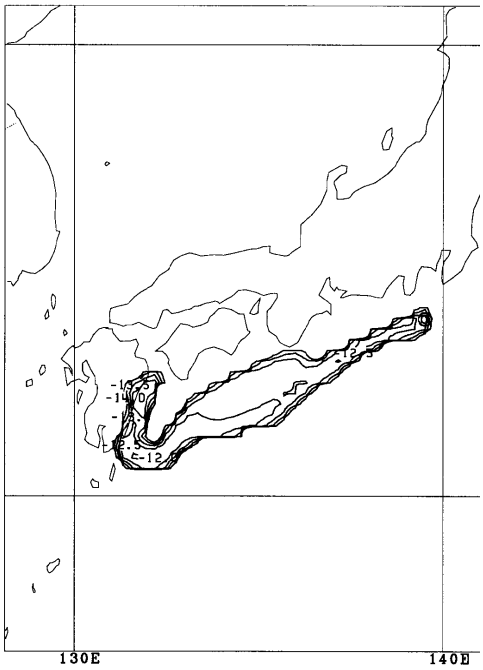
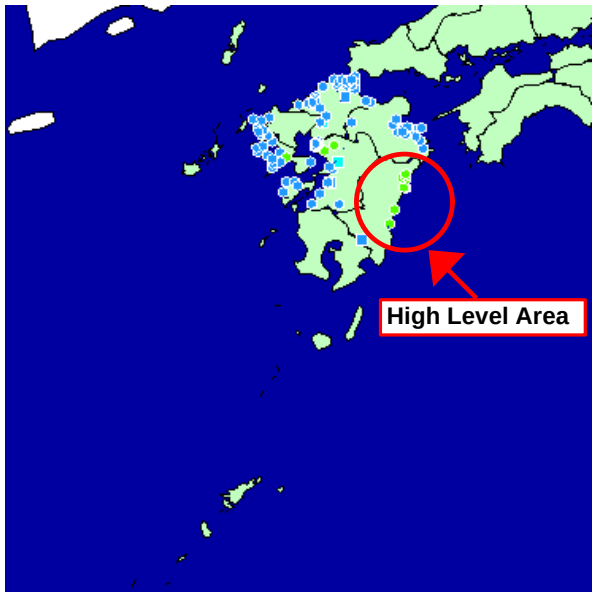


Figure.2 New ATM(left) and Observations of sulfur dioxide(right)



0-500m Concentration
00UTCinit 15 Aug 2001, T=30



02UTC 16 Aug 2001

3. Public forecasts

The JMA forecaster for air pollution forecast issues a two day forecast for volcanic gas from Miyake Island using the products of the new ATM. This forecast message is included in the public volcanic information every day (Figure.3). Some Japanese newspapers carry the volcanic information if there is a high probability that the volcanic gas flows over Japan.

Figure.3 Forecast examples for volcanic gas from Miyake Island

(Original : Japanese Only)

1) 1630JST 26 August 2001

Tomorrow (27 August) : There is a high probability that the volcanic gas will flow over the Kanto district since weak southerly winds will continue to blow over the south of the Kanto district.

2) 1630JST 29 August 2001

Tomorrow (30 August) : There is a low probability that the volcanic gas will move toward the Honshu (the main island of Japan) since easterly or northeasterly winds will continue to blow over the south of the Kanto district.