RADIOACTIVE POLLUTION OF FUKUSHIMA DAIICHI NUCLEAR POWER PLANT

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1. INTRODUCTION

Before reoperations of Sendai nuclear power plant, radioactive pollution simulation is depending on SFEEDI. However, in the case of Fukushima nuclear power plant accident, the information disclosure delayed with SPEEDI, and the neighborhood felt fear. Radioactive pollution of Fukushima Daiichi nuclear power plant was analysed by the simulation in the citizen level for the safety of neighborhood.

2. METHODS

2.1 Atmospheric diffusion model

Dry and wet depositions were calculated from the actual observed values of wind directions, wind velocities, rainfalls, spatial doses after nuclear power plant accidents with the atmospheric stability. Using a diffusion model, all pollutions were analysed from those data.

2.2 Classification of pollution

From the meteorological archives, were calculated a time series of time spatial doses, were calculated most of pollutions were classified by precipitation and wind directions.

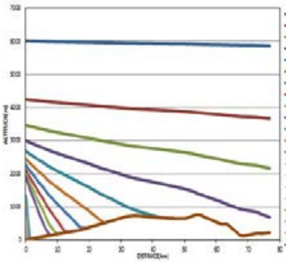
3. RESULTS

3.1 Normal distribution approximation

Fig. 1 Pollution state Fig. 2 Pollution state

With the simulation of the same pollution at Sendai nuclear power plant, as Fukushima nuclear power plant accident the result showed the pollutions approached the suburb of Kagoshima City where the most people live.

3.2 Particle model



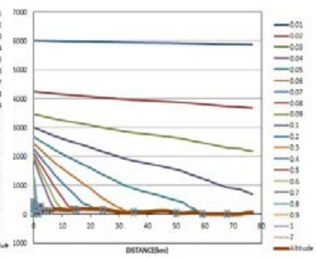


Fig.3Profile(Fukushima) Fig.4 Profile(Sendai)

Fig. 5 Atmospheric diffusion model (Sendai)

The mountains stretch north to south at altitude 700m from Fukushima nuclear power plant to Fukushima City. The particles over 0.05mm were blocked on the mountain and slopes, then did not approach Fukushima City. On the other hand, the landform around Sendai nuclear power plant is almost flat, thus particles would be considerably scattered to the wide area. Therefore, the particle model simulation for

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Sendai nuclear power plant showed the pollution at Kagoshima City.

3.3 Atmospheric diffusion model

Using atmospheric diffusion model, a pollution range and a dose of radioactivity fit considerably almost observation values. The real pollution was derived mostly by the atmosphere diffusion. Mountains around 700m in height are adjacent in the outskirts

Fig. 6 Atmospheric diffusion　Fig. 7 Observation

where pollution spreads and the pollution is limited in a range surrounded by the mountains. The mixture layer height in the atmospheric diffusion model becomes 600m.

3.4 Classification of pollution

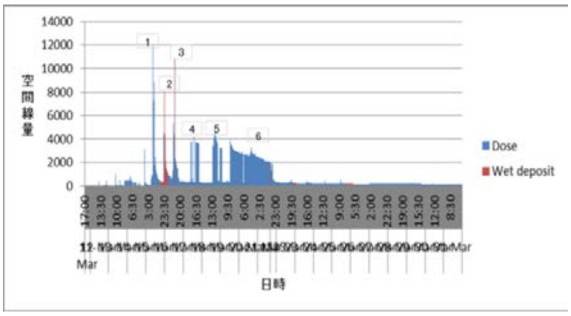

Fig. 8 Spatial dose with wet deposition

Fukushima nuclear power plant pollutions concentrated on March 12 to 31, the most pollutions were classified by 6. The radioisotope pollution with hydrogen explosions is shown as 1 in Fig. 8. Moreover, spatial dose of radioactivity increased at 3 in Fig. 8. The ratio of hydrogen explosions was only 25.4% in total, and the rest was 74.6% with Leaks. The ratio of radioisotope for Iidate village became 18.5%.

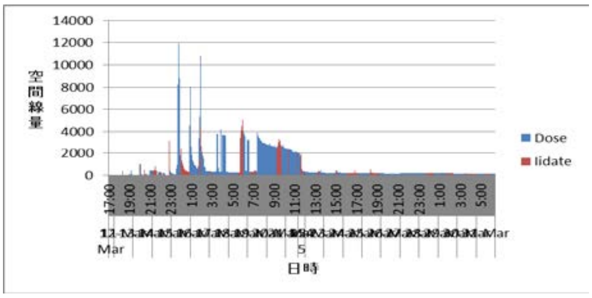

Fig. 9 Pollutions at Iidate Village

4. DISCUSSION

The diffusion by a particle model was predicted by the wind velocity. If an accident with particle diffusion at Sendai nuclear power plant happened, and wind over 4m/s blew to Kagoushima direction at the time, the pollutions for Kagoshima City where would be predicted. 25.4% diffusion from Fukushima nuclear power plant was associated with explosions. Furthermore, southeastern wind of the direction for Fukushima City was, the average wind velocity of 1.6m/s, and the duration time of 30 minutes, the pollutants did not arrive at Iidate village and Fukushima City when a hydrogen explosion occurred at Fukushima nuclear power plant. The rest of 74.6% was the leaks from nuclear power plant, with the atmospheric diffusion. The mountains on southeastern direction of Iidate village with high pollution are relatively low in altitude and mostly less than 600m. The pollutant which was not blocked by the mountain flied to Iidate village by the atmospheric diffusion.

REFERENCES

The weather data archive of Fukushima Daiichi Nuclear Power Plant

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