

Sources and a structure of database for numerical model simulation of the Hiroshima A-bomb in 1945

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Abstract

A database for numerical model simulation is prepared based on studies of HiSoF members. This database includes initial and boundary conditions which are 1) amount of flammable materials in 50 m grid within 8 km $\times$ 8km area from hypocenter of the A-bomb, 2) times of begin and end of induced fire just after A-bomb in 50 m grid, 3) time dependent heat, water and carbon fluxes in 50 m grid, 4) a wind field in 100 m, 1 km and x km grids within 8 km $\times$ 8km area, 50 km $\times$ 50 km area and 500 km $\times$ 500 km area, respectively. The database also has tables of results of initial survey of radioactivity by many researchers after the A-bomb which can be used as validation data for results of numerical simulations. The database gives reference height of a mushroom cloud and initial distribution of fission products within the mushroom cloud. The database contains rainfall distribution which also can be used as validation data, too.

20 Introduction

To conduct numerical model simulation of distribution of radioactive fallout and black rain after the explosion of the Hiroshima A-bomb in 6 August 1945, initial conditions and boundary conditions such as distribution of fission products in the mushroom cloud, heat, water and carbon fluxes from surface of the ground should be given by appropriate grid size and time scale. HiSoF members studied to create database for this purpose and combined them as a database.

1. Methods

1.1 Create 50 m grid data

Amount of flammable materials, times of begin and end of induced fire just after A-bomb, and time dependent heat, water and carbon fluxes in 50 m grid within 8 km $\times$ 8km area from hypocenter of the A-bomb were obtained results of Koizumi (2011, this book), Okada and Aoyama (2011, this book) and Aoyama et al. (2011, this book). These data has same additional table for latitude and longitude by The World Geodetic System 84, WGS84, distance and direction from hypocenter of the A-bomb, grid number coordinated as hypocenter is set origin, (0, 0) which has relationship with each data table.

35 1.2 From old and new research maps

We also create several set of tables which include old research results just provided as maps

only at the time of publication. We used maps published before 1945 and overlaid it on maps of old research with 50 m grid, then, we read locations of data on the maps in terms of latitude and longitude by WGS84 and grid number. For some new maps, we need to assign latitude and longitude by WGS84 and grid number to each data point which are provided only maps.

5 2. Reference height and initial distribution of fission products within the mushroom cloud

The database also gives time dependent reference height of a mushroom cloud and 2-dimensional shape of mushroom cloud based on a research conducted by Baba et al. (2011, this book). Initial distribution of fission products within the mushroom cloud are also given by
10 Imanaka (2011, this book).

3. Time development of meteorological precipitation

Otaki (2011, this book) established time development of meteorological precipitation and provide a few table of the database. Masuda (2011, this book) also provide a map of area of precipitation.

15 4. Conclusions

A database for numerical model simulation is prepared based on studies of HiSoF members. This database includes initial and boundary condition of 4 tables. These are 1) amount of flammable materials in 50 m grid within 8 km × 8km area from hypocenter of the A-bomb, 2) times of begin and end of induced fire just after A-bomb 50 m grid, 3) time dependent heat,
20 water and carbon fluxes in 50 m grid, 4) wind field in 100 m, 1 km and 10 km grids within 8 km × 8km area, 50 km × 50 km area and 500 km × 500 km area, respectively. The database also has tables of results of initial survey of radioactivity by many researchers after the A-bomb. The database also gives reference height of a mushroom cloud and distribution of fission products within the mushroom cloud. The database provides a few validation data of rainfall for modelers.

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References

- Baba, M., F. Ogawa, S. Hiura, N. Asada. 2011. Height Estimation of Hiroshima A-bomb Mushroom
30 Cloud from Photos, 55-67. In: M. Aoyama and Y. Oochi (Eds.), Revisit the Hiroshima A-bomb with a Database: Latest Scientific View on Local Fallout and Black Rain, Hiroshima City, Hiroshima.
- Imanaka, T. 2011. Initial process of atomic bomb cloud formation and radioactivity distribution, 1-14. In: M. Aoyama and Y. Oochi (Eds.), Revisit the Hiroshima A-bomb with a Database: Latest Scientific View on Local Fallout and Black Rain, Hiroshima City, Hiroshima.
- 35 Kawano, N., M. Ohtaki, T. Okada. 2011. Visualized Map of a fire field near epicenter of Hiroshima A-bomb in August 6, 1945, 15-24. In: M. Aoyama and Y. Oochi (Eds.), Revisit the Hiroshima A-bomb with a Database: Latest Scientific View on Local Fallout and Black Rain, Hiroshima City, Hiroshima.

- Koizumi, T. 2011. Digital Mapping of Urban Area of Hiroshima City just before and after the Atomic Bombing, 25-435. In: M. Aoyama and Y. Oochi (Eds.), Revisit the Hiroshima A-bomb with a Database: Latest Scientific View on Local Fallout and Black Rain, Hiroshima City, Hiroshima.
- Masuda, Y. 2011. A review of Masuda's re-investigation of 'black rain' after the Hiroshima A-bomb,
5 125-130. In: M. Aoyama and Y. Oochi (Eds.), Revisit the Hiroshima A-bomb with a Database: Latest Scientific View on Local Fallout and Black Rain, Hiroshima City, Hiroshima.
- Ohtaki, M. 2011. Re-construction of spatial-time distribution of 'black rain' in Hiroshima based on statistical analysis of witness of survivors from atomic bomb, 131-144. In: M. Aoyama and Y. Oochi (Eds.), Revisit the Hiroshima A-bomb with a Database: Latest Scientific View on Local Fallout and
10 Black Rain, Hiroshima City, Hiroshima.
- Okada, Y., M. Aoyama. 2011. Resources of heat, water and carbon fluxes for an induced urban fire in 1945 Hiroshima based on field research of Japanese traditional houses, 37-41. In: M. Aoyama and Y. Oochi (Eds.), Revisit the Hiroshima A-bomb with a Database: Latest Scientific View on Local Fallout and Black Rain, Hiroshima City, Hiroshima.