Mapping the Fire Field near the Hypocenter of the Hiroshima A-bomb

Noriyuki Kawano*[a], Megu Ohtaki[b], and Takao Okada[c]

[a] *Institute for Peace Science, Hiroshima University*
[b] *Research Institute for Radiation Biology and Medicine, Hiroshima University*
[c] *Research Division, Atomic Bomb Survivors Relief Department, Hiroshima City*

Abstract

The aim of this study was to spatially and temporally map the fire field that occurred near the hypocenter of the Hiroshima A-bomb on 6 August 1945. For this purpose, we used official records in Hiroshima city and plotted location-specific fire status data on a series of maps to aid in the visualization of the development of fires. The maps show that fires started in 21 locations immediately after the bombing and they spread with the passage of time, until almost the entire area within a 2-km radius of the hypocenter was burning by about 15:00. The fire continued burning in at least 10 locations past midnight, primarily in an area on the east side of the city.

Introduction

More than 65 years have passed since the atomic bomb was dropped on Hiroshima. Considerable efforts have been devoted to studying the damage caused by the atomic bomb, but numerous issues remain unresolved. One such issue is the damage caused by radioactive fallout in areas not officially designated as being affected by the atomic bomb. This primarily involves the issue of the area affected by so-called “black rain” which was a rain containing radioactive fallout. Residents of areas that are not officially designated as affected areas as well as other people have repeatedly called for a revision of the officially designated areas, and there is considerable public interest in this issue.

The aim of this paper is to reexamine the spatial and chronological distribution of fires immediately after the bomb was dropped because the presence of fire was one of the conditions used to designate areas affected by black rain. Ascending air currents and firestorms accompanying secondary fires after the atomic bombing influenced the distribution of radioactive fallout (Atomic Bomb Survivors Relief Department Health and Welfare Bureau Hiroshima City, 2010, p. 3), much of which was deposited by black rain. The primary document used in this paper is *Hiroshima Genbaku Sensaishi* (Hiroshima Atomic Bomb Damage) (Hiroshima City Hall, 1971), abbreviated below as *Genbaku Sensaishi* (A-bomb Damage). The aim of this research is contribute to identify the areas affected by black rain by spatially and temporally mapping the fire field that occurred near the hypocenter of the Hiroshima A-bomb.

Specifically, we created spatial and chronological maps of the spread of fires within

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Revisit the Hiroshima A-bomb with Database: 15-24

approximately 2 km of the hypocenter in Hiroshima after the atomic bomb was dropped. This is the first time that such an initiative has been attempted, although other researchers have examined fire damage in Hiroshima for other reasons. Matsuo and Tani (2007) examined personal accounts of the atomic bombing, what are commonly called "atomic bombing testimonies," from the Survey of A-Bomb Sufferers conducted by *Nihon Hidankyo* (Japan Confederation of A- and H-Bomb Sufferers Organization) in an attempt to reconstruct the actual state of evacuation by Hiroshima atomic bomb survivors until the point where they reached their first places of refuge. They clarified that Hiroshima's rivers and bridges played an extremely important role as places of first refuge in the initial period after the bombing. As part of their study, they investigated when and where fires broke out, as recorded in *Genbaku Sensaishi*, and plotted these on a map. But their map did not include the information about time when the fire was extinguished and wind direction during fires. They found that fires had a significant impact on the evacuation routes that the survivors selected.

Methods

Genbaku Sensaishi was published in 1971 and is made up of five volumes. In the second volume, Hiroshima City is divided up into 36 zones, and the state of the city immediately before and after the atomic bombing is summarized based on information for each of the towns that make up the city. The content of the volume is mainly based on the records, which was compiled from the results of surveys conducted by 82 regional committee members delegated by Hiroshima City, as well as the testimony and witness accounts of atomic bomb survivors and other related reference materials. *Genbaku Sensaishi* is the public record of detailed studies of the fires in Hiroshima City after the bombing.

We summarized all fire-related information recorded in *Genbaku Sensaishi* as shown in appendix I in this book. The appendix is a summary of the names of the zone, the town or former town names within the specified areas, map coordinates, the times that fires first broke out, information on the spread and intensity of the fires, the times that the fires were extinguished or contained, and other related information. A considerable amount of information is missing for many locations. In particular, there were many cases in which information about the time that the fires were extinguished was missing or unclear. Therefore, using the data for the 66 towns for which there was clear information on the times that the fires started and ended, we analyzed the distribution of the length of time fires burned in the various locations. The time distribution was close to log-normal, with a median value of 8 hours and 12 minutes (Figure 1). Therefore, the fire extinguishment time for towns with unclear or missing data was set at 8 hours and 12 minutes after the time that the fire had started. The latitude and longitude of representative buildings (schools, temples, etc.) within a town, current as of January 2011, were used as map coordinates.

Results

Primary (direct) fires broke out as a result of heat waves, and secondary (indirect) fires resulted from the bomb blast, which was accompanied by the destruction of buildings. Within 30 minutes after the bomb blast, large fires broke out and firestorms started. After 2 to 3 hours, the wind speed had reached 18 m/s, and from 11:00 to 15:00 fierce whirlwinds occurred in some areas in the northern half of the city. The winds subsided at about 17:00 that afternoon. As a

result of the firestorms, anything that was burnable was completely destroyed in an approximately 2-km radius from the hypocenter (The Committee for the Compilation of Materials on Damage Caused by the Atomic Bombs in Hiroshima and Nagasaki, 1981).

Figure 2 is a chronological visualization of the fire outbreak and extinguishment for each of the towns listed in appendix. The first image is expanded to make the names of the towns easier to read; the smaller panels chart the spread of the fires throughout the day both spatially and temporally. The red triangles indicate areas where fires were currently burning, and the yellow triangles indicate areas where a fire was extinguished. Fires broke out immediately after the bombing in 21 towns (T=08:15). In those towns in close proximity to the hypocenter, we assume that the fires were caused by heat waves. In areas further away, such as in Eba, they could have been secondary fires resulting from the bomb blast. The fires subsequently spread, and by about 15:00 almost the entire city was burning. After this, the fires began to gradually subside in an increasing number of areas. There were areas, such as Senda 2-chome, Senda 3-chome, and the Nakajima area, where the fires did not die down on 6 August. Most of these towns were located to the east of the hypocenter.

Wind direction is shown in Figure 3. Detailed times are unknown for the wind direction, so the fire situation at 10:00 was added to the figure as an example. The Figure 3 shows that the wind was blowing in a counter-clockwise direction centering on a point west of the hypocenter. Although the direction of the wind is thought to have had considerable impact on the spread of the fires, there is no clear evidence of this in the maps shown in Figure 2.

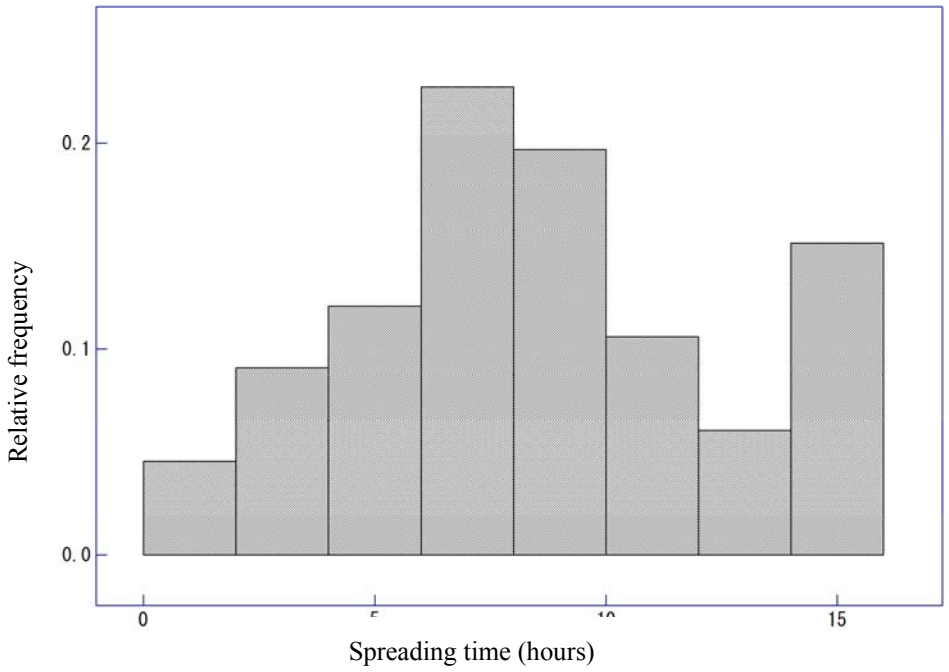


Figure 1 Histogram of the fire spreading time

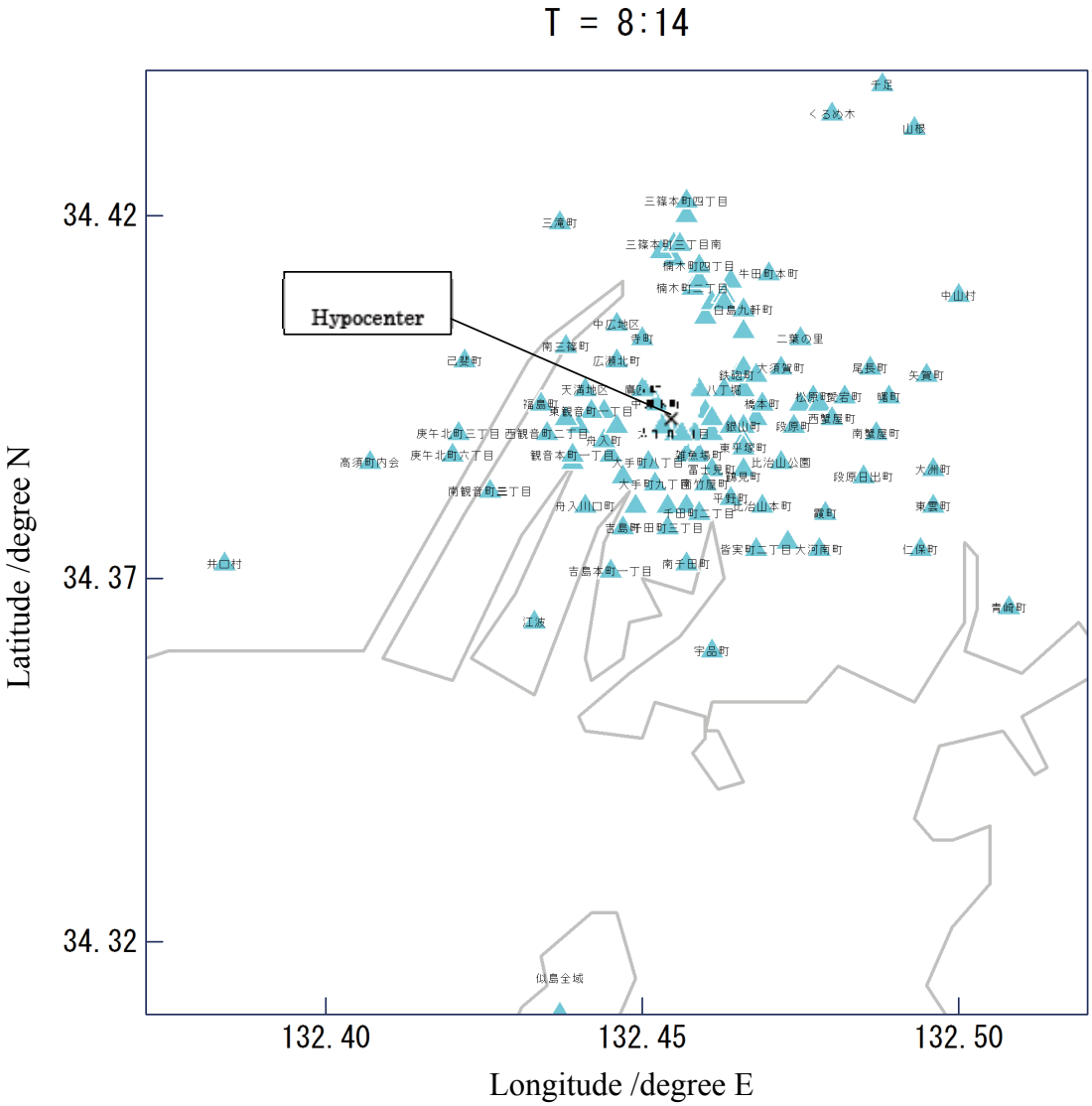
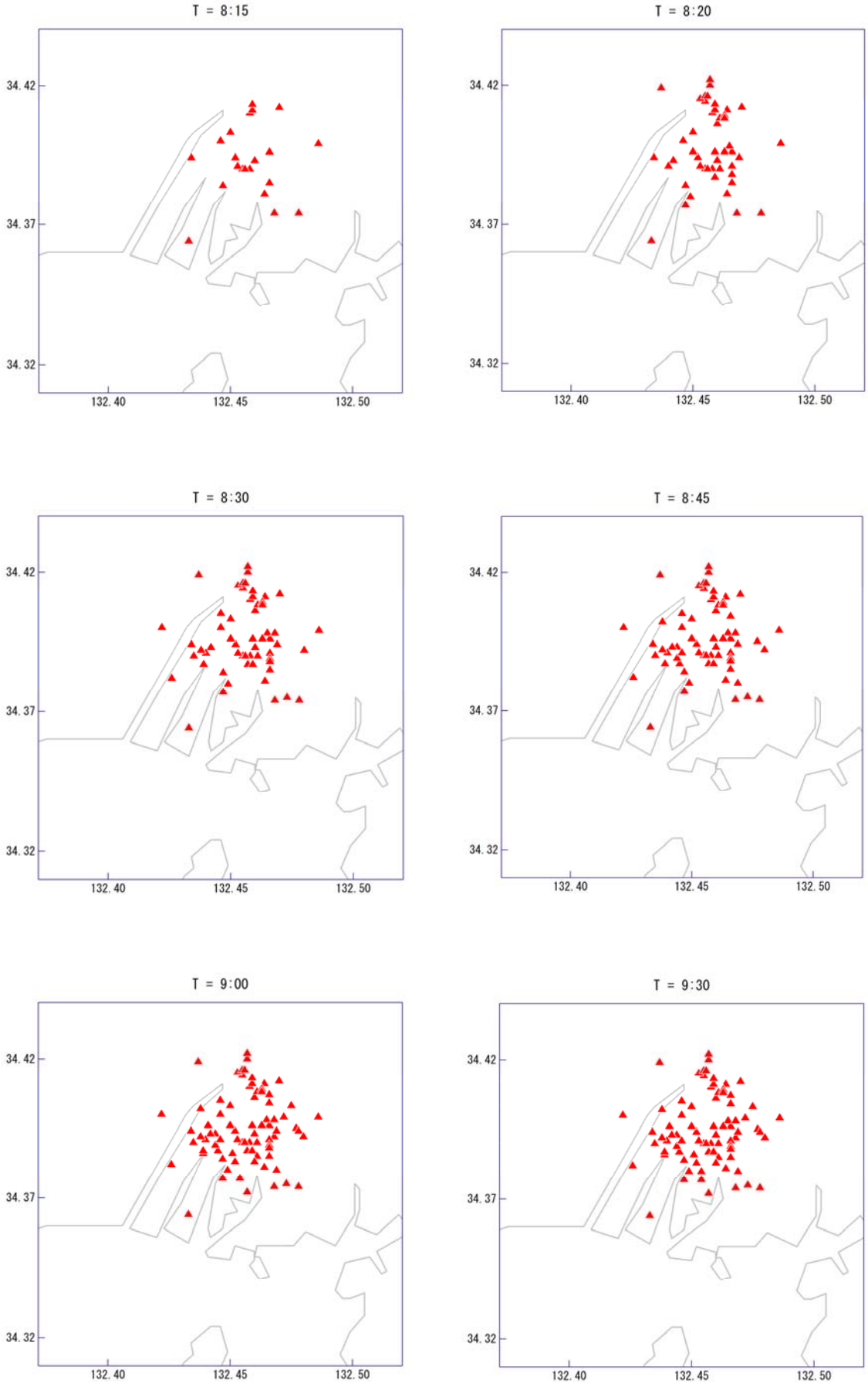


Figure 2 Visualization of status of fires from 0814JST to 2400JST on 6 August 1945. Figures for 0815JST to 0930JST are in page19, for 1000JST to 1500JST are in page20, for 1600JST to 2100JST are in page21 and for 2200JST to 2400JST are in page 22, respectively.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T = 8:30
T = 8:45
T = 9:00
T = 9:30
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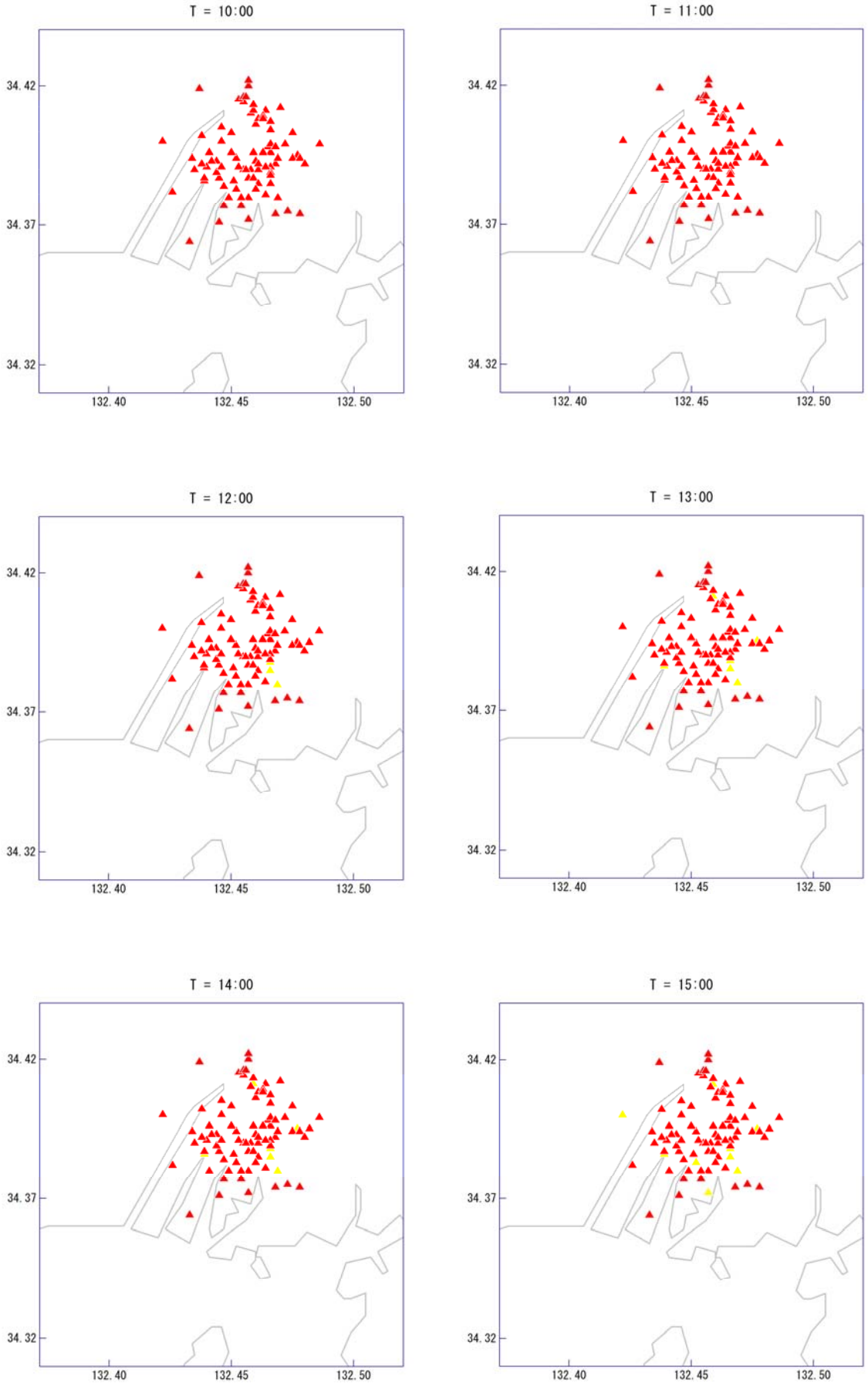
34.37
34.32
132.40
132.45
132.50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T = 12:00
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T = 14:00
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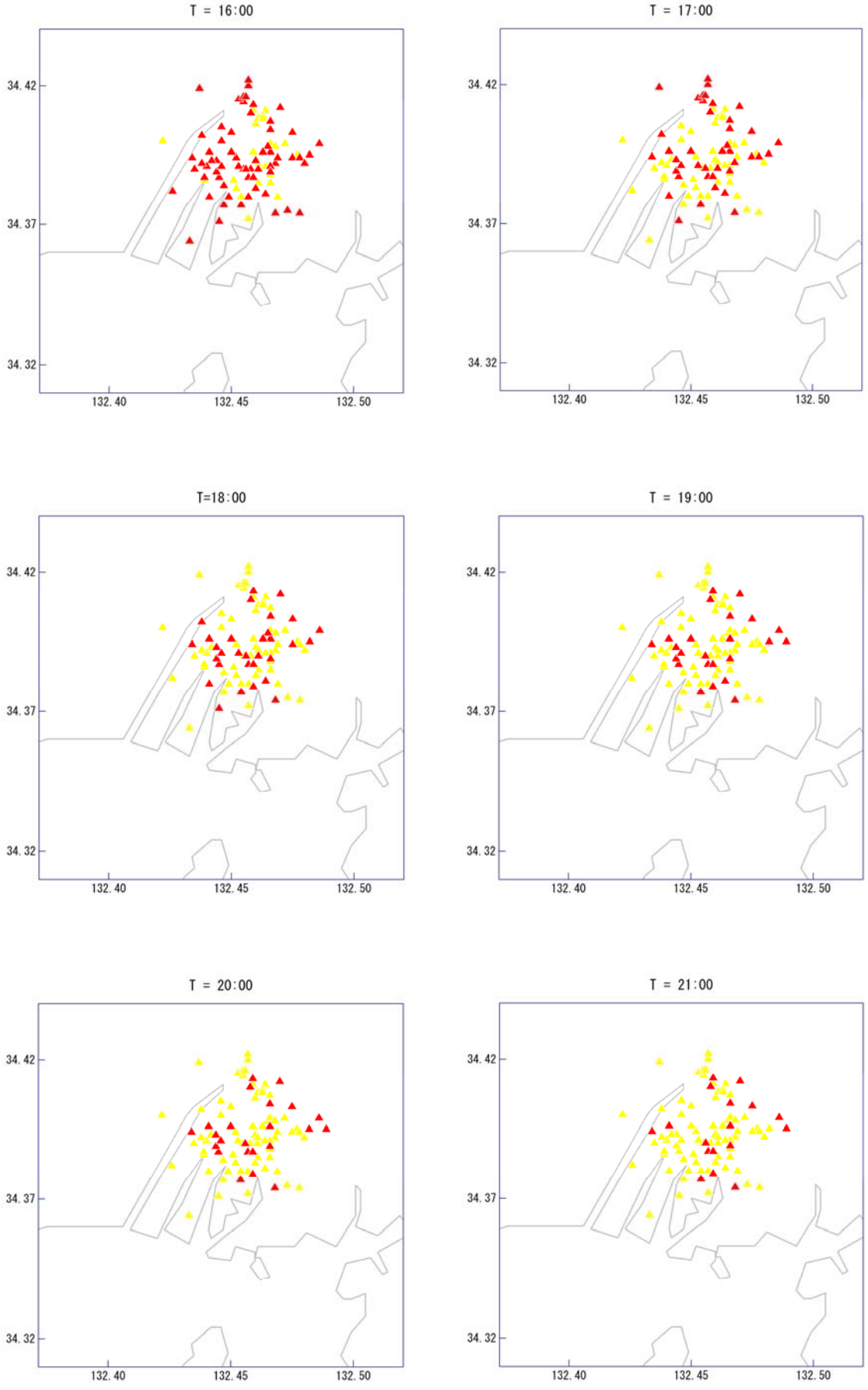
34.37
34.32
132.40
132.45
132.50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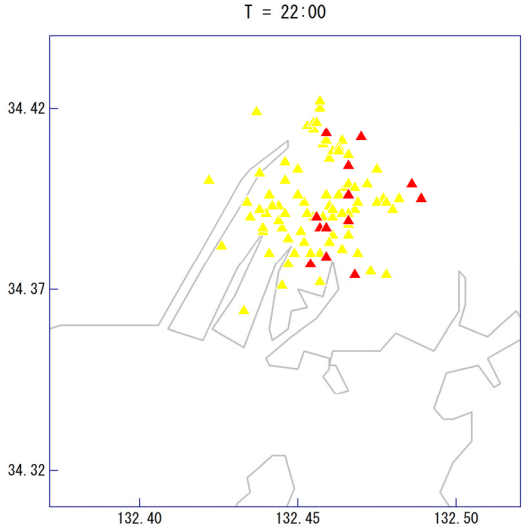
132.40
132.45
132.50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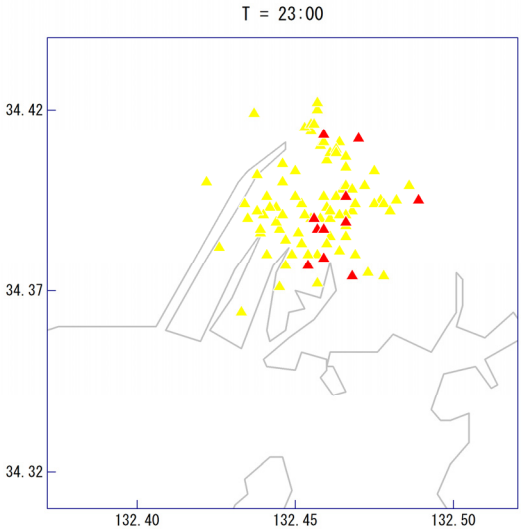
132.50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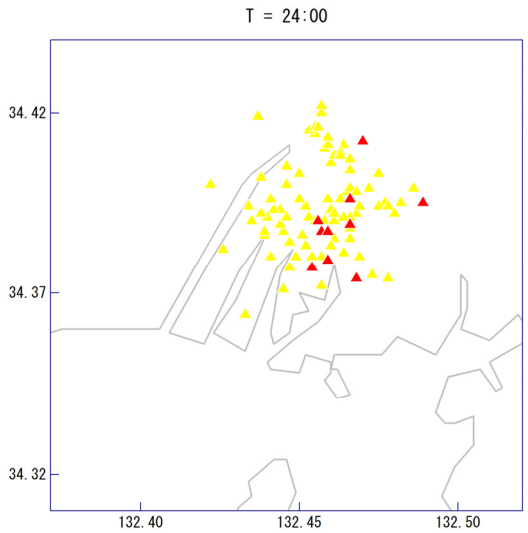
132.45
132.50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132.45
132.50

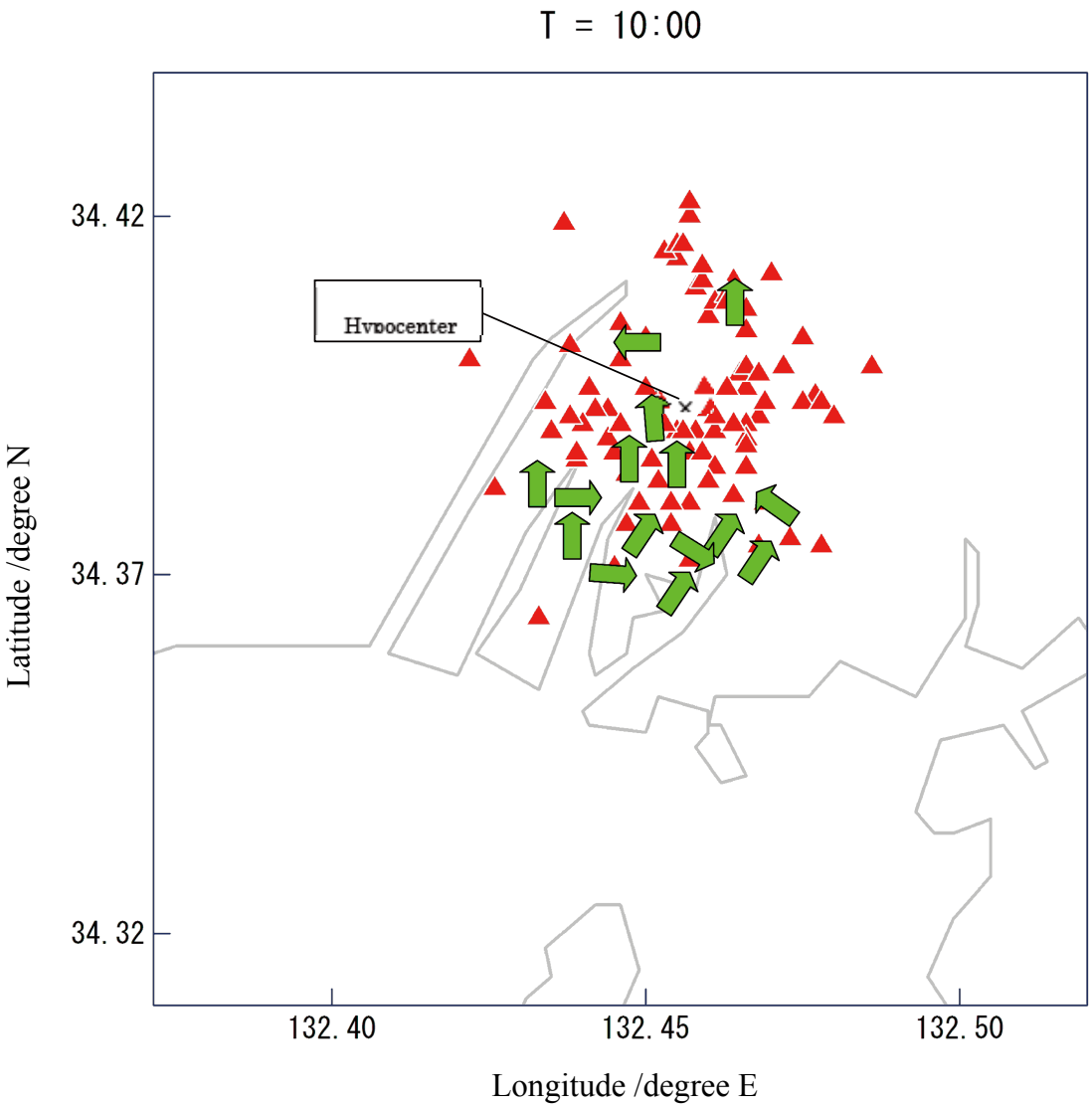

Figure 3 Wind direction during fires

Conclusion

In July 2010, the Governor of Hiroshima Prefecture and the Mayors of Hiroshima City, Hatsukaichi City, Akitakata City, and Fuchu Town jointly submitted to the Ministry of Health, Labor and Welfare a Request for the Expansion of Atomic Bomb Affected Areas (Atomic Bomb Survivors Relief Department Health and Welfare Bureau Hiroshima City, 2010, p. 183). The request stated that the area that was affected by black rain was wider than the area known as the Uda rain area and that those who experienced black rain in the undesignated areas suffered both physically and emotionally at a level equivalent to atomic bomb survivors. For this reason, the total area identified as the area affected by black rain in the survey conducted in 2008 was designated as a Districts Designated for Class 1 Health Checks.

We created spatial and temporal maps of the fires that occurred immediately after the bombing of Hiroshima. By doing so, we hope to aid further in-depth research on the effects of the bomb.

References

Atomic Bomb Survivors Relief Department, Health and Welfare Bureau, Hiroshima City (2010), *Summary of Relief Measures for Atomic Bomb Survivors*, Hiroshima City. (in Japanese)

Hiroshima City Hall (Ed.) (1971), *Hiroshima Genbaku Sensaishi Vol. 2* (Hiroshima Atomic Bomb Damages), Hiroshima City Hall. (in Japanese)

Matsuo, M., Tani, S. (2007), Rivers and bridges as first places of refuge at the time of the atomic bombing in Hiroshima, *Hiroshima Peace Science* 29, 1-27. (in Japanese)

The Committee for the Compilation of Materials on Damage Caused by the Atomic Bombs in Hiroshima and Nagasaki (Ed.) (1981), *HIROSHIMA AND NAGASAKI The Physical, Medical, and Social Effects of the Atomic Bombings*, Iwanami Shoten.

Note on this article.

This article is a summary of “広島原爆投下後の爆心地付近における延焼状況の視覚” that first appeared in Hiroshima Peace Science, 32, PP107-128, 2010. (in Japanese)