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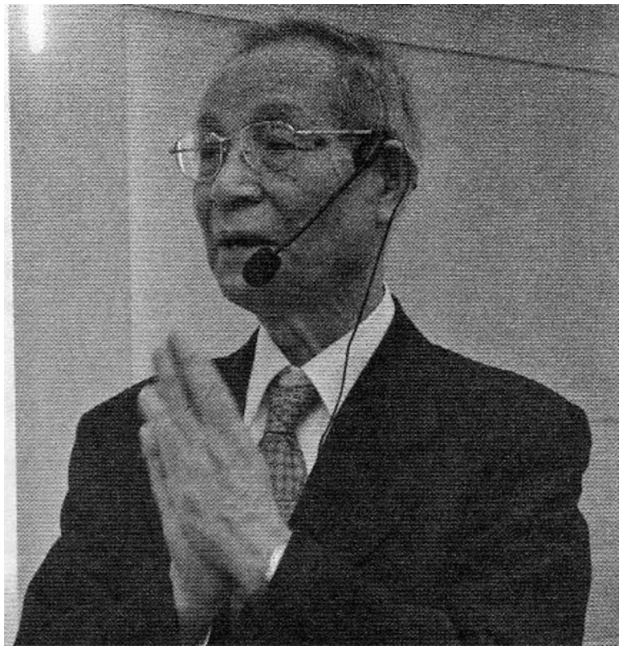
From "Black Rain" to "Fukushima": The Urgency of Internal Exposure Studies

Masuda Yoshinobu
Japanee text can be found here.

Translated by Sakai Yasuyuki and Steve Leeper

Internal exposure has become a major public concern as a result of the Fukushima Dai-ichi nuclear disaster. Hiroshima's "black rain" was the first event that revealed the significance of internal exposure. I began working on the black rain problem in 1985 after meeting Mr. Murakami Tsuneyuki, then Director General of Hiroshima "Black Rain" A-Bomb Sufferers Organization. But let me tell the story from the beginning.


Masuda Yoshinobu

I was born on September 11, 1923 ten days before the Great Kanto Earthquake that devastated Tokyo. I am now 88 years old. I studied at the Meteorological Technical Officials Training School (predecessor of the Meteorological College) for two years before joining the Navy. I was commissioned a second lieutenant in June 1945. On the day of the defeat, I was in Taisha Air Base near Izumo-Taisha Grand Shrine, Shimane, which sent attack aircraft to Okinawa. I worked there as a meteorological officer forecasting the weather. Although I did not know about the dropping of the Hiroshima A-bomb on August 6, I heard rumors that huge numbers of people, mainly soldiers, were brought to the Army Hospital near Izumo-Taisha, bandaged from head to foot. I knew something very serious had happened.

In 1946, I entered the newly opened post-graduate course at the Meteorological Technical Officials Training School. After three years of study, I started working for the Meteorological Laboratory in 1949.

On March 1, 1954, the US tested a hydrogen bomb on the Bikini Atoll with one thousand times the destructive power of the Hiroshima A-bomb. A Japanese tuna fishing boat, the Lucky Dragon # 5, was caught in the path of the fallout, and Kuboyama Aikichi, the radiotelegraph operator, died as a result. Meteorological researchers at that time found that pressure waves were recorded on barographs in meteorological observatories throughout Japan. They found that nuclear tests can be detected by analyzing the changes in pressure waves. That year, I contributed a paper to the journal of the Japan Meteorological Society, suggesting that a nuclear blast ejecting atomic dust high into the atmosphere could cause climate change. In fact, cold weather in June and July that year resulted in crop failure in northern Japan.

If I had continued this research, I might have uncovered the "nuclear winter" I discuss below. But since the Meteorological Agency was to start weather forecasting based on numerical methods using a large computer, I started my study of numerical forecasting. In 1959, an IBM704 computer became the Meteorological Agency's first large computer. I pursued research and development on numerical forecasting in the Computer Section (predecessor of the Numerical Forecasting Section) for 19 years. In 1978, I was transferred to the Meteorological Laboratory and kept working on numerical forecasting until I retired in March 1983.

From "nuclear winter" to "black rain"

In 1982, the American astronomer Carl Sagan (1934 – 96) and his group presented a paper entitled "Nuclear Winter." Reading it, I thought "My God!" If I had kept studying fallout and climate change, I could have been first. I felt beaten.

"Nuclear winter" is an extreme climatic event caused by all-out nuclear war, with many fires breaking out, and ash and soot blocking sunlight. Similar studies were conducted in Russia. The simulation showed locations where the temperature drops to as low as -56 degrees Celsius 40 days after detonation. And even after the "nuclear winter," the destroyed ozone layer allows harmful ultraviolet rays to penetrate to the earth's surface, bringing about a destructive "nuclear summer." This is extremely serious and means we must never allow a nuclear war for any reason.

In October 1984, Gensuikyo (Japan Council against A & H Bombs) held an international forum on the "Prevention of Nuclear War and a Total Ban on Nuclear Weapons." There, I presented "Nuclear Winter – The Horrifying Devastation of Nuclear War." I believe it was the first analysis of "nuclear winter" in Japan. Two weeks later, Miyamoto Kenji, Secretary-General of the Japanese Communist Party called to ask, "Do you think the theory of nuclear winter is true?" I answered, "I think it will absolutely happen if a large hydrogen bomb is detonated."

Right after that, in December, Miyamoto met with Konstantin Chernenko, Secretary-General of the Soviet Communist Party. Although the Japanese and the Soviet parties were in conflict at that time, they attempted to agree on the issue of prevention of nuclear war and the abolition of nuclear weapons. Their joint statement emphasized the urgency of " total abolition of nuclear weapons." This led to the "Appeal from Hiroshima and Nagasaki" announced in February the next year, creating another major wave of anti-nuclear movement.

But some people began to say that it is only essential to prevent "nuclear winter," meaning that small nuclear weapons could be acceptable. I participated in the "World Meeting Against Atomic and Hydrogen Bombs" in 1985. Speaking again on "nuclear winter," I

pointed out that even a small nuclear weapon could not only kill by heat, blast, and radiation, but could also cause "black rain" that would destroy the environment. At that point, Murakami Tsuneyuki, Director General of Hiroshima "Black Rain" A-Bomb Sufferers Organization, expressed concern about the investigation of the black rain that had been carried out to date.

Murakami was referring to a precipitation map called "Uda's Rain Area", created on the basis of the investigation by Dr. Uda Michitaka and the staff of the Hiroshima District Meteorological Observatory one month after the A-bomb was dropped and continuing between September and December 1945. I was greatly surprised. In truth, in my book "Nuclear Winter – Nuclear Warfare and Extreme Climatic Events," I had trusted Uda's report and cited it.

Mr. Murakami asked me, "As a specialist in meteorology, do you really think that this kind of torrential rain falls on such a simple oval shaped area?" I felt as if I had been struck on my head. I was so ashamed I wanted to just disappear. It is unthinkable that such a violent cumulonimbus cloud would pour down rain over a simple oval shaped area. I immediately decided to investigate myself. This was the beginning of my black rain investigation.

"Black rain" re-investigation and Masuda's rain area

I had already retired from the Meteorological Laboratory, so I did not have the means to conduct an investigation. I had no choice but to read collections of records and memorandums, whatever I could find, for clues to the "black rain." I had to read one piece through to the end to learn whether it rained or not. The records were too melancholy to read without tears. I knew well that the famous Prof. Sawada Shoji was an A-bomb sufferer, but I didn't know that he had been forced to abandon his mother who was burnt to death in the approaching fire. During my black rain investigation I came to know his story.

In May 1987, I presented my preliminary report "How Far Black Rain Fell after the Hiroshima A-bomb" to the spring congress of the Japan Meteorological Society. I didn't expect it to become a major issue, but the media covered it extensively. That night I began to get phone calls. Then letters came in saying, "Your map is still wrong. I lived here, and I know the black rain fell here."

Realizing that it was beyond my capacity, I asked Mr. Murakami to conduct field studies. In June 1987, we held public hearings in five places, including Yuki-Higashi Elementary School in Saeki, Hiroshima. Expecting 20 or 30 participants at most, we arrived at the school to find more than 100 people waiting outside for the hall to open. In the end nearly 200 people came to the school. We ran out of questionnaires. Today, photocopiers are available in convenience stores everywhere, but at that time it was a hard task to get more copies.

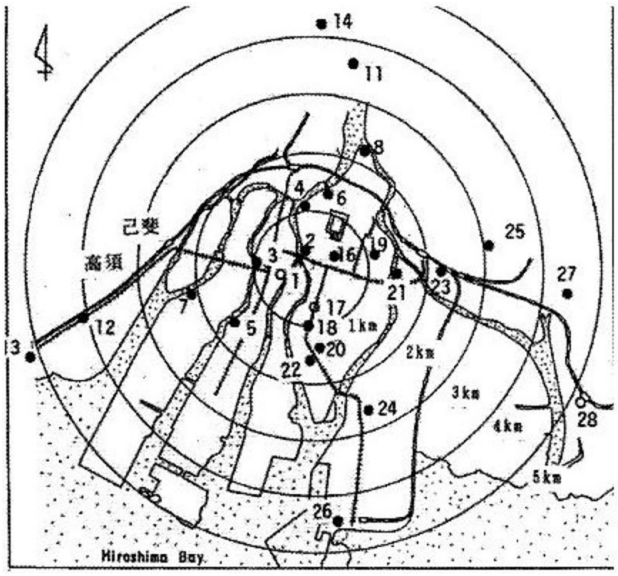


Figure 1. Locations where Dr. Nishina Yoshio et al. collected specimens. Specimens marked with white circles are no longer in existence. (Map prepared by Prof. Shizuma Kiyoshi at Hiroshima Univ.)

Forty years had already passed since the bombing. We couldn't expect to hear details just by asking everyone to "speak about your A-bomb experience." Instead, we asked a limited number of people to testify in front of everyone. Listening to their detailed stories, members of the audience would say, "Yes, I remember a similar experience!"

To obtain accurate data, we questioned them about the rain from three viewpoints. First, whether it rained or not. Second, when and how long it rained. And third, how intense it was. In other words, whether it was a downpour or a light pattering, whether laundry got wet with rain, whether it was stained, and so forth. We questioned the witnesses in as much detail as possible.

Plotting the data on a map, we found that it didn't rain much in areas close to the hypocenter. That's not surprising because it does not rain where a strong updraft is present. On the other hand, heavy rain fell in a horseshoe-shaped area surrounding the hypocenter. I respect Dr. Uda's work carried out right after the bombing. He did what he could, but he did not reveal as much a detail.

Physicist Nishina Yoshio entered Hiroshima on August 8 right after the bombing. He found X-ray film exposed and concluded that the new weapon had been an "atomic bomb." He took 22 specimens from the sites shown in Figure 1, and we still have them.

Prof. Shizuma Kiyoshi at Hiroshima University investigated the sand samples looking for a relationship between the black rain and radioactivity. The result showed that "Masuda's rain area" conformed very well to the distribution of radioactivity, proving the relation between black rain and radioactivity (Figure 2.)

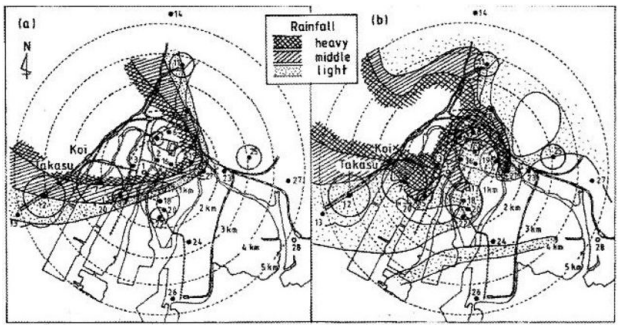


Figure 2. Comparison of the two rain areas. Uda's (left) and Masuda's (right), in relation with the 137Cs distribution in specimens collected by Dr. Nishina Yoshio et al. in Hiroshima City. (Map prepared by Prof. Shizuma Kiyoshi at Hiroshima Univ.)

I have conducted two field studies on the black rain after the Hiroshima A-bomb. The first was the one I mentioned above in June 1987. The second was in August 1987, when I went to Geihoku town, on the border between Hiroshima and Shimane prefectures. Although a lack of data in peripheral areas leaves room for further improvement, the black rain area has been extended to roughly four times the previous area.

It should be noted that while black rain tends to be the narrow focus of discussion, radioactive dust actually has greater health effects. This is relevant to the Fukushima disaster. To a certain extent, I investigated the distribution of radioactive dust generated by the Hiroshima A-bomb. I cannot say anything conclusive because I have too few data points, but the dust may have been distributed far more extensively than the rain.

Masuda's rain area and A-bomb sufferers

My reports on the black rain greatly influenced A-bomb sufferer issues. In December 1980, before I started to investigate the black rain, the Round-Table Conference on Basic Issues of Measures for A-bomb Sufferers (Kihon-Kon) chaired by Prof. Kaya Seiji, then president of the University of Tokyo, submitted two recommendations

to the government. One was the War Endurance Doctrine, which states that war sacrifice "must be endured equally by all." The other was the notion that "additional designation of A-bomb affected areas should be limited to cases with sufficient scientific and rational basis." These recommendations killed the dream of extending A-bomb affected areas that Murakami Tsuneyuki and others were painstakingly pursuing. This was why Mr. Murakami was "troubled by Uda's rain area." My black rain reports were presented in this context.

On August 6 every year in Hiroshima, successive Prime Ministers have met with A-bomb sufferers. In August 1987, when Prime Minister Nakasone Yasuhiro met with A-bomb sufferers, he was told about "Masuda's rain area" by an A-bomb sufferer and was asked whether the reports qualify as "sufficient scientific and rational basis." Nakasone answered "I have no reluctance to extend the designated areas if there is a scientific and rational basis."

So, in August 1988 the Hiroshima City and Prefectural governments established an expert committee on the black rain issue. I was not chosen as a committee member, and the head of the Hiroshima Regional Meteorological Observatory took part only as an observer. The committee considered three sources of information. The first was residual radioactivity in soil samples, but it was impossible to distinguish Hiroshima A-bomb effects from radiation due to nuclear tests conducted all over the world. The second was chromosomal abnormality, but no difference was found between A-bomb sufferers and non-A-bomb sufferers. The problem was the third issue, black rain. Yoshikawa Tomoaki at the Meteorological Laboratory carried out a computer simulation of the black rain. He concluded that, although rain fell in an extensive area, the area of radioactive rain matched Uda's rain area. His report, however, had many serious flaws.

Yoshikawa's simulation used initial values far from reality. His model was inadequate. Photographs were falsified to reduce the height of the A-bomb cloud to just eight thousand meters, and the hypocenter was shifted by one mesh in the figure showing the computational result. There were also errors in wind speed, the duration of the fire, and more. In 2004, I testified in an A-bomb Illness Acknowledgement Case at Hiroshima District Court, and Yoshikawa also testified. Yoshikawa was unable to respond convincingly to interrogation by the attorney for the plaintiff or to questions of the chief judge. All 42 plaintiffs won their cases.

Hiroshima City Government's A-bomb fact-finding survey

In Nagasaki, right after the dropping of the A-bomb, researchers from the US, jointly with Japanese researchers from Riken Institute of Physical and Chemical Research, and Kyushu University, investigated radioactivity in detail. This was probably to survey the effects of a plutonium bomb that was to become the main type of A-bomb. The investigation showed that Nagasaki's Nishiyama Reservoir received rain containing very strong radioactivity, thus that area was designated as affected. Rain also fell in Shimabara Peninsula, some 40 kilometers east of Nagasaki, for about five minutes. But Hiroshima has no such detailed fallout map.

There are two different kinds of black rain. The first black rain falls from the mushroom cloud generated by the blast of the atomic bomb that spreads in all directions. The second falls from cumulonimbus clouds generated by the strong updraft caused by the firestorm. The first rain from the mushroom cloud can be clear or muddy. Different sufferers describe different colors. I became aware of the difference between the two kinds of black rain after investigating the time and location of the rain from various angles. Dr. Uda also revealed the two kinds of rain. Although this in an important point, it was not mentioned in the new investigation by the municipal government.

The investigation by the municipal government aimed specifically at PTSD (Post Traumatic Stress Disorder). Review meetings for the "Report of the Health Consciousness Survey of Residents Including Those with A-bomb Experience" were held in the Ministry of Health, Labour and Welfare. The first meeting was held in December 2010, and the sixth meeting was held in January 2012. No difference in PTSD was found between the black rain area and non-black rain area. Although they haven't reached their final conclusion, it is not likely that the national government will grant the extension of the designated area that the Hiroshima City government is demanding. To be honest, this investigation may end up in "much cry and little wool."

Black rain is profoundly relevant to the Fukushima nuclear disaster. Fukushima is also an internal exposure issue. The suffering of people in Hiroshima affected by black rain and fallout provides useful information. I think we need to tackle this problem not only to extend the designated black rain area around Hiroshima but also to study what awaits people in Fukushima. We need to think about how best to help them.

This article appeared in Japanese in the June 15, 2012 edition of Hiroshima Journalist. This is part one of a March 16, 2012 lecture at the Confederation of A- and H-Bomb Sufferers Organizations on "The Twin Devils of Nuclear Weapons and Nuclear Power – From Black Rain to Fukushima." Part two, "The Fukushima Nuclear Accident and the Threat of Radiation", is not included here.

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