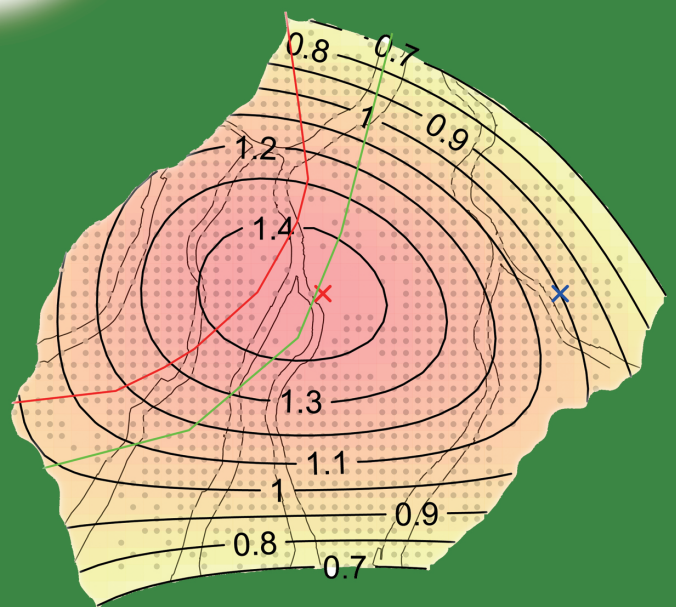
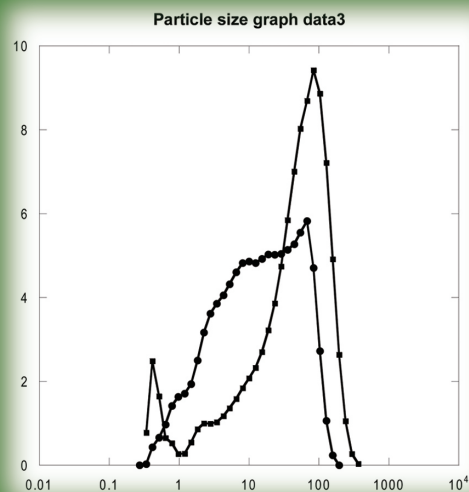


Editors:  
Michio AOYAMA and Yutaka OOCHI

# Revisit The Hiroshima A-bomb with a Database Volume 2



Hiroshima City 2013

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*This book is dedicated to huge number\* victims  
by the Hiroshima A-bomb in 1945*

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*\* The exact number of the death at the instance of explosion of the Hiroshima A-bomb in 1945 has not been cleared. Approximately 140,000 (error of  $\pm 10,000$ ) are estimated to have died by the end of December 1945.*

*280,959 names are registered in Hiroshima Peace Memorial Park as the A-Bomb victims of August 6, 2012.*

# Preface

On August 6, 1945, a single atomic bomb reduced the streets of Hiroshima to rubble, taking many precious lives.

Making clear the reality of the atomic bombing and relaying to the next generation the full scope of that unprecedented disaster is the mission of Hiroshima, alongside seeking the total abolition of nuclear weapons.

In 2010, the City of Hiroshima, in order to explain the true nature of the damage from the bombing, established the Hiroshima Study Group on Re-construction of Local Fallout from A-bomb in 1945 (HiSoF). This group brought together experts in geochemistry, radiobiology, nuclear engineering, and other fields to study collections of the latest scientific findings and data with the goal of clarifying the true state of Hiroshima's radioactive fallout.

This book is a volume 2 of the previously published essay collection of July 2011 "Revisit The Hiroshima A-bomb with a Database-Latest Scientific View on Local Fallout and Black Rain-", that includes the newest results and data.

We sincerely hope that through this book, research on the reality of the damage from the bombing will further develop both domestically and internationally, and many people will feel compelled to work for a peaceful world without nuclear weapons due to their deepened understanding of the A-bomb's disastrous effects.

In closing, I would like to express my sincere gratitude to all the members of HiSoF and all of those whose contributions made this book possible, and I ask for your continued cooperation and support for our city's initiatives for peace.

March 2013

MATSUI Kazumi

Mayor

The City of Hiroshima



# 序

昭和 20 年（1945 年）8 月 6 日、一発の原子爆弾により広島<sup>の</sup>街は廃きよと化し、多くの尊い命が奪われました。

この原爆被害の実相を明らかにし、未曾有<sup>みぞう</sup>の大惨禍の全容を後世に伝えていくことは、核兵器廃絶を願う被爆地広島<sup>の</sup>の使命となっています。

本市では、この原爆被害の実相の解明のために、平成 22 年（2010 年）から、広島原爆による放射性降下物などの実態を解明することを目的として、地球化学、放射線物理学、原子力工学などの様々な分野の専門家で構成する「広島原爆による放射性降下物等実態検証に係る関係者協議会（Hiroshima Study Group on Re-construction of Local Fallout from A-bomb in 1945 (HiSoF)）」を設け、最新の研究結果やデータの収集に取り組んできました。

本書は、平成 23 年（2011 年）7 月に発行した論文集「Revisit The Hiroshima A-bomb with a Database -Latest Scientific View on Local Fallout and Black Rain-」の第 2 巻として、新たな研究結果やデータをまとめたものです。

本書を通じて、国内外における原爆被害の実相の解明に向けた研究が更に進展し、原爆被害について多くの人々の理解が深まることにより、核兵器廃絶や世界恒久平和の実現につながることを心から期待します。

最後に、HiSoF のメンバーの皆様を始め、本書の製作に御協力を頂いた方々に改めて深く感謝の意を表しますとともに、本市の平和行政に対する一層の御協力をお願いいたします。

平成 25 年（2013 年）3 月

広島市長 松 井 一 實





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# Introduction

Hiroshima City has been carrying out a series of surveys in an effort to draw a complete and more realistic picture of the A-bombing and its impact on the people there at the time of the explosion. As a part of its efforts, the City set up the Hiroshima Study Group on Re-construction of Local Fallout from A-bomb in 1945, HiSoF, to facilitate further studies and discussion on this issue.

HiSoF is a group of researchers including meteorologists, radiobiologists, nuclear engineers, as well as experts in statistics, computer graphics and other related fields. Hiroshima City also invited researchers who were essential to perform studies on the effects of radioactive fallout and 'black rain' resulting from the explosion of the Hiroshima atomic bomb.

HiSoF group has been carried out researches about recent results of studies on radioactive fallout and 'black rain' and about wind filed data as initial condition. HiSoF group also discussed about international comparison study of numerical model simulation of radioactive fallout and 'black rain'.

Hiroshima city published a book in July 2011 entitled "Revisit The Hiroshima A-bomb with a Database -Latest Scientific View on Local Fallout and Black Rain-" which includes recent research results about initial distribution of the radioactive fallout in the Hiroshima atomic bomb, the development of the atom bomb mushroom cloud, the fire situation, the area of the black rain.

This book is volume 2 of the HiSoF book previously published in July 2011 and provide additional data and research results after volume 1 was published. This volume includes recently found wind filed data, research results and so on to provide initial conditions and the data to confirm results by future numerical model simulation of radioactive fallout and 'black rain' derived from the Hiroshima A-bomb on August 6, 1945.

This book contains 3 articles based on studies by members of HiSoF and 3 articles by contributors including HiSoF members. It consists of two parts: Initial Conditions and Validation Data.

In part I, there are three papers as shown.

The wind data based on the navigation record of the aircraft of bomber and two stations data at Sapporo and Tateno, Japan in July and August 1945 to provide initial and boundary conditions of movements of mushroom cloud of the A-bomb. (1.1 original report)

Results of neutron activation analysis of the soils used under roof tiles in traditional Japanese houses, and ground soil samples in Hiroshima city to evaluate the gamma- and beta-ray exposure in air and on skin from induced radionuclides in soil. (1.2 original report)

Results of particle size distribution of the soils used for walls and under roof tiles in traditional Japanese houses and ground soil samples. The measurement of the particle size of soil samples can be used to evaluate the gamma- and beta-ray exposure in air and on skin from induced radionuclides in soil, too. (1.3 original report)

In part II, there are three papers as shown.

Results of a study that suggests the region west to the hypocenter has a higher risk compared to other areas and there exists an impact on risk that cannot be explained by direct exposure only. (2.1 reprint of published article)

Cesium-137 and Pu isotopes in under-floor soil samples from about 20 houses built 1–4 years after 1945 were measured in an attempt to evaluate the close-in fallout deposition at the time of the Hiroshima atomic explosion.  $^{239,240}\text{Pu}$  was used to distinguish global fallout  $^{137}\text{Cs}$  from Hiroshima A-bomb derived  $^{137}\text{Cs}$ . In all samples measured, low levels of  $^{137}\text{Cs}$  (range: 6.4–843 Bq/m<sup>2</sup>, but mostly in the range 10–50 Bq/m<sup>2</sup>) and traces of  $^{239,240}\text{Pu}$  (0.1–24 Bq/m<sup>2</sup>, but mostly less than 1 Bq/m<sup>2</sup>) were detected. The results by considering the contribution from the global fallout suggest that  $^{137}\text{Cs}$  deposition due to the Hiroshima A-bomb was in the range of 50–100 Bq/m<sup>2</sup>. (2.2 original report)

A paper which asks a question of whether observed Hiroshima TLD excess dose could be the result of a pattern of local fallout of Hiroshima A-bomb. (2.3 reprint of published article)

We believe that all articles in this book would be beneficial to all researchers and modelers in this field, and of use for further development of the study toward elucidation of the effects due to local radioactive fallout by the atomic bombing in Hiroshima.

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