THERMAL SHOCK FRONT ON THE PLANET EARTH

Shigehisa Nakamura

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CONTENTS

PREFACE

This work concerns an introduction to problem on thermal shock front on the planet earth.

By this time, we have had a histry of thermal energy application, i.e., a primitive fire for the human life after friction energy transformation that has bee called as the first age of fire application by the human being.

We have our history of the thermal energy out of the forest and what found on the earth. An extensive activity of the human being has been after finding of convenient utility of a higher energy application out of the fossile fuels. That has been called as the second age of the thermal energy application in the human life.

Findings of the radioactive atoms during our recent history, we have had several stradegies after releasing impulsive thermal energy releases. Even when the radioactive energy were released after the manipulations of the artificial radioactive materials. They have had said that the radiation energy out of the artificial energys is for the third age of the thermal energy application in the welfare of the human living, nevertheless they have had missing to be aware of something for controlling the energy release processes.

The author has had his chance to see the first stage of the atomic energy release at an instance in his life.

The human activity has had helped to get a more successful function though that was one of the man-made locomotives. The locomotives has given us a threat of dangerous ruin to the human life on the earth.

We have had enjoyed our lives by our application of the third thermal energy though they have had missing to control for the human life.

The author has had his job for a happy human life with his tiny potential for these years. Nevertheless, he has to notice here to appeal that the human life could be sustainable only if they could control their own performances at utilizing thermal energy now.

Lastly, the author has to express his wish them to be more clever in their life, and never miss for any control items even in the age of the advanced scientific understanding.

2011 April 01

The last and latest director,
Shirahama Oceanographic Observatory, Kyoto University

THERMAL SHOCK FRONT IN THE ATMOSPHERIC SURFACE LAYER

Monitoring of Thermal Dome in the Earth Surface Layer

Shigehisa Nakamura
Kyoto University, Japan

Abstract— In order to see specific pattern of the monitored thermal dome formed on the atmospheric layer on the earth, a model is introduced for helping to obtain the pattern of the thermal dome in a form of mathematical expression. The solution is constructed by the interesting factors at determining the shape of the thermal dome envelope. Some note is given to remark for various cases of actual pattern under impulsive and steady heat sources.

1. INTRODUCTION

In order to see specific pattern of the thermal dome found in the atmospheric layer on the earth. For a convenience, a formulation is introduced for a model of the interested thermal dome. Generally, problem is for a nonlinear process. Approximated formulation might give us a mathematical description in convenience. A solution for a linear equation of flow in the interested layer could be a suggestion for an actual thermal process. A numerical model must be convenient for obtaining a solution approximately though it is hard yet to identify any model is properly applicable to the actual processes of thermal dome formation. Several actual cases are introduced briefly with some notes.

2. MODEL OF THERMAL DOME

In order to describe a thermal dome in the atmospheric layer on the earth surface, it is used that a model is assumed to be constructed by a formulation of fluid dynamics of atmosphere in the troposphere defined as that between the tropopause and the earth surface. In the troposphere, vertical distribution of the atmospheric temperature can be described as follows,

$$T(z) = \Gamma z + T_0, \quad \text{...} (1)$$

Where, $T(z)$ is an equivalent potential temperature at the height z above the earth surface, and $T_0 = T(z=0)$. In the actual atmospheric layer, Γ = 4degreeC per 1000m (for example, Kimura, [1]).

As for a case of heat island in an urban area, Kimura had given a brief note with his model for application to the case in the city area of Tokyo [2]. In his work, a thermal dome is a model for an urban area in a local small area on the earth with an assumption of a centered steady heat source in an interested thermal dome.

3. FORMULATION

In order to formulate a process in this work, now, a recti-linear coordinate system of (0-x,y,z) with the vertical axis (z) is introduced as the reference.

Assume a heat source located at the origin of the coordinate system, the thermal dome modeling in a stratified atmospheric layer on the earth surface can be formulated to make ease in a mathematical reduction at obtaining a solution. In this case, the expression form can be simplified as follows, i.e.,

$$[u(x,y,z;t), v(x,y,z;t), w(x,y,z;t), p(x,y,z;t)] = [u(r;t), v(r;t), w(r;t), p(r;t)]. \quad (2)$$

With what is noted above, the equation of motion for the interesting model can be written in a form as follows, for the velocity field of $U = u$ and the pressure field p,

$$(\partial U/\partial t) + U\nabla U = -(1/\rho)\nabla p + \nabla(\nu \nabla U), \quad \text{...}(3)$$

where the desity field ρ in a layer of isotropic air particles with a dynamic viscosity constant ν (= μ/ρ) in brief, though the exact expression of ν in a general form must be a tensor.

As for the equation of potential temperature in the thermal field, it can be written as

$$(\partial T/\partial t) + U\nabla T = \nabla(\kappa \nabla T), \quad \text{...}(4)$$

where the notation κ for diffusion coefficient (as an approximation of tensor).

4. TWO DIMENSIONAL STAWADY PROCESS

As for a two dimensional process, the above equations (2), (3) and (4) form a simultaneous equation system for the case of two-dimensional problem on heat island or cool island [2]. In this work, a set of approximated linear equations is considered for obtain an asymptotic solution in the atmospheric layer on the earth surface.

The boundary conditions are as follow for convenience, i.e.,

$$u = 0,\ w = 0, \text{ and } T = T_0 \cos kx, \quad \text{for} \quad z = 0, \quad \text{...}(5)$$

and

$$u \to 0,\ w \to 0, \text{ and } T \to 0, \quad \text{for} \quad z \to \infty \quad \text{..}(6)$$

After rewriting introducing several parameters and applying the Cauchy-Rieman relation to introduce a stream function, the reduced form of the equation is obtained as follows,

$$(\partial^2 T/\partial x^2) + (E_0^2/Pr)(\partial^6 T/\partial z^6) = 0, \quad \text{..}(7)$$

where, $E_0 = \nu^2/(\alpha g \Gamma L^4)$, and $Pr = \nu/\kappa$. When rewriting the above (6) after introducing that $(1/Ra) = (E_0^2/Pr)$ with a consideration of z/δ, then, an order estimation of the thermal dome formation in scale must be expected as that evaluated $\delta^6 = (1/Ra)$ In the equation of the above (7), time factor is implicit under the specific assumptions and conditions.

5. VERTICAL SECTION OF THERMAL DOME

The solution of the equation (7) can be obtained with an assumption of $T = \theta(\eta)\cos kx$ for $\eta = z/\delta$. Now, the equation is rewritten as

$$(d^6\theta/d\eta^6) = k^2\theta \quad \text{..}(8)$$

Substituting $\theta = \exp(\sigma\lambda\eta)$ with $\sigma^6 = k^2$, then, $\lambda^6 = 1$. So that, six eigen values of the equation (8) are expected. The equation (8) have six roots, nevertheless three roots in term of positive real part do not satisfy the boundary condition for $z \to 0$. Then, the solution satisfying the necessary conditions for $z = 0$ can be written as

$$\theta = (1/2)\exp(-\sigma\,\eta) + (1/\sqrt{3})\exp(-\sigma\,\eta/2)\cos[(\sqrt{3}/2)\sigma\,\eta - (\pi/6)] \text{ ....}(9)$$

The author has now obtained a solution for the interested two dimensional problem in a vertical cross section with the vertical axis passing the origin in the coordinates. Obtained solution tells us that a form of the interested thermal dome is determined by the heat source pattern on the earth surface. An assumption makes it possible to describe the heat source pattern by a mathematical function.

6. IMPULSIVE THERMAL ENERGY REREASE

In the actual case of an impulsive thermal energy release, it is hard to measure the related dynamical and physical factors in the interested area covering the thermal dome with a centered thermal source.

In a case of an impulsive thermal energy release, process of a thermal dome formation must surely be transitional. It must be not visible to see a thermal dome formation.

Adding to the above noted, an explosive thermal energy release must be a shock front in a form of a semi-sphere on the earth surface.

Growing stage of the thermal dome must be seen to find a transparent dome with a centered column of the upwelling flow with a circular shock front on the earth surface.

It can be seen in a photographic monitoring on board of an aircraft, for example. There might be many cases though the author would introduce some typical cases.

In Figure 1, a photographic monitoring (courtesy of USAF) is introduced in order to see a visible pattern of the typical one case of the explosive thermal energy releases [3]. This shows a column at the centered thermal source where an impulsive energy was released just 500m above the ground surface. The circular ring of the white clouds shows the shock front on the ground surface around the thermal source. This thermal pattern could be understood by a simple two-dimensional model (for example, [1] and [2]). Nevertheless, it is necessary to find a numerical solution for a three-dimensional thermal process under several conditions.

In Figure 2, a photograph (courtesy of USAF) is introduced a thermal dome as a visible pattern for a case of the explosive thermal energy release just under the sea surface in the ocean. The vertical column of the water mass is seen to form the thermal dome in the stratified atmospheric layer just above the centered thermal source. In the photograph, it can be seen a set of multiple thermal dome in a high air induced after the thermal impact at the thermal releasing center, on the sea surface, and on the sea floor of the Atoll [4]. A cloud ring can be seen in the photograph on the sea surface at distance as a signal to show where the shock front is propagating. A thermal front in a two-dimensional model might be completely different from the actual transitional thermal front even in the stratified atmospheric layer on the ocean.

This thermal pattern in Figure 2 is obtained as a picture for demonstrating a visible pattern. So that, it should be followed by a successive numerical modeling in order to detect three-dimensional thermal pattern which might be realized in the electromagnetic waves in the infrared band.

One of the other examples is an iridescent spheres appeared above the atmosphere [5]. Reed [5] noted that the thermal dome is expanded very rapidly, at around 3km/s, with the center remaining quite transparent. The author has no idea to give any comment for the speed of the dome expanding without some additional data and information. Nevertheless, it is sure that this speed is about one third of the critical velocity on the ballistic orbit for the unidentified flying material. Adding to that, the speed of the above iridescent sphere is approximately one third of the speed of an existing satellite in the steady polar orbital motion. At this stage, it seems to be hard to give any deterministic notice under the author's stand point without any additional scientific data in need.

6. DISCUSSIONS

The author has introduced first a simple model for mathematical solution for a thermal dome in the atmospheric layer on the earth surface. This solution suggests a specific structure of the atmospheric convection at the core of the thermal dome in fact. The specific photographs are ever obtained by the optical camera (in the visible band) on board of an air craft. Some of these are the examples of an explosive nuclear energy release (for example, [3] and [4]). An illustration is given in the photographs in Figures 1 and 2. Each of the cases in the figures is a shot at an instance of the transitional process, though each of the photographs shows that the final stage of the energy release supports approximately the model of a thermal dome pattern. In the model, it is referred to consideration in an approximated formulation for a mathematical solution with an infinitely asymptotic solution. The solution is apparently independent of the time factor in this work under the assumptions and the given conditions. This solution could help us at realizing the pattern in a scope of physical process even though the mathematical model of the two dimensional ones should be taken as an approximated thermal dome pattern.

An application of the model introduced in this work might be well considered for the heat island developed in the urban area seems to be supporting the solution in this work [2] apparently. Adding to the above, a case of continuous volcanic explosions could be realized even though the volcanic processes are not so simple in fact.

A set of approximated linear equations are introduced for a key to the formulation or to a numerical modeling in a more advanced step after some example for an illustration in this work, the solution looks to be supported by the optical monitoring of the thermal dome in the atmospheric layer on the earth boldly. A nonlinear problem with a consideration of time variable must be raised for the next step in order to promote the related research works.

7. CONCLUSIONS

The author noted some specific pattern of the thermal dome first as a solution in an approximated linear problem in relation to a possible pattern of the thermal dome in the actual atmospheric layer on the earth surface. Some remarks are given for application of the thermal dome model. Exactly speaking, a three-dimensional model must be developed for the next step in order to have an advanced dynamical understanding of this work. It should be made to see what is the thermal structure inside the thermal dome. A more advanced research is expected for understanding the thermal dome formation process.

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Figure 1 Thermal dome pattern at an explosive nuclear energy release on the 9 August 1945 at Nagasaki [3] (by the courtesy of USAF).

Figure 2 Thermal dome pattern at an explosive nuclear energy release on 1 March 1954 at Bikini Lagoon, in the western Pacific [4]. (by the courtesy of USAF).

THERMAL SHOCK FRONT IN THE EARTH SURFACE OCEAN LAYER

Monitoring of Thermal Dome Shock Front Pattern on the earth

Shigehisa Nakamura
Kyoto Universiy, Kyoto Japan

Abstract- This work concerns to a problem on the thermal dome shock front pattern formed after an explosive energy release in the earth surface. Such the pattern has been seen at the past case as seen in a monitoring of a thermal energy release. Some of the photographs show a thermal dome as a part of a shock front pattern, each of which was visualized in a film for the visible band or the infrared band of the electromagnetic waves. The author notes that his interest about what is a specific pattern at a formation of the thermal dome shock front pattern in order to obtain a simplified understanding.

1. INTRODUCTION

In order to realize specific pattern of the thermal dome shock front in the atmospheric layer on the earth, a simplified model is introduced, for a convenience, to obtain an easy grasp of a dynamical understand. For this purpose, a dynamical background is required to see a process of the thermal dome shock front pattern. First, an actual case is introduced as one of the specific cases of the explosive energy release at an instance, which was monitored in a photographic technique to demonstrate the thermal dome shock front in the atmosphere on the earth. In order to realize the thermal shock front pattern found in the photograph as a result of a monitoring, the author introduces a simplified model which might be helpful at classifying the life of the interested thermal dome shock front pattern and at evaluating an estimated amount of the thermal energy for generating the thermal dome shock front. This front could be monitored well by the instruments mounted on the aircraft rather than that on the satellite with the path for the polar orbital motion or on the satellite synchronized motion with the earth's rotation of the orbit just above the equator.

2. SPECIFIC PATTERN OF THERMAL DOME

In a case of thermal energy release for making a thermal dome as a shock front in the atmospheric layer covering the earth surface, a visible pattern of thermal shock front is seen on the earth surface.

There might be many examples though the author introduces one of the specific examples as found in Figure 1. This case is obtained on 1 March 1954 at Bikini Lagoon in the northwestern Pacific (by the courtesy of USAF). For the details of this case, there must be distributed in the public so that the author tends to introduce his dynamical understanding of the thermal dome shock front formation in this work.

3. THEORETICAL UNDERSTANDING

In order to have any dynamical understanding, it is necessary to formulate the interested problem considering in this work in a mathematical form. Essentially, it is necessary to get a set of formulated equations.

As for the velocity field $\boldsymbol{u}(u, v, w; t)$, the equation of motion should be introduced first, (considering the atmospheric layer, the sea water layer, and the crustal layer to be uniform and isotropic here for convenience), that is,

$$(\partial \boldsymbol{u}/\partial t)+\boldsymbol{u}\nabla\boldsymbol{u}=-(1/\rho)\nabla p+\alpha g\boldsymbol{T}+\nabla(\nu\nabla\boldsymbol{u}), \qquad (1)$$

where, the notations ρ, α and ν $(=\mu / \rho)$ are deansity, thermal conduction modulus and dynamical viscosity (viscosity is notated as μ). The notation μ is used in order to describe the equation of motion for the case of molecular viscosity, even though, the atmospheric flows and the ocean currents are turbulent so that a turbulent viscosity is defined instead of the molecular viscosity.

As for the thermal field T, the equation for the potential temperature in the atmospheric layer covering the earth surface, that is,

$$(\partial T / \partial t) + u \nabla T + \nu \Gamma = \nabla (\kappa \nabla T), \qquad (2)$$

In this work, it is necessary to assume several conditions for solving the above equation in order to see what evolution of a thermal dome as the function of the variables of time t and of space r (for example, introduce a coordinate O-xyz system or O-$r\theta$ ϕ).

Generally speaking, initial condition should be introduced when the problem is a transitional process. Adding to this, several boundary conditions should be given with some proper assumptions. The interesting boundary is between the atmosphere and ocean, i.e., sea surface. When the sea surface layer should be considered in need, it should be introduced the boundary condition between the sea water layer and the crust layer with an appropriate consideration.

4. THERMAL SOURCE FUNCTION

Thermal processes in nature, it is more convenient to approximated formulation. In this case, it is necessary to introduce the thermal source as a function in a manner of mathematics.

Generally, the source function might be in a form as written below. That is,

$$F = F(u(r, t), T(r, t)), \qquad (3)$$

Then, it is necessary to specify the thermal source function in need.

A point source of the thermal energy supply can be described by a delta function of r, and an impulsive thermal energy supply must be approximated as a delta function of time t, for convenience. For example,

$$F = \delta (u \in u_0, u_0 = \oint G(r, t)\, dr\, dt), \qquad (4)$$

A bold approximation of the thermal source function for a continuous energy releasing, could be expressed by a step function. A step function is basically described as follows; i.e.,

$$F = \int \delta (r)\, dr. \qquad (5)$$

Using an approximated expression of the thermal energy releasing process, the solution in need might be obtained in a mathematical form.

As for several specific processes, the equation to be solved can be reduced as a problem of an eigen value problem after some mathematical manipulations.

Utilizing this step function for a complicated case found in the actual process in the nature, mathematical analyses might give us various kinds of the thermal energy releasing processes in practice.

Recent age, it is more familiar to utilize a numerical computation for any complicated problems. Singularity in the exact solution is hard to apply for any actual process in practice though the recent numerical modeling would give us an easy solution to satisfy.

5. NUMERICAL MODELLING

In these years, most of the scientists have had used numerical modeling techniques, which are very convenient for obtaining a solution for a practical application. Nvertheless, the author has to give you his notice that mathematical analysis is excellent at what is the most important factor at a research on the dynamical process in his interest. The author has his understanding about numerical modeling in the physical and dynamical fields of sciences. Occasionally, numerical model simply gives an answer under the restricted conditions. The author considers that singularity in mathematics is important to realize what it means at application of the obtained solution, though no notice is given if a numerical model is used for solving the process in need.

6. EIGEN VALUE PROBLEM

It is hard to obtain an eigen value problem for the interested thermal energy release problem.

With the author's understanding of mathematics for applied thermo-dynamical process, a schematic model is introduced for convenience, as seen in Figure 2.

A response of the atmospheric layer at an thermal energy release can be expressed by a step function which might be distorted with time elapse and by the given local conditions. In Figure 2, it shows that an input function as a step function F_1 could be a solution for a continuous thermal energy release. The trend is shown on the diagram of the response R as a function of time. In order to consider a process to start decaying at the given time T_1, the reversed function F_2 can be introduced for an approximated solution.

In Figure 2, a schematic relation of thermal shock front in relation to energy release model as a simplified model.

7. EVOLUTION OF THERMAL SHOCK FRONT PATTERN

An explosive thermal energy release forms a shock front which grows time to time to form a big spherical dome. The shock front must be spherical if the shock front is free from any surrounding boundary (for example, as in case A of Figure 3).

In a case of the thermal energy release at a certain height above the earth surface, shock front directly propagating upward is observed at the same time the shock front reflected on the earth surface following. The earth surface as the boundary deforms the spherical shock front. This suggests that the maximum of the thermal energy effect is at the position just under the release point on the earth surface. First step is a fire ball. With time elapse (for example, several seconds after the release in the case of Nagasaki in 1945), a minor pattern can be observed as a shock front. A more time elapse might be effective to show the major phase of the thermal shock front pattern as shown in B of Figure 3.

In a case of the thermal energy release in the sea water layer, the fire ball deformed by the boundaries as the sea surface, the crust and the coral zone and sediment layer. A typical case of such the cases is that found at Bikini Lagoon in the Pacific in 1954. This is the case as shown in the case C of Figure 3.

Unfortunately, the growing phase in Figure 2 was ever seen or watched though no data is left for the decaying phase.

The author has to express his acknowledgements for their assistance at completing this work. Nevertheless, the author would give no conclusion to the thermal energy release except his future work.

Figure 1 Thermal dome pattern at an explosive nuclear energy release on 1 March 1954 at Bikini Lagoon in the Northwestern Pacific. (by the courtesy of USAF)

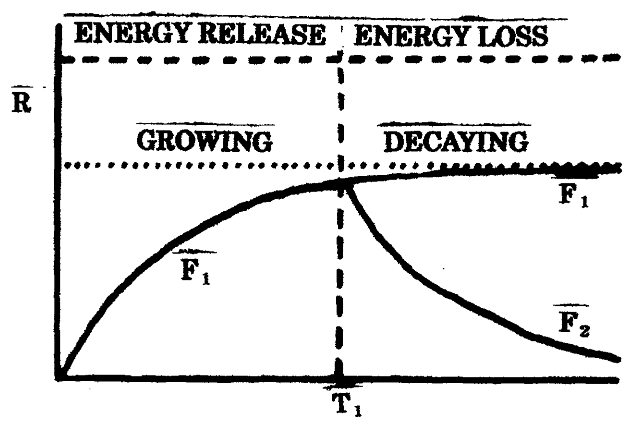

Figure 2 Schematic relation of thermal shock front in relation to energy release model

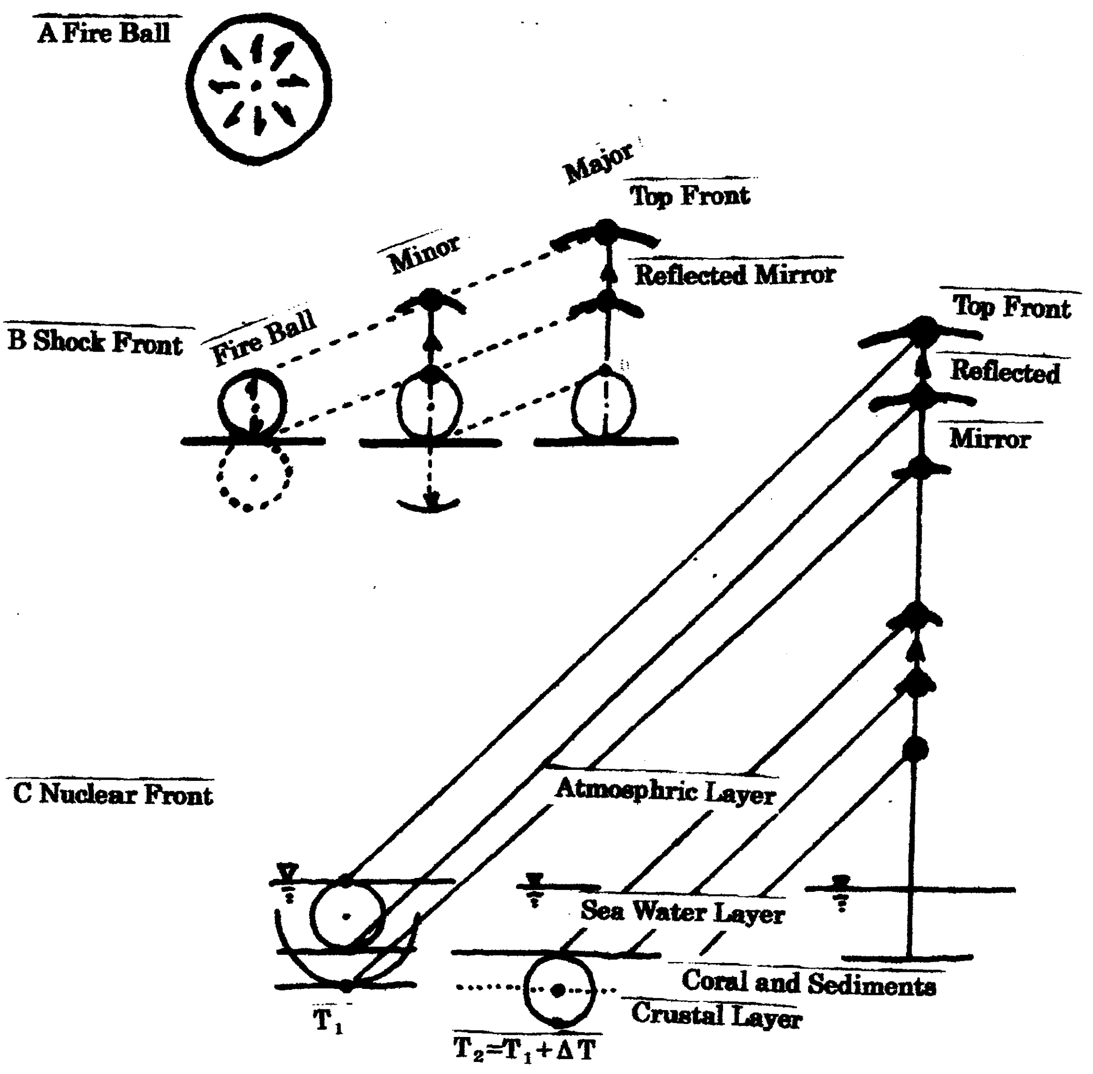

Figure 3 Evolution of thermal shock front pattern
A- Fire Ball, B- Shock front on the earth surface, C- Shock front above the sea

THERMAL SHOCK FRONT IN THE UPPER ATMOSPHERIC LAYER

Monitoring of Thermal Dome as an Iridescent Sphere above the Atmosphere

Shigehisa Nakamura
Kyoto University, Japan

Abstract- This work concerns to a thermal dome as an iridescent sphere appeared above the atmosphere. The author is a modeling for realize what is a possible process of iridescent sphere above the atmosphere in a physical scope. One of the iridescent spheres in the photographic illustration must be caused by a explosive thermal energy release. A simple formulation for the thermal dome may be effective for understanding the process of the thermal dome above the atmosphere. The author would introduce a key to see the physical process of this thermal dome formation.

1. INTRODUCTION

In this work, a process is noted by a model for a thermal dome as an iridescent sphere appeared above the atmosphere in a scope of fluid dynamics. By this time, the author has had monitored the thermal patterns on the ocean surface. His interest is also in the physical process of a thermal dome above the atmosphere. One of the keys must be obtained by introducing a dynamical model. In order to realize this process the author introduced some note in relation to a similar process ever seen on the earth surface.

2. DATA SOURCE

One example of the iridescent spheres appeared above the atmosphere off Scandinavia and northern China in 1988 [1]. The data is found in a form of photographic illustration. That is, Reed [1] introduced one of the typical illustrations of the iridescent spheres. This illustration was one example provided by Danny Stillman. In this work, simply the author would focus his interest to introducing a physical model of the thermal dome.

3. ATMOSPHERIC LAYER

The interested atmospheric layer in this work must be between tropopause and earth surface. This layer is called as troposphere. In the troposphere, atmospheric convection is taken to be constructed to be a conservative system. In the troposphere, vertical distribution of the atmospheric temperature can be described as

$$T(z) = \Gamma z + T_0, \quad \text{.......(1)}$$

where, $T(z)$ is an equivalent potential temperature at the height z above the earth surface, and $T_0 = T(z=0)$. In the actual atmospheric layer, $\Gamma = 4$℃ per 1000m (for example, Kimura, [2]).

4. FORMULATION

In the scope of hydrodynamics, a model is introduced in a form of mathematical formulation. Generally, the model should be for three dimensional in process. Essentially, the equation of motion introduced is nonlinear, though a linealized approximation in the equation could be considered with a fairly good approximation. In this case, the equation for the potential temperature should be also introduced.

5. CONDITIONS

In the model, boundary conditions must be considered for T on the earth surface and the tropopause. Mean field of the winds is excluded so that the disturbances can be obtained an approximated solution solving the linealized equation. Nevertheless, a case of a thermal sphere above the atmosphere can be taken as free from the boundary conditions, if the thickness of the atmospheric layer is large enough comparing to the scale o the thermal dome in interest.

Several cases must be considered at solving the equation to see the process. That is,

(1) Fireworks using a gunpowder in a classic manner
  (a) Shoot up vertically in order to get the capsule up to the aimed altitude,
  (b) The trigger let the capsule to fire at no vertical motion where the capsule in height of the aimed altitude successfully.
(2) Environment control by using dynamite
  (a) Set up the position of the firing operation in the schedule,
  (b) Follow the land-cruisers, shovels, and scrapers
  (c) Pass a roll over for flatten the ground surface or the related operations.
(3) Operate to fire or crush in the certain position in the atmospheric layer
  (a) Shoot up a capsule containing a gunpowder, or trinitrotoluene, or nuclear reactor,
  (b) Control to work the trigger for firing or for the purpose in plan.

To the details, it is recommended to refer to the other related guidelines.

6. DISCUSSIONS

For a convenience, the author here introduce some discussions about the illustration as shown in Figure 1 in order to realize the process of a thermal dome formation. Looking at the pattern of the dome, it can be seen that a point source moving in the atmospheric layer at the trigger for firing in operation. A line of light in the dome area seems to be suggesting the orbit of the capsule on a ballistic orbit. The author has no data to the details so that it seems too hard to tell a certain deterministic notice. Nevertheless, the past examples of the explosive thermal energy release are taken to show us an essentially common process is found in the illustration. What is essential is axis of the acceleration.

Reed [1] noted that the thermal dome is expanded very rapidly, at around 3km/s, with the centers remaining quite transparent. The author has no idea to give any comment for the speed of the dome expanding. Although, it is sure that this speed is about one third of the critical velocity on the ballistic orbit, and is also approximately one third of the speed of an existing satellite in the steady polar orbital motion.

As far as the author concerns, he thinks that it is hard to give any deterministic notice under this condition without any detail of the scientific data in need.

7. CONCLUSIONS

A model of a thermal dome above the atmosphere is introduced in order to what process was in the illustration including an ilidescent sphere. With consideration of the related factors and conditions, the author may take it as that the illustration is showing a thermal dome formed around the axis of the acceleration along the ballistic orbit.

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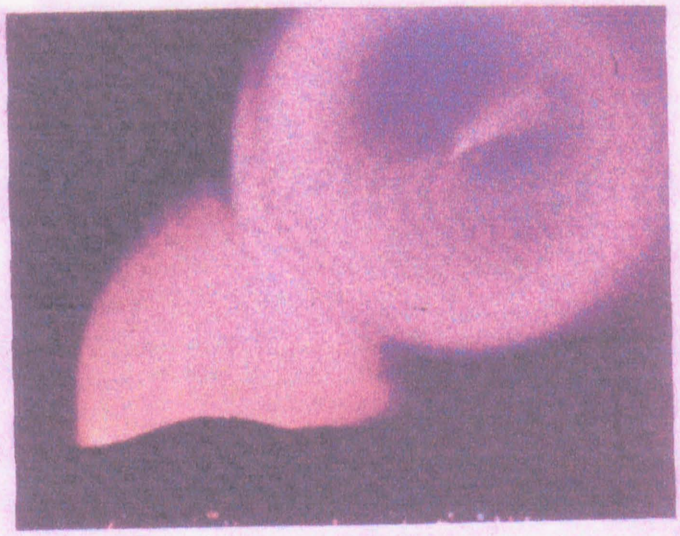

Figure 1 One example of the iridescent spheres appeared above the atmosphere off Scandinavia
(by the courtesy of T. C. Reed and Danny Stillman)

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INTERNATIONAL ACTIVITY – Shigehisa Nakamura 2011Apr01

1. 71Aug01-71Aug19 IUGG General Assembly, Moscow, USSR
2. 72Aprx1-72Aprx2/a Congress on Ocean Development,Keidanren,Tokyo#
3. 74Jan25-74Feb03 IUGG Tsunami Symposium, Wellington, NZ
4. 77Mar21-77Apr01 IUGG Tsunami Symposium Ensenada, Mexico
5. 78Jun10-78Oct10 *Visiting Senior Fellow, Hawaii Univ., HIG, Hon, HI
6. 79Aug24-79Sep05 Pacific Science Congress, Khabarovsk, USSR
7. 80Jul26-81Jan21 *Visiting Scientist, CSIRO Perth(Div.LRM), Australia
8. 82Aug15-82Aug22 Tsunami Soc., Honolulu, Hawaii, USA
9. 83Aug13-83Aug28 IUGG General Asembly, Hamburg, West Germany
10. 84Dec09-84Dec15 Seminar/Workshop on Preparedness for Geologic Disasters in Southeast Asia and the Pacific Region, Manila, Philippines
11. 85Aug03-85Aug09 Joint Assembly IAMAP/IAPSO, Honolulu, HI, USA
12. 87Aug16-87Aug24 IUGG General Assembly, Vancouver, Canada
13. 88Mar18-88Mar25 EuropeanGeopysicalSociety(EGS) General Assembly, Bologna, Italy
14. 88Nov14-88Nov21 NOAA Int.Conf.on Tidal Hydrodynamics(NBS/NIST) Gaithersburg, MD, USA
15. 91Aug17-91Aug24 IUGG General Assembly, Wien, Austria
16. 91Sep20-91Oct05 Int.Workshop 'Waves and Vortices in the Ocean and their Laboratory Analogues, Vladibostok, Russia
17. 92Apr06-92Apr10 EGS General Assembly, Edinburg, UK
18. 92Jun01-92-Jun05 Pacific Congress on Marine Science and Technology, (PACON), Kona, Hawaii, USA
19. 93Jun13-93Jun18 PACON93 China Symposium, Beijing, China
20. 94Jul02-94Jul09 PACON94, Townsville, Queensland, Australia
21. 94Sep20-94Sep27 InternationalSymposium on Marine Positioning 1994 (INSMAP94), Hannover, Germany
22. 95Apr02-95Apr09 EGS General Assembly, Hamburg, Germany
23. 95Jun05-95Jun10 Int.Workshop 'Boundary Effects in Stratified and/or Rotating Fluids', Sankt-Peterburg(Pushkin-Tsarskoi Selo), Russia
24. 95Aug09-95Aug14 IAPSO(IUGG) General Assembly, Hon, HI, USA
25. 96Mar04-96Mar10 Oceanology International 96, Brighton, UK
26. 96Jun17-96Jun23 PACON96, Honolulu, Hawaii, USA
27. 96Jul20-96Jul26 AGU-WPGM'96, Brisbane, Australia

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29. 97May10-97May14 Oceanology International 97 Pacific Rim, Singapore
30. 97Jun30-97Jul04 Joint Assembly IAMAS/IAPSO, Melbourn, Australia
31. 98Jul21-98Jul24 AGU-WPGM'98, Taipei, Taiwan
32. 98Jul27-98Jul31 PORSEC98, Quindao, China
33. 98Oct12-98Oct15 ICHD98, Seoul, Korea
34. 99Mar22-99Mar26 PIERS1999, Taipei, Taiwan
35. 99Jul19-99Jul24 IUGG99 General Assembly, Birmingham, UK
36. 00Mar25-00Apr01 ISRE(Int.Sym.Remote Sensing Env.), Cape Town, SA
37. 00Dec03-00Dec08 PORSEC2000, Panaji, Goa, India
38. 01Jul08-01Jul12 PACON2001(Jul8-11), Burlingame, Calif., USA
39. 01Jul15-01Jul19 IAMAS2001(Jul.10-18), Innsbruck, Austria
40. 02Feb11-02Feb15 AGU-Ocean Sciences 2002, Honolulu, Hawaii, USA*
41. 02Jul01-02Jul05 PIERS2002, Cambridge, MA, USA
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53. 07Mar26-07Mar30 PIERS2007, Beijing, China
54. 07Aug27-08Aug30 PIERS2007, Prague, Czech
55. 08Mar24-08Mar28 PIERS2008, Hangzhou, China
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58. 09Apr19-09Apr24 EGU2009, General Assembly, Vienna, Austria
59. 10May02-10May07 EGU2010, General Assembly, Vienna, Austria

2011 April 01

Autobiography and Curriculum Vitae

Name: **Shigehisa Nakamura, Mr..**
Birth: 1933/ Nagasaki, Japan
Address: Famille Vila-A104, Minato, Tanabe, Wakayama, 646-0031 Japan
Tel/Fax: +81-739-25-5691
Email address: schnak09@power.odn.ne.jp

Education

1958 Batchelor of Science, Faculty of Science(Geophysics-Geoelectromagnetism), Kyoto University, Japan
1960 Master of Science, School of Geophysics(Physical Oceanography), Kyoto University, Japan
1963 Finished Doctor Course, School of Geophysics(Physical Oceanography), Kyoto University, Japan [Candidate of PhD as Doctor of Science]
1976 Doctor of Engineering-Civil and Ocean Engineering(PhD), Kyoto University

Affiliation

1963-1997- Disaster Prevention Research Institute, Kyoto University, Japan
1978 - Visiting Senior Fellow, Hawaii University at Manoa, Honolulu, HI, USA
1980-1981- Visiting scientist, CSIRO at Perth, Western Australia, Australia
1992-1996- Director, Shirahama Oceanographic Observatory, Kyoto University

1988-Life Member, American Geophysical Union, Washington, USA
1992- Fellow, Royal meteorological Society, UK
2004- Life Fellow, PACON International (Univ.Hawaii), Honolulu, Hawaii, USA
2007- Fellow, Electromagnetics Academy (MIT), Cambridge, Massachusetts, USA
2008-Gratis Member, European Geosciences Union
2010-Complimentary Member, European Geosciences Union

Prize and Honours:

1983- Prix de la Franco-Japonaise Societe de Oceanographie, Tokyo, Japan

Published materials: Academic papers in Scientific Journals, Proceedings, and others
Scientific Books(Japanese and/English) including "e-Books"
[search Nakamura in the Web-sites, ->>http:www.piers.org
and/or ->>http://repository.kulib.kyoto-u.ac.jp/dspace]

Recent Interests: Geopysics, Electromagnetics, Space and Planets, Civil Engineering
Spacecraft monitoring of space environment,
Satellite monitoring for earth science,
Ocean Sciences, Radiations, Natural Hazards,
Solar Sciences, Man-Made Aurora, Subglacial Volcanoes.

I, as Shigehisa Nakamura, declare that my curriculum vitae are correct as seen above.

Shigehisa Nakamura

ADDENDA – AUTHOR'S PUBLISHED CONTRIBUTIONS

IN "PIERS2011-Marrakesh, MOROCCO"
ISSUED BY ELECTROMAGNETICS SOCIETY
(MIT, CAMBRIDGE, MA)

Monitoring of Thermal Dome as an Iridescent Sphere above the Atmosphere

Shigehisa Nakamura
Kyoto University, Japan

Abstract— This work concerns to a thermal dome as an iridescent sphere appeared above the atmosphere. The author is a modeling for realize what is a possible process of iridescent sphere above the atmosphere in a physical scope. One of the iridescent spheres in the photographic illustration must be caused by a explosive thermal energy release. A simple formulation for the thermal dome may be effective for understanding the process of the thermal dome above the atmosphere. The author would introduce a key to see the physical process of this thermal dome formation.

1. INTRODUCTION

In this work, a process is noted by a model for a thermal dome as an iridescent sphere appeared above the atmosphere in a scope of fluid dynamics. By this time, the author has had monitored the thermal patterns on the ocean surface. His interest is also in the physical process of a thermal dome above the atmosphere. One of the keys must be obtained by introducing a dynamical model. In order to realize this process the author introduced some note in relation to a similar process ever seen on the earth surface.

2. DATA SOURCE

One example of the iridescent spheres appeared above the atmosphere off Scandinavia and northern China in 1988 [1]. The data is found in a form of photographic illustration. That is, Reed [1] introduced one of the typical illustrations of the iridescent spheres. This illustration was one example provided by Danny Stillman. In this work, simply the author would focus his interest to introducing a physical model of the thermal dome.

3. ATMOSPHERIC LAYER

The interested atmospheric layer in this work must be between tropopause and earth surface. This layer is called as troposphere. In the troposphere, atmospheric convection is taken to be constructed to be a conservative system. In the troposphere, vertical distribution of the atmospheric temperature can be described as

$$T(z) = \Gamma z + T_0 \tag{1}$$

where, $T(z)$ is an equivalent potential temperature at the height z above the earth surface, and $T_0 = T(z = 0)$. In the actual atmospheric layer, $\Gamma = 4°\text{C}$ per 1000 m (for example, Kimura, [2]).

4. FORMULATION

In the scope of hydrodynamics, a model is introduced in a form of mathematical formulation. Generally, the model should be for three dimensional in process. Essentially, the equation of motion introduced is nonlinear, though a linealized approximation in the equation could be considered with a fairly good approximation. In this case, the equation for the potential temperature should be also introduced.

5. CONDITIONS

In the model, boundary conditions must be considered for T on the earth surface and the tropopause. Mean field of the winds is excluded so that the disturbances can be obtained an approximated solution solving the linealized equation. Nevertheless, a case of a thermal sphere above the atmosphere can be taken as free from the boundary conditions, if the thickness of the atmospheric layer is large enough comparing to the scale of the thermal dome in interest.

Several cases must be considered at solving the equation to see the process. That is,

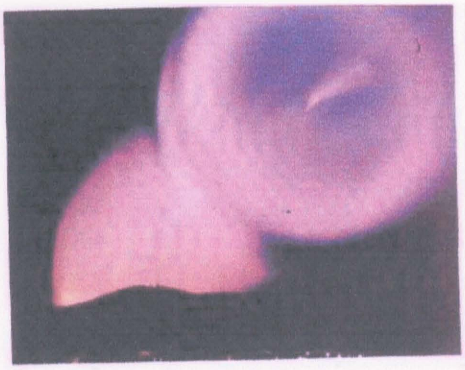

Figure 1: One example of the iridescent spheres above the atmosphere off Scandinavia. (by the courtesy of T. C. Reed and Danny Stillman)

(1) Fireworks using a gunpowder in a classic manner
  (a) Shoot up vertically in order to get the capsule up to the aimed altitude,
  (b) The trigger let the capsule to fire at no vertical motion where the capsule in height of the aimed altitude successfully.
(2) Environment control by using dynamite
  (a) Set up the position of the firing operation in the schedule,
  (b) Follow the land-cruisers, shovels, and scrapers,
  (c) Pass a roll over for flatten the ground surface or the related operations.
(3) Operate to fire or crush in the certain position in the atmospheric layer
  (a) Shoot up a capsule containing a gunpowder, or trinitrotoluene, or nuclear reactor,
  (b) Control to work the trigger for firing or for the purpose in plan.

to the details, it is recommended to refer to the other related guidelines.

6. DISCUSSIONS

For a convenience, the author here introduce some discussions about the illustration as shown in Figure 1 in order to realize the process of a thermal dome formation. Looking at the pattern of the dome, it can be seen that a point source moving in the atmospheric layer at the trigger for firing in operation. A line of light in the dome area seems to be suggesting the orbit of the capsule on a ballistic orbit. The author has,no data to the details so that it seems too hard to tell a certain deterministic notice. Nevertheless, the past examples of the explosive thermal energy release are taken to show us an essentially common process is found in the illustration. What is essential is axis of the acceleration.

Reed [1] noted that the thermal dome is expanded very rapidly, at around 3 km/s, with the centers remaining quite transparent. The author has no idea to give any comment for the speed of the dome expanding. Although, it is sure that this speed is about one third of the critical velocity on the ballistic orbit, and is also approximately one third of the speed of an existing satellite in the steady polar orbital motion.

As far as the author concerns, he thinks that it is hard to give any deterministic notice under this condition without any detail of the scientific data in need.

7. CONCLUSIONS

A model of a thermal dome above the atmosphere is introduced in order to what process was in the illustration including an ilidescent sphere. With consideration of the related factors and conditions, the author may take it as that the illustration is showing a thermal dome formed around the axis of the acceleration along the ballistic orbit.

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Monitoring of Thermal Dome in the Earth Surface Layer

Shigehisa Nakamura
Kyoto University, Japan

Abstract— In order to see specific pattern of the monitored thermal dome formed on the atmospheric layer on the earth, a model is introduced for helping to obtain the pattern of the thermal dome in a form of mathematical expression. The solution is constructed by the interesting factors at determining the shape of the thermal dome envelope. Some note is given to remark for various cases of actual pattern under impulsive and steady heat sources.

1. INTRODUCTION

In order to see specific pattern of the thermal dome found in the atmospheric layer on the earth. For a convenience, a formulation is introduced for a model of the interested thermal dome. Generally, problem is for a nonlinear process. Approximated formulation might give us a mathematical description in convenience. A solution for a linear equation of flow in the interested layer could be a suggestion for an actual thermal process. A numerical model must be convenient for obtaining a solution approximately though it is hard yet to identlfy any model is properly applicable to the actual processes of thermal dome formation. Several actual cases are introduced briefly with some notes.

2. MODEL OF THERMAL DOME

In order to describe a thermal dome in the atmospheric layer on the earth surface, it is used that a model is assumed to be constructed by a formulation of fluid dynamics of atmosphere in the troposphere defined as that between the tropopause and the earth surface. In the troposphere, vertical distribution of the atmospheric temperature can be described as follows,

$$T(z) = \Gamma_z + T_0, \tag{1}$$

where, $T(z)$ is an equivalent potential temperature at the height z above the earth surface, and $T_0 = T(z = 0)$. In the actual atmospheric layer, $\Gamma = 4$ degree C per 1000 m (for example, Kimura, [1]).

As for a case of heat island in an urban area, Kimura had given a brief note with his model for application to the case in the city area of Tokyo [2]. In his work, a thermal dome is a model for an urban area in a local small area on the earth with an assumption of a centered steady heat source in an interested thermal dome.

3. FORMULATION

In order to formulate a process in this work, now, a recti-linear coordinate system of $(0 - x, y, z)$ with the vertical axis (z) is introduced as the reference.

Assume a heat source located at the origin of the coordinate system, the thermal dome modeling in a stratified atmospheric layer on the earth surface can be formulated to make ease in a mathematical reduction at obtaining a solution. In this case, the expression form can be simplified as follows, i.e.,

$$[u(x, y, z; t), v(x, y, z; t), w(x, y, z; t), p(x, y, z; t)] = [u(r; t), v(r; t), w(r; t), p(r; t)]. \tag{2}$$

With what is noted above, the equation of motion for the interesting model can be written in a form as follows, for the velocity field of $U = u$ and the pressure field p,

$$(\partial U/\partial t) + U\nabla U = -(1/\rho)\nabla p + \nabla(v\nabla U), \tag{3}$$

where the desity field ρ in a layer of isotropic air particles with a dynamic viscosity constant $v(= \mu/\rho)$ in brief, though the exact expression of v in a general form must be a tensor.

As for the equation of potential temperature in the thermal field, it can be written as

$$(\partial T/\partial t) + U\nabla T = \nabla(\kappa\nabla T), \tag{4}$$

where the notation κ for diffusion coefficient (as an approximation of tensor).

4. TWO DIMENSIONAL STEADY PROCESS

As for a two dimensional process, the above Equations (2), (3) and (4) form a simultaneous equation system for the case of two dimensional problem on heat island or cool island [2]. In this work, a set of approximated Linear equations is considered for obtain an asymptotic solution in the atmospheric layer on the earth surface.

The boundary conditions are as follow for convenience, i.e.,

$$u = 0,\ w = 0,\ \text{ and }\ T = T_0 \cos kx,\ \text{ for }\ z = 0, \tag{5}$$

and

$$u \to 0,\ w \to 0,\ \text{ and }\ T \to 0,\ \text{ for }\ z \to \infty, \tag{6}$$

After rewriting introducing several parameters and applying the Cauchy-Rieman relation to introduce a stream function, the reduced form of the equation is obtained as follows,

$$(\partial^2 T/\partial x^2) + (E_0^2/Pr)(\partial^6 T/\partial z^6) = 0, \tag{7}$$

where, $E_0 = v^2/(\alpha g \Gamma L^4)$, and $Pr = v/\kappa$. When rewriting the above (6) after introducing that $(l/Ra) = (E_0^2/Pr)$ with a consideration of z/δ, then, an order estimation of the thermal dome formation in scale must be expected as that evaluated $\delta^6 = (l/Ra)$. In the equation of the above (7), time factor is implicit under the specific assumptions and conditions.

5. VERTICAL SECTION OF THERMAL DOME

The solution of the Equation (7) can be obtained with an assumption of $T = \theta(\eta)\cos kx$ for $\eta = z/\delta$. Now, the equation is rewritten as

$$(d^6\theta/d\eta^6) = k^2\theta \tag{8}$$

Substituting $\theta = \exp(\sigma\lambda\eta)$ with $\sigma^6 = k^2$, then, $\lambda^6 = 1$. So that, six eigen values of the Equation (8) are expected. The Equation (8) have six roots, nevertheless three roots in term of positive real part do not satisify the boundary condition for $z \to 0$. Then, the solution satisfying the necessary conditions for $z = 0$ can be written as

$$\theta = (1/2)\exp(-\sigma\eta) + (1/\sqrt{3})\exp(-\sigma\eta/2)\cos[(\sqrt{3}/2)\sigma\eta - (\pi/6)] \tag{9}$$

The author has now obtained a solution for the interested two dimensional problem in a vertical cross section with the vertical axis passing the origin in the coordinates. Obtained solution tells us that a form of the interested thermal dome is determined by the heat source pattern on the earth surface. An assumption makes it possible to describe the heat source pattern by a mathematical function.

6. IMPULSIVE THERMAL ENERGY RELEASE

In the actual case of an impulsive thermal energy release, it is hard to measure the related dynamical and physical factors in the interested area covering the thermal dome with a centered thermal source.

In a case of an impulsive thermal energy release, process of a thermal dome formation must surely be transitional. It must be not visible to see a thermal dome formation.

Adding to the above noted, an explosive thermal energy release must be a shock front in a form of a semi-sphere on the earth surface.

Growing stage of the thermal dome must be seen to find a transparent dome with a centered column of the upwelling flow with a circular shock front on the earth surface.

It can be seen in a photographic monitoring on board of an aircraft, for example. There might be many cases though the author would introduce some typical cases.

In Figure 1, a photographic monitoring (courtesy of USAF) is introduced in order to see a visible pattern of the typical one case of the explosive thermal energy releases [3]. This shows a column at the centered thermal source where an impulsive energy was released just 500 m above the ground surface. The circular ring of the white clouds shows the shock front on the ground surface around the thermal source. This thermal pattern could be understood by a simple two-dimensional model (for example, [1] and [2]). Nevertheless, it is necessary to find a numerical solution for a three-dimensional thermal process under several conditions.

In Figure 2, a photograph (courtesy of USAF) is introduced a thermal dome as a visible pattern for a case of the explosive thermal energy release just under the sea surface in the ocean. The

Figure 1: Thermal dome pattern at an explosive nuclear energy release on 9 Auguest 1945 at Nagasaki [3], (by the courtesy of USAF).

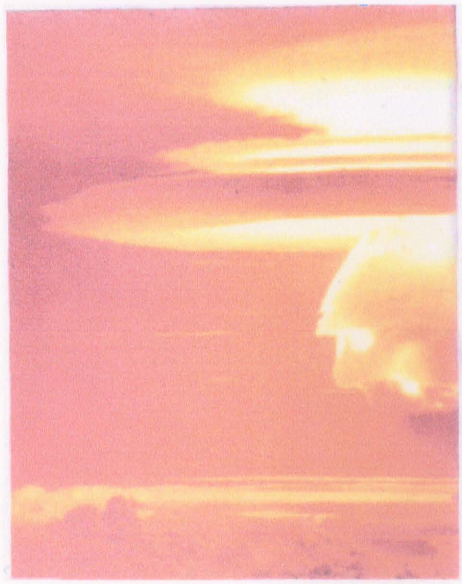

Figure 2: Thermal dome pattern at an explosive nuclear energy release on 1 March 1954 at Bikini Lagoon, in the western Pacific [4] (by the courtesy of USAF).

vertical column of the water mass is seen to form the thermal dome in the stratified atmospheric layer just above the centered thermal source. In the photograph, it can be seen a set of multiple thermal dome in a high air induced after the thermal impact at the thermal releasing center, on the sea surface, and on the sea floor of the Atoll [4]. A cloud ring can be seen in the photograph on the sea surface at distance as a signal to show where the shock front is propagating. A thermal front in a two-dimensional model might be completely different from the actual transitional thermal front even in the stratified atmospheric layer on the ocean.

This thermal pattern in Figure 2 is obtained as a picture for demonstrating a visible pattern. So that, it should be followed by a successive numerical modeling in order to detect three-dimensional thermal pattern which might be realized in the electromagnetic waves in the infrared band.

One of the other examples is an iridescent spheres appeared above the atmosphere [5]. Reed [5] noted that the thermal dome is expanded very rapidly, at around 3 km/s, with the center remaining quite transparent. The author has no idea to give any comment for the speed of the dome expanding without some additional data and information. Nevertheless, it is sure that this speed is about one third of the critical velocity on the ballistic orbit for the unidentified flying material. Adding to that, the speed of the above iridescent sphere is approximately one third of the speed of an existing satellite in the steady polar orbital motion. At this stage, it seems to be hard to give any deterministic notice under the author's stand point without any additional scientific data in need.

7. DISCUSSIONS

The author has introduced first a simple model for mathematical solution for a thermal dome in the atmospheric layer on the earth surface. This solution suggests a specific structure of the atmospheric convection at the core of the thermal dome in fact. The specific photographs are ever obtained by the optical camera (in the visible band) on board of an air craft. Some of these are the examples of an explosive nuclear energy release (for example, [3] and [4]). An illustration is given in the photographs in Figures 1 and 2. Each of the cases in the figures is a shot at an instance of the transitional process, though each of the photographs shows that the final stage of the energy release supports approximately the model of a thermal dome pattern. In the model, it is referred to consideration in an approximated formulation for a mathematical solution with an infinitely asymptotic solution. The solution is apparently independent of the time factor in this work under the assumptions and the given conditions. This solution could help us at realizing the pattern in a scope of physical process even though the mathematical model of the two dimensional ones should be taken as an approximated thermal dome pattern.

An application of the model introduced in this work might be well considered for the heat island developed in the urban area seems to be supporting the solution in this work [2] apparently. Adding to the above, a case of continuous volcanic explosions could be realized even though the volcanic processes are not so simple in fact.

A set of approximated linear equations are introduced for a key to the formulation or to a numerical modeling in a more advanced step after some example for an illustration in this work, the solution looks to be supported by the optical monitoring of the thermal dome in the atmospheric layer on the earth boldly. A nonlinear problem with a consideration of time variable must be raised for the next step in order to promote the related research works.

8. CONCLUSIONS

The author noted some specific pattern of the thermal dome first as a solution in an approximated linear problem in relation to a possible pattern of the thermal dome in the actual atmospheric layer on the earth surface. Some remarks are given for application of the thermal dome model. Exactly speaking, a three-dimensional model must be developed for the next step in order to have an advanced dynamical understanding of this work. It should be made to see what is the thermal structure inside the thermal dome. A more advanced research is expected for understanding the thermal dome formation process.

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Monitoring of Thermal Dome Shock Front Pattern on the Earth

Shigehisa Nakamura
Kyoto University, Japan

Abstract— This is a note about a case of thermal dome formed after an explosive energy release in the ocean surface layer on the Earth. A theoretical model is introduced for realizing the pattern of the thermal dome in a mathematical expression. The solution is constructed by the main factors related to the physical process of the dome formation. Some notices are given to see what about the actual pattern was monitored.

1. INTRODUCTION

In order to realize specific pattern of the thermal dome formed in the atmospheric layer on the ocean surface layer covering a coral lagoon on the Earth crust. For a convenience, a linear formulation is introduced under an assumption of no circular motion around a thermal source point. A solution is expressed by several physical factors which help us to see what specific thermal dome pattern is. Actually the process of the thermal dome must be a kind of non-linear one, nevertheless an approximated process could be obtained by solving a linear problem. Then, it could be given some remarks for the following works to an advanced research and applications.

2. SAMPLE CASE OF THERMAL DOME

In order to demonstrate a thermal dome in the atmospheric layer above the ocean surface layer which covering a coral lagoon on the Earth crust, a model is assumed to be constructed by a fluid dynamics of atmosphere in the troposphere between the tropopause and the Earth surface.

In the troposphere, vertical distribution of the atmospheric temperature can be described as

$$T(z) = \Gamma_z + T_0 \tag{1}$$

where, $T(z)$ is an equivalent potential temperature at the height above the sea surface, and $T_0 = T(z = O)$. In the actual atmospheric layer, it can be expressed as $\Gamma = 4°\text{C}$ per 1000 m (for example, [1])

As for a case of heat island in an urban area, Kimura had written his brief note in his publication [2]. In this case, a local small area on the Earth surface is assumed as a heat source (positive for heating or negative for cooling) of the thermal dome formed on land. There has no land surface condition considered except the atmospheric condition.

As for the ocean surface layer, an assumption is as that the uniform thermal layer of the sea water about 200 m or less. Under the sea surface, a spread of coral lagoons is considered to cover the Earth crust.

A heat source is assumed to be a point source just under the ocean surface.

As for the mean field of winds above the sea surface, this field is excluded out of the resultant field of the winds in order to distinguish the variations of the wind field which is generated and affected by an energy release at the heat source located at the origin of a co-ordinates system. When the heat source is assumed to be located at a point, a convenient co-ordinates system must be in a semi-spherical field on the sea surface, and a cross section of the interested thermal dome might be expected as a semi-circular space above the sea surface.

3. FORMULATION

Now, assuming a semi-spherical co-ordinates system $(r,\ \theta,\ \phi;\ t)$, each of the velocity components in the interested field can be expressed by gradient of r, θ, and ϕ, respectively. Considering the axis of r is taken to be vertical positive and the plane formed by the axes θ and ϕ fit on the ocean surface with the origin 0, then, the velocity field can be expressed as follow if the angular velocity is negligible for an assumption of only rotational motion but any motion across the circular shell of the semi-sphere. That is,

$$[u(r, \theta, \phi; t), v(r, \theta, \phi; t), w(r, \theta, \phi; t)] = [u(r, \theta; t), v(r, \theta; t), w(r, \theta; t)] \tag{2}$$

when zero velocity for the radial component of ϕ.

Then, equation of motion for the interested process is written as foflow for the cross section:

$$(\partial u/\partial t) + u(\partial u/\partial t) + v(1/r)(\partial u/\partial \theta) = -(1/\rho)(1/r)(\partial p/\partial r) + \alpha g T + \nabla(\nu \nabla u) \quad (3)$$

and,

$$(\partial v/\partial t) + u(\partial v/\partial r) + v(1/r)(\partial v/\partial \theta) = -(1/\rho)(-\partial p/\partial \theta) + \nabla(\nu \nabla v) \quad (4)$$

As for the equation of potential temperature in the atmospheric layer,

$$(\partial T/\partial t) + u(\partial T/\partial r) + v(1/r)(\partial Tv/\partial \theta) + v\Gamma = \nabla(\kappa \nabla T) \quad (5)$$

When the thermal energy radiation is radiated at the point source located at the origin, the thermal disturbances out of the heat source is essentially propagate radial.

4. PATTERN OF THERMAL DOME

In a case of thermal dome produced by the enormous amount of thermal energy release as a result of a nuclear reaction process, it can be expected a radial propagation of the front formed by the thermal energy radiation quickly before any thermal convective motion is induced in the atmospheric zone. A spherical shock front might be formed even if any human body was on the paths of the thermal radiation.

When the energy was radiated after a nuclear reaction, the first radiation should be propagated in the speed of the electromagnetic waves (that is to say, instantaneously). Then, thermal energy must be followed to that after completing the energy exchange process between the radiation beams out of the source and the atomic or molecular particles on the paths of the radiations of the electromagnetic power out of the source. This might be called "Fire Ball". With the time elapse, the fire ball grew quickly in a short time. Inside of the fire ball, there might had been generated the complicated motions of the atmosphere trapped by the fire ball. The thermal energy in the fire ball might surely be diffused out across the surface of the fire ball.

The ocean water might be forced to be activated by the nuclear effect though the thermal effect to the ocean surface water was easily happened to generate an evaporated water mass pinnacle at the origin. The water vapor must have formed a dense cloudy column to make a mushroom shape shell just as the thermal front of the dome. The growth of the speed was so quick that there must surely be generated a spherical shock front because this speed is beyond the propagation speed of the electromagnetic waves induced by the nuclear reaction. One of the examples is shown in Figure 1. To the details, it must be seen in the other publications appeared already in the past [3].

Figure 1: Thermal dome pattern at an explosive nuclear energy release on 1 March 1954 at Bikini Lagoon in the Northwestern Pacific (by the courtesy of USAF).

5. EXPLOSIVE THERMAL ENERGY RELEASE

In Figure 1, a case of the explosive thermal energy releases is introduced. There might be any cases of the other similar thermal processes.

The author would here give a note to several patterns of the energy release.

(1) One of the most primitive examples is to make a fire by burning of wood tips or of charcoal carbon tips.
(2) Fossil fuels are effective in the history of the human activity.
(3) Dynamite is one of the typical materials as an explosive thermal energy release must be effective in practical purpose for public works. The dynamite was used for battle in the past.
(4) Nuclear reaction has been utilized for the electric power supply for the public works and citizen services under a well-controlled power release system. Nevertheless, the nuclear reaction (atomic fissures and/or fusions) was used in the world war in order to assure that this was effective to make an explosive thermal energy release as was widely known.
(5) Primitive nuclear reaction can be make an effective explosive thermal energy release after a trigger strong radiation beam to activate the all of the constituents in the atmosphere, in the waters and on the land surface. The activated materials are changed to be another form of forced radioactive materials which consist in any form of ashes produced at the nuclear reaction by the explosive energy release.
(6) The activated ashes were transferred into the atmospheric layer after induced convective winds to diffuse out around the surrounding areas.
(7) As for the case introduced in Figure 1, the ocean water and coral pieces are activated to be

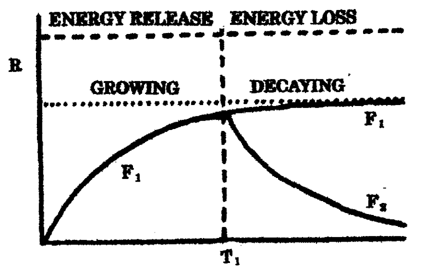

Figure 2: Schematic relation of thermal shock front in relation to energy release model.

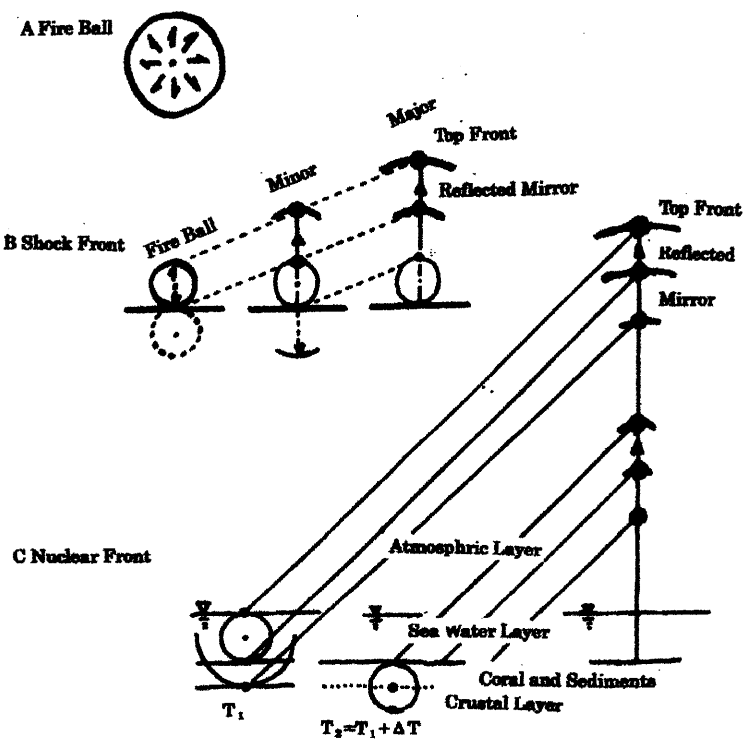

Figure 3: Evolution of thermal shock front pattern. A-Fire Ball, B-Shock front on the Earth surface, C-Shock front above the sea.

the contents of the strong radioactive isotopes. The accuracy of the trigger at each nuclear reactor must be caused to form a crown cap as a set of the main three sheets. The reflected radiations and shock front must be effective to form the minor set of the caps under the main caps set. The shock front in form of a fringe of the cloud on the land surface can be seen.

(8) The first step was the radioactive isotopes production in advance of the shock front in the atmospheric layer as a thermal dome.

(9) The explosive thermal energy release was the second step in the case of the nuclear reaction in the case of Figure 1.

To the details, it could be found what was seen at that time in the other publications.

6. CONCLUSIONS

The author has had a chance to see a process of a thermal dome after an energy release at a point source. Especially, the thermal energy is generated by a nuclear energy release might cause to form a shock wave as a front of the thermal dome in a form of a fire ball. The author could introduce in this work one of the examples out of the photographs of a thermal dome formed after a nuclear energy release on the ocean surface layer. This is a key to promote an advanced research successively.

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Author's biography in brief
1958 BSc, Kyoto University (Science)
1960 MSc, Kyoto University (Science)
1963 DSc-Candidate, Kyoto University (Science)
1976 DEng, Kyoto University (Engineering)

1963-1997 Kyoto University
1978 Visiting Senior Fellow, Hawaii University, HI, USA
1980-1981 Visiting Scientist, CSIRO Perth, WA, Australia
1992-1996 Director, Shirahama Oceanographic Observatory

Fellow- Electromagnetic Society, Cambridge, MI, USA