Upward Floating Mechanism of Aerosol and Clouds Making Machine.

This is problem of Cloud Making Machine(CMM) Launching Aerosol(CN)from Ocean . Then natural Upward Floating Mechanism of CN is decisive in cloud generating efficiency. One is well known wind turbulence diffusion observed in ordinal chimney smoke diffusion, Another is weak Buoyancy Force(with cold sink flow)generated by magic **CN's absorbing vapor gas** in latent heat emission.Loss of{hot & light}vapor gas is to cause local air gas colder and heavier toward sink current.After all,some of enough hotter CNs go upward to become cloud droplet at condensation altitude. 2019/06/07,11,12,13

Cloud Making Machine(CMM)the Overview.

⑴CMM's Mission is making sun heat intercepting clouds over the ocean by launching massive tiny salts of cloud nuclei.This is fatal for the world now facing climate catastrophe due to massive accumulated of CO2 intercepting outgoing heat from earth.Unless this machine,we could not be saved.Once temperature become to cause wild climate,there is nothing,but this method that can settle the emergency.Above all,in order to STOP ARCTIC WARMING causing Methane Catastrophe Death World by Fireball Earth due to ice-less Arctic,this is decisive the HIGHEST PRIORITY TASK at NOW WORLD !!!.

⑵**Cloud Nuclei**(=CN=aerosols,salt,..) **the Angel Demon.**

⒜Vapor gas in air becomes liquid water by temperature down,forming cloud droplet in higher clouds condensation altitude(1k～3km or more higher to 10Km).However without CN,those are not likely to become water,even by lower condensation temperature. That is,clouds and CN are co-body in clouds forming mechanism.

⒝Vapor absorbing CN becomes hotter so long as not becoming absorption saturation. Then absorbed water mass is told few to few ten times of CN weight.Note clouds droplet density in clouds sky is about the order of $0.1g/m^3$.Thereby CN density can be less one, which could be possible by remote launching by CMM.
http://www.dpri.kyoto-u.ac.jp/nenpo/no47/47b0/a47b0t36.pdf

⒞**How to lift up massive CNs to clouds condensation altitude？**
One is well known random wind turbulence diffusion observed in chimney smoke upward flow. However this is dice trowing,so half of those are to fallen down(if only turbulence !) .

⒟**Angel Demon's Engine Mechanism for Lifting Up CN from ground to cloud altitude.**
In local air volume(parcel,or boundary-less balloon)with floating many CNs,heat flows from lower air temperatureT_0 to higher ($\delta T+T_0$)of CN, thus CN can gather heat energy to be hotter to make heat balloon !, While air gas lost hot vapor become colder to fall down.

Contents of APPENDIX.

In order to success in Cloud Making Machine,the necessary validity in scientific and technical matters must be examined.Note this is a coarse report by non-expert author. However he could get the trust-ability to strongly recommend the building to experiment. Above all,this is the deadly problem of DO or DIE for all the people in the world

APPENDIX-1:Very Weak Viscous Dragging Force Enables Aerosol Floating.

If upward air wind velocity $V_S=2.7\times10^{-4}$m/s,Then all salts of radius<10^{-6}m do not fall down.

A2：Buoyancy Force by Archimedes Principle.

Density difference between inner & outer parcel is to cause buoyancy or sink force.

A3：Velocity of Heated Up Cloud Nuclei Air Balloon

Estimating upward velocity of air gas parcel due to bit temperature difference.

By this estimation,very bit air temperature rise can lift up CNs !!

A4：Upward Floating of Aerosol by Wind Turbulence Diffusion.

Half of chimney smoke slowly go upward by dice throwing due to wind turbulence.

A5：Physics of Atmosphere,Water-Vapor and Aerosols.

This is some important-learning items for following sections

A6：Buoyancy & Sink Force in Air Gas Parcel by Archimedes Principle.

CN vapor absorption→air density down by heat & air density up by heat loss

→density difference between inner & outer balloon is to generate buoyancy and sink force.

A7：Up Floating CN Balloon with Hot and Cool Current

This is re-verification of the model.

A8：Clouds Forming Physics toward Cloud Making Machine.

This is some important-learning items for following sections.

A9：Risk Factors for Breaking Upward Flow Condition.

In the matter of course,if wind is wild enough,CN uplifting becomes in vain.

A10：Realizability of CLOUDS MAKING MACHINE

Necessary parameters may become realizable by estimation at here.

However author could not know the details of each concrete technology.

Even as though this is the deadly problem of DO or DIE for all !!!

A11：Reaching Time to Clouds Condensation Altitude in CN Launching.

It is determined buoyancy heat which is analyzed by heat conservation law equation.

So long as less turbulence,chimney smoke of CN gathering vapor heat would go upward.

☞: At beginning of writing this report,author had question why launched aerosol go up to clouds altitude and had to research the solution.Thereby,this report is collection of study notes at that times,so unification and completeness is rather uncertain.Some might be wrong,however,he came to affirmative conclusion at a whole,and now expect CMM could get global consensus to toward urgent building and experiment.Now he entirely hope global cooperation 2019/06/05

APPENDIX-1:Very Weak Viscous Dragging Force Enables Aerosol Floating.

This calculation become strong validity of upward floating CNs by very weak latent heat buoyancy force generation in CNs absorbing vapor gas in atmosphere<see also **A6**>.

Viscous Dragging Velocity

https://en.wikipedia.org/wiki/Stokes%27_law

(1)$u=(2/9)<r^2(\rho-\rho_0)g/\mu>$......u=minimum upward velocity of air gas dragging CN.

(2)$\mu=1.73\times10^{-5}$kg/m.s.......viscosity of air gas

(3)$\rho=2.16\times10^3$kg/m^3........CN=salt density

(4)$\rho_0=1.3$Kg/m^3....... air gas density at T=288K,

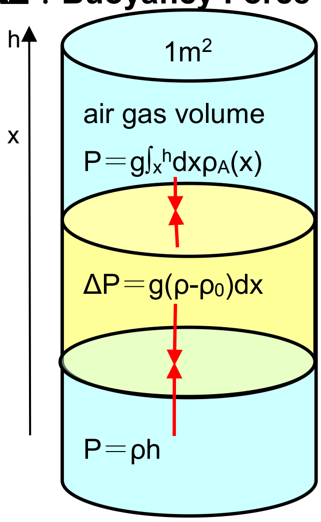
(5)$r=1\times10^{-6}$m...........salt diameter

(6)$V_S=2.72\times10^{-4}$m/s

(7)$V_S\times3600\times24=23.5$m/24h

If air gas volume has upward velocity$=V_A>V_S$、Then all salts of $R<1\times10^{-6}$m is to be dragged upward by viscous force in air volume.This may be most reasonable force lifting up heavier CNs by very weak upward velocity of air gas.

A2 : Buoyancy Force by Archimedes Principle.



Fluid volume of density ρ_0' s replacing by ρ is to cause buoyancy force due to the mass difference $\Delta\rho$.

Thereby ,heat expansion of air mass goes upward !.

Also heat sink of air mass goes downward as sink force.

$dx.f_B=dx(\rho-\rho_0)g=dx.g\Delta\rho$.

$f_B=g\Delta\rho$.

$\Delta\rho=-/\rho_0(\Delta T/T_0)$........air gas

Thus density chage is detemined by that of temperature.

＊$\Delta\rho/\rho_0=-\Delta T/T_0$.← $\rho=(R/M)(P/T)$← $PV=(m/M)RT$;air gas state EQN

＊In this report,**the invisible closed volume of air gas with different density and with buoyancy(or sink force)** is called (heat,cloud nuclei)balloon,parcel,or (big)clouds egg.

*CN≡cloud nuclei;;AG≡atmospheric gas,or air gas.T≡temperature;;P≡pressure,

ρ≡mass density(Kg/m^3)、

A3 : Velocity of Heated Up Cloud Nuclei Air Balloon

Upward Velocity of hot CN parcel is decisive in Cloud Making Machine.It was found that calculation by chimney effect and that by fluid equation(but very wild calculation)agree with each other.Thus this wild estimation could be utilizable by a certain degree.

(1) $\rho\, D\mathbf{u}/Dt \equiv \rho[(\partial \mathbf{u}/\partial t)+\langle \mathbf{u}.\mathrm{grad}\rangle \mathbf{u}] = \mu \nabla^2 \mathbf{u} + \langle -\mathrm{grad}P + \mathbf{g}\rho \rangle$.....**NS Eqn.**

This is NS equation in volume density and assume stationary flow.This can be turned to volume integral equation form as follows.<u=velocity,g=gravity,μ=friction of fluid,ρ=density>

*$d[\rho(\mathbf{r}(t);t)\mathbf{v}(\mathbf{r}(t);t)]/dt = \rho[\partial \mathbf{u}/\partial t + \Sigma_{k=1}{}^{3} u_k \partial_k \mathbf{u}] + u[\partial\rho/\partial t + \Sigma_{k=1}{}^{3} u_k \partial_k \rho] \equiv \rho\, D\mathbf{u}/Dt + \mathbf{u} D\rho/Dt$.

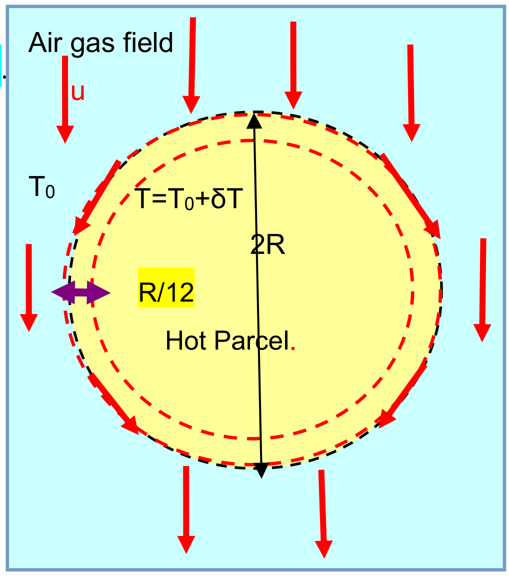
*$\nabla^2 \mathbf{u} = \mathrm{grad.div}\mathbf{u} - \mathrm{curl.curl}\mathbf{u}$.

$\oint dV \rho\, D\mathbf{u}/Dt = \mu \oint d\mathbf{S}\, \mathrm{div} u - \mu \oint d\mathbf{S} \times \mathrm{curl}\mathbf{u} + \langle \oint d\mathrm{S}.\, P - \oint dV \rho\, g \rangle$.

Note $0=(\partial \mathbf{u}/\partial t)$, $0=\mathrm{div} \mathbf{u}$.

(2)**Stationary Equation in Volume Integral.**

$\oint dV \langle \mathbf{u}.\mathrm{grad}\rangle \mathbf{u}] + \mu \oint d\mathbf{S} \times \mathrm{curl}\mathbf{u} = \langle \oint d\mathrm{S}.\, P - \oint dV \rho\, g \rangle$.



Following is **very wild approximations**.

(3)$\oint dV \rho_0 [\langle \mathbf{u}.\mathrm{grad}\rangle \mathbf{u}] = \rho_0 [\langle \mathbf{u}.\mathrm{grad}\rangle \mathbf{u}] \oint dV$

$\oint dV = (R/\alpha) 4\pi R^2 = (R/12) 4\pi R^2$..

$\rho_0 \langle \mathbf{u}.\mathrm{grad}\rangle \mathbf{u}] = \rho_0 u (u/R)$

(4)$\mu \oint d\mathbf{S} \times \mathrm{curl}\mathbf{u} = \mu 4\pi R^2 (u/R)$

(5)$\langle \oint d\mathbf{S}.P - \oint dV \rho\, g \rangle = (4\pi/3) R^3 \delta\rho g$.

(6)$\delta\rho/\rho_0 = \delta T/T_0$.← $\rho = (P/T)(M/R)$.

(7)$(R/\alpha) 4\pi R^2 \rho_0 u (u/R) + \mu 4\pi R^2 (u/R) = (4\pi/3) R^3 g \rho_0 (\delta T/T_0)$.

advection derivative＋viscous force＝buoyancy force.

(curving acceleration force)

$g = 9.8 m/s^2$.

$\mu = 1.73 \times 10^{-5} kg/m.s$

$\rho_0 = 1 kg/m^3$.

$\delta T/T_0. = \delta T/(273, \text{or } 288)$

$R = 1m \sim 10m \sim 100m \sim ??$

$0 = u^2 + (\alpha \mu/R\rho_0) u - (\alpha/3) R g (\delta\rho/\rho_0)$.

$u = \langle -(\alpha \mu/R\rho_0) + [(\alpha \mu/R\rho_0)^2 + (4\alpha/3) R g (\delta\rho/\rho_0)]^{1/2} \rangle /2$.

(7)$u = -(6\mu/R\rho_0) + [(6\mu/R\rho_0)^2 + 4Rg(\delta T/T_0)]^{1/2} \fallingdotseq [4Rg(\delta T/T_0)]^{1/2}$.

☞:$R > 1m, (6\mu/R\rho_0) \to 0$. $\alpha = 12$→Equation is agree with $u = [2gh(\delta T/T_0]^{1/2}$.<chimney effect>

Larger parcel enables neglecting friction force term,

but not momentum change(momentum energy)=buoyancy force(work by the pressure).

See the details in ⑾.

$[(\alpha/3)(R = h/2) g (\delta T/T_0)]^{1/2} = [(\alpha/6) h g (\delta T/T_0)]^{1/2} = [2gh(\delta T/T_0]^{1/2}$... $\alpha = 12$.

＊$(\alpha \mu/2R\rho_0)^2 = (12\mu/2 \times 1 \times \rho_0)^2 = [1 \times 10^{-7}]^2$. ≪≪$4Rg(\delta\rho/\rho_0) = 4 \times 1 \times 9.8(1/273) = 0.144$.

⑻Velocity Table by NS Eqn(Chimney Eqn with h=2R).These are enough to lift up CNs !!

$\delta T/T_0$	0.001/273	0.01/273	0.1/273	1/273
u(R=1m,)	0.012m/s	0.038m/s	0.12m/s	0.38m/s
T(1000m)	23h	7,3h	2.3h	0.73h

$\delta T/T_0$	0.001/273	0.01/273	0.1/273	1/273
u(R=10m,)	0.038m/s	0.12m/s	0.38m/s	1.2m/s
T(1000m)	7.3h	2,3h	0.73h	0.23h

⑼Estimation on Upward Velocity of Cigar Smoke.

These may agree with observation in calm room environment.

$u \sim [4Rg(\delta T/T_0)]^{1/2}$

$\delta T/T_0$	0.1/273	1/273	10/273	100/273	1000/273
u(R=0.01m)	0.012m/s	0.038m/s	0.12m/s	0.38m/s	1,2m/s
u(R=0.005m)	0.0085m/s	0.026m/s	0.085m/s	0.27m/s	0.84m/s
u(R=0.0025m)	0.006m/s	0.019m/s	0.06m/s	0.19m/s	0.6m/s

＊negative velocity due to friction force=$(12\mu/2(R=0.005)\rho_0)=2\text{x}10^{-5}$.

＊velocity due to dynamical & heat pressure=$[4Rg(\delta\rho/\rho_0)]^{1/2}=[4\text{x}0.005g(1/273)]^{1/2}=8.6\text{x}10^{-3}$.

As for R=0.005m,friction force effect is negligible by about 1/100.

⑽Radius become friction sensitive by temperature<$\mu=1.73\text{x}10^{-5}$kg/m.s>.

$(6\mu/R\rho_0)^2=4Rg(\delta T/T_0)$←friction force effect～dynamical force one.

$9(\mu/\rho_0)^2/g(\delta T/T_0)=R^3 \rightarrow R=[9(\mu/\rho_0)^2/g(\delta T/T_0)]^{1/3}=[\,2{,}75\text{x}10^{-16}(T_0/\delta T)]^{1/3}$.

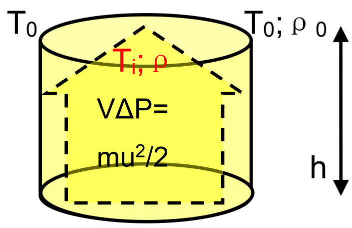
$(T_0/\delta T)$	273/0.01	273/1	273/100
R	4,2x10^{-4}m	4,2x10^{-5}m	4,2x10^{-6}m

⑽***Chimney Effect****<velocity of heated up air gas by chimney height=h>*

https://ja.wikipedia.org/wiki/%E7%85%99%E7%AA%81%E5%8A%B9%E6%9E%9C

velocity of warmed air gas

⑾$u=[2gh(T-T_0)/T_0]^{1/2}$.



$\rho=(P/T)(M/R).\rightarrow \rho=\rho_0(T_0/T_i)$;

$\Delta P=gh(\rho-\rho_0)=gh\rho_0((T_i-T_0)/T_0)$.

$\Delta P.V=mu^2/2,\rightarrow$

$u^2=2\Delta P(V/m)=2\Delta P/\rho_0=2gh<(T_i-T_0)/T_0>$.

☞;Caution this may be velocity just after the launching,but do not keep the velocity.In order to keep the velocity, something heat up mechanism is necessary such as heat balloon.

A4：Upward Floating of Aerosol by Wind Turbulence Diffusion.

This is well known RANDONM WALK model in launched aerosol that enables to diffuse some of them toward cloud condensation altitude.It is dice throwing to get riding ticket to the altitude,so major of them would fall to ocean surface.Thereby strong CN density spraying may be necessary to assure generating clouds(If upward force is only the diffusion).

⑴**Turbulence Diffusion**<smoke volume expansion could be estimated>.

By less time and knowledge,coarsely to tell,solution is Gaussian,then essence is mere a *RANDOM WALK* which is described by following Normal Distribution.

⒜***Pragmatical Estimation on Turbulence Diffusion Length in 1hour.***

http://www.ha-na-sig.jp/contents3/img/03/sankoushiryou.pdf

$C(x,y,z)=(Q/2\pi u\sigma_y\sigma_z)\exp(-y^2/2\sigma_y^2)\{\exp(-(z-He)^2/2\sigma_z^2)+\exp(-(z+He)^2/2\sigma_z^2)\}$

$D(t)=(\sigma_z(t)+\sigma_z(t))=1000\sim2000m$?? is depth(z axis height)of smoke at time x=100Km/(u=2m/s)~14h?.Author could not understand means of x/u and {A,B..}

⒝**1dimensional diffusion or RANDOM WALK.**

$N(x,t)=<N_0\sqrt{2\pi(2Dt)}>\exp[-x^2/2(2Dt)]$. → average length $<x>=\sigma=\sqrt{(2Dt)}$ Thereby volume(with pseudo boundary) expansion is estimated by $V=(2Dt)^{3/2}$.

http://physics.gu.se/~frtbm/joomla/media/mydocs/LennartSjogren/kap2.pdf

Rapid and large macroscopic diffusion by turbulence<⒜> has also same essence of rather small space scale,but far larger than atomic scale of random walk.

⑵An image of turbulence diffusion in ocean surface wind.

Cloud Making is executed in fine day without clouds,when wind may be not so strong.

⒜Actuality of weak wind velocity＝V distribution in altitude.

In near surface V is lower,while V is almost constant at sufficient altitude.

http://www.asahi-net.or.jp/~rk7j-kndu/kenkyu/ke01.html

http://app10.infoc.nedo.go.jp/Nedo_Webgis/faq.html

They tell wind velocity is **logarithmic function of altitude**.

＊observed Weak Wind at near ocean surface

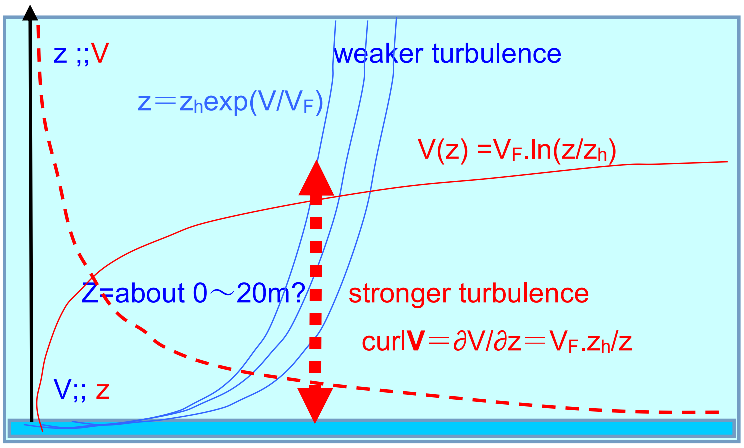
https://www.jstage.jst.go.jp/article/proce1989/48/0/48_0_451/_pdf

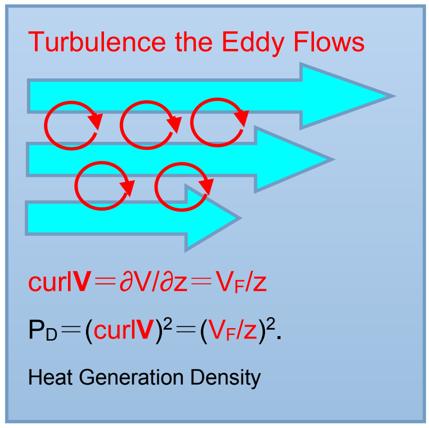
See V(z) in fig(図)3

⒝$V(z)=V_F.\ln(z/z_h)$→

⒞$z=z_hV_F\exp(V)$,,......,{z=altitude,z_h=surface parameter,$V_F=V(z/z_h=e=2.718)$ }

⒟curl**V**$=\partial V/\partial z=V_F.z_h/z$. This is the origin of wind turbulence intensity. It is velocity difference between altitude (z,z+dz),at where fluid air gas generate friction force between those different V of wind.Those are to generate many small eddy flows; http://www.777true.net/Information-Loss-Process-in-NS-Equation_The-Cause-of-Chaos.pdf





(e)Friction force become heat the activation of molecular random motion.The energy is supplied from velocity attenuation of wind.This is the origin of RANDOM WALK of wind flow particles.However the energy is weak enough as order of ～1W/m³.～0.001℃/sm³

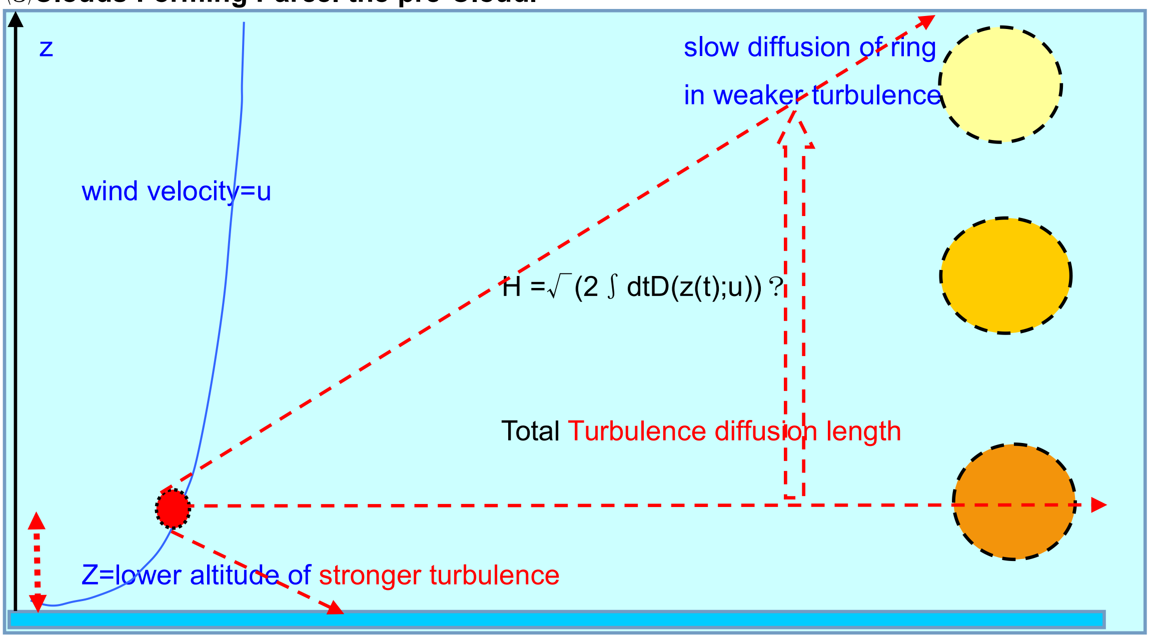
(f)Note in lower altitude,turbulence diffusion is stronger to diffuse spreaded CNs,

While in higher altitude ,those become weak to cause stable clouds nuclei clusters

If logarithmic law is exact？,higher altitude turbulence becomes very weaker !!

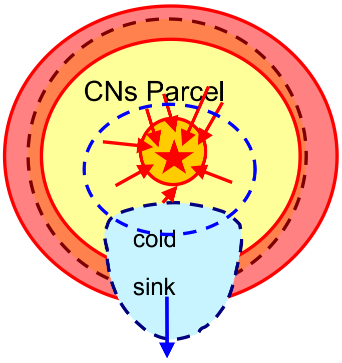
P_D＝(curl**V**)^2＝(V_F/z)^2. → P_D(1000m)/P_D(10m)＝1/10000.!!?

(3)**Clouds Forming Parcel the pre-Cloud.**



Flow without turbulence is luminar one,which is realized in higher altitude in weak wind day.

⑷**Heat Separation**<*eggshell does not break until baby bird(up & down flows)is born !*>



If CN parcel was **closed system**,then CN absorbs hot vapor to be warmer,while air gas become colder due to deficit of warmer and lighter vapor gas<After all,the cooled becomes sink out flow.In qausi homogenous gas space in{T,P},then there must be also income flow from exterior to compensate out flow due to mass conservation law>.In order to enable closed system,eggshell of ring diffusion speed must be slow to allow time for growing sink flow.

Also note **surround of CN becomes hotter** due to latent heat generation in vapor absorbing. Especially note heat conductivity between air gas ans solid-liquid is very small.Also note CN has outrageously has big collision cross section for vapor absorbing and outrageous bigger heat content due to extremely larger mass than air gas molecule,thus CN becomes heat flow rectifier with heat capacitor.Thus this becomes **HEAT SEPARATION REACTION** against 2nd law of thermodynamics in local space and time in none closed system with input and output flow.

Longer time interval＝t of reaching ring radius to the center.

R(z;u;t)=√￣(2D(z;u)t).→t＝R^2/2D(z;u)＞time for growing cooling down flow from inner circle.

A5：Physics of Atmosphere,Water-Vapor and Aerosols.

⑴Atmospheric Air Density at (P,T)

https://www.thoughtco.com/density-of-air-at-stp-607546

ρ =(P/T)(M/R).	ρ：:kg/m^3 density
P＝101325Pa(1atm)	P：:Pa pressure
ρ(288K;1a)=1.23Kg/m^3	T：:absolute temperature in K
ρ(273K;1a)=1.3Kg/m^3	R＝8.314 m^2 kg s^{-2} K^{-1} mol^{-1}：gas constant
ρ(258K;0.78a)=1.07Kg/m^3	M＝0.029Kg/mol:average atomic mass of air

⑵**Specific Heat Capacities of Air.**

https://www.ohio.edu/mechanical/thermo/property_tables/air/air_cp_cv.html

$C_P = \partial Q/\partial T_{|P=cons}$＝1.0KJ/deg.$m^3$。.....in ideal gas,this becomes constant !!.

⑶**Saturated Vapor Pressure, Density for Water**.

Following table is indispensable for calculation of water content in cloud.

https://www.s-yamaga.jp/nanimono/taikitoumi/kukichunosuijoki.htm

＊Vapor density calculation m=PVM/RT＝(1x18/8.314)(P/T)＝2.17(P/T)

T(℃;K)	Saturation pressure hPa=Pa/100	Saturation Density g/m^3	
(15)**288.15**	17.1	12.8gm^{-3}/1.3kg=1%	
(8)**281.15**	10.7	8.28	
(2)**275.15**	7.06	5.57	Note air of 1m^3 has 1.3kg weight,while the vapor is mere 5.5g of 0.4%.Visible steam in bath room may means tiny water droplets floating in the air(it is almost cloud).
(1)**274.15**	6.57	5.20	
(0)**273.15**	6.11	4.85g/m^3	
(-2)**271.15**	5.18	4.15g/m^3	
(-5)**268.15**	4.02	3.14	
(-8)**265.15**	3.10	2.54	
(-10)**263.15**	2.60	2.36	
(-15)**258.15**	1.65	1.24	
(-20)**253.15**	1.03	0.89	
(-50)**223.15**	0.04	0.04	

https://www.s-yamaga.jp/nanimono/taikitoumi/kukichunosuijoki.htm

https://www.chegg.com/homework-help/humidity-depends-water-s-vapor-pressure-temperature-saturati-chapter-13-problem-20cq-solution-9781938168000-exc

(4)**Latent Heat of Water** the heat emitted in gas to liquid phase transition.

You may have observed that it needs stronger heat to vaporizing a bit of water.The reverse is also true, vapor can emit strong heat in liquid water transition from gas.

＊**Emitted heat in vapor into liquid transition**＝44.0 kJ/mol(18g H_2O)＝2444KJ/kg.
δT＝Q_L(latent heat)/C_p(specific heat of airgas)
＝<44KJ(1g/18g)/1.0KJ/degm^3>＝2.44(℃,,K). ....T rise of unit volume air gas

https://en.wikipedia.org/wiki/Water_(data_page)

1g/m^3 vapor can emit latent heat＝44.0 kJx(1g/18g)＝2.44KJ.

1g/m^3 vapor can warm 1m^3 air 2.44℃ rise, It is strong too enough heat for buoyancy !!.

(5)Amazing Temperature Rise by Latent Heat in Vapor Absorbing.

<**Caution**;this assume nothing heat dissipation,but keep heat,and is impossible in actual>

Latent Heat of Vapor＝44KJ/18g→C_P＝(absorbed water+salt)...specific heat of (salt+water)

＊Salt specific heat＝50J/deg(1mol=58g)＝0.86J/g.deg

＊Liquid water specific heat＝4.187J/g .deg

This is a simulation // water amount x is suddenly increased from x=0(T＝0)		
1g salt gather 3 g vapor→	T=Q/C_P＝(3x4.19+0.86/Jg)$^{-1}$x3gx44KJ/18g	＝546℃
gather 0.1g vapor. →	T=Q/C_P＝(1x4.19+0.86/Jg)$^{-1}$x1gx44KJ/18g	＝484℃
gather 0.04g vapor. →	T=(0.04x4.19+0.86/Jg)$^{-1}$x0.04gx44KJ/18g	＝95℃

This is a simulation // water amount x is gradually increased from x=0(T＝0)		
water mass	T rise	dT＝44K(dm_W/18)/($m_W C_W$+$m_S C_S$)=Heat/Heat Content.
10g	2280℃	dT/dx＝(44K/18C_W)/(x+m_S(C_S/C_W)).
3g	1616℃	T＝(44K/18C_W)ln<x+m_S(C_S/C_W)>+C(938)
0.1g	236℃	T＝(44000/18x4.19)ln<x+(0.86/4.19)>
0.035g	94℃	T＝938＋583.ln<x+0.2>

Such high temperature can not be realized in actual small aerosol at a time.Because over 100℃ means re-evaporation of water.Evaporation temperature at high altitude is lower than 100℃. It may be that small aerosol absorb vapor to get hot heat and immediately dissipate heat into near surround to cause buoyancy force until saturation in absorbing vapor.By such way of keeping heat dissipation,they may reach altitude of clouds forming.

(5)**Aerosol Data.**

(a)typical aerosol absorbing water

https://en.wikipedia.org/wiki/Cloud_condensation_nuclei

Sulfate, Nitrate, Organic Aerosol, Black Carbon; Small particles such as BC soil particles (yellow sand), sea salt particles.the size is told 1nm～1mm. Number density in atmosphere ＜1000/cm^3＝$10^9/m^3$

⒝**Vapor Absorption Amount by an Aerosol Particle**

http://www.dpri.kyoto-u.ac.jp/nenpo/no47/47b0/a47b0t36.pdf

If humidity is higher,aerosol particle can absorb vapor water from air and becomes heavier as few to few ten times of the mass at dried.

This is important,because such large absorption of water means less mass of aerosol.

This fact make merit for Cloud Making Machine Efficiency(clouds volume/salt amount)

Example)

Saturation mass of salt water is about 1/3 of water.Or salt of mass=1 can absorb water by 3times. Salt water may absorb more water with less salt density.

⑹**Dulton's Partition Volume Law**<for air gas density change calculation>:

In analyzing salt,s vapor absorbing to generate latent heat toward buoyancy force generation,air gas mass density down change due to that of vapor and salt become negligible compared with temperature rise by the heat.The validity is at here !.

Atmospheric air gas is mixed one,which needs rather complicated calculation become necessary to estimate vapor gas change($m_w \to m_w + \delta m_w$.;others are not change).

*j measn various gas of partition volume=V_j in air;mass=m_j;atomic mass=M_j
w=vapor;s=salt,R=gas constant,T=absolute temperature,M=29g of air atom.

$PV_j = (m_j/M_j)RT. \to\ PV = P\Sigma_j V_j = \Sigma_j (m_j/M_j)RT = (\Sigma_j m_j/M)RT = (m/M)RT.$

$\Sigma_j(m_j/M_j) = (\Sigma_j m_j/M)$.

$\to\ M = \Sigma_j m_j / \Sigma_j (m_j/M_j)$;..........average mass of air atom＝29g/mol

$\Sigma_j m_j = m_A$........................actual total mass of air gas～1.0～1.3Kg/m^3.

$\to \delta M = \delta m_w / \Sigma_j (m_j/M_j) - \Sigma_j m_j / <\Sigma_j (m_j/M_j)>^2 \{\delta m_w/M_w\}$

$= M(\delta m_w/m_A) - m_A/<m_A/M>^2\{\delta m_w/M_w\} = M(\delta m_w/m_A) - (M^2/m_A)\{\delta m_w/M_w\}$

$= M(\delta m_w/m_A)[1 - M(29g)/M_w\}$.

$\to\ \delta M/M = \delta m_w/m_A\{1-(M/M_w)\}$.

$M>M_w \to$ decreasing lighter component means density increasing toward cause buoyancy.

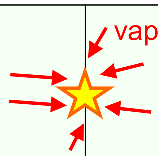
$M<M_w \to$ adding heavier means density increasing toward cause anti-buoyancy.

A6：Buoyancy & Sink Force in Air Gas Parcel by Archimedes Principle.

❶The Overview.

The actual process is very complicated one due to both{thermodynamics & fluid-dynamics}.

Following is very simplified model of heat separation causing sink and buoyancy forces.

Before Heat Absorbing		In Heat Absorbing		After Heat Absorbing	
Air gas(AG) with vapor and CNs.	T=constant CN			Cooled air gas sink down	Hot AG going up
During above process,the system should be closed,but must become opened after reaction! Salt-vapor reaction rate??＞diffusion velocity? of boundary of virtual closed system. If we take larger CN parcel,boundary width change rate may be smaller.					

❷Buoyancy & Sink Force Generating by Gas Density Change due to Heat Separation.

This is kernel point that heat input or output is to change density of local air volume,which turn to generate buoyancy or sink force by Archimedes Principle.

(1) $\rho=(P/T)(M/R) \leftarrow PV=(m/M)RT$........... **Ideal Gas Sate EQN.**

＊ ρ =density＊P=pressure＊T=temperature＊M=29g of air gas mass＊R=8.31J/K.mol

(2) $\delta\rho/\rho=-\delta T/T+\delta M/M$.........<P=constant in atmosphere environment>

＝(heat term)＋(air gas mixing ration change)

(3) $\delta T/T$ ： $\delta T>0$ means heat expansion of air gas causing density lower,

(4) δT＝latent heat of $1g/m^3$ vapor/specific heat of air gas($1m^3$).

$\delta T/T=(44KJ(1g/18g)/1KJ.degm^3)/T(273)=2.44/273=0.009$.......1g vapor Latent heat/m^3

(5) $\delta M/M=\delta m_w/m_A\{1-(M/M_w)\}$.<air gas M=29g,vapor M_w=18g>

See detail in **A5**(6)**Dulton's Partition Volume Law,**

：lighter vapor gas component $0>\delta m_w$ absorbed turn to air gas density rise($\delta M/M>0$).

However the effect is <u>about negligible</u> ($\delta M/M=-1g/1000g(1-29/18)=0.0006$).

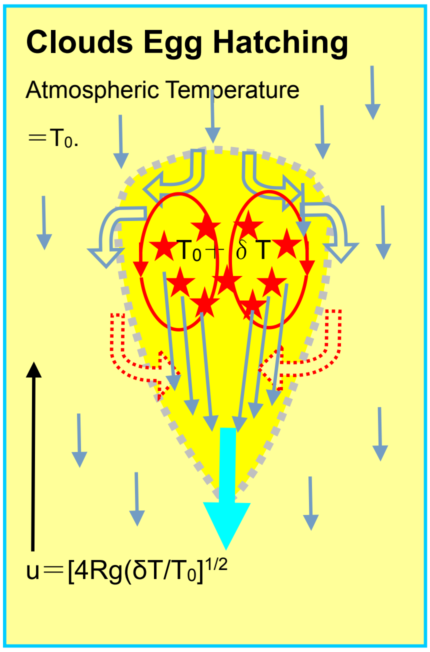
Note ratio=($\delta M/M$)/($\delta T/T$)=0.0006/0.009＝0.07.........constant negligible

The concrete details is mentioned in **A7**(4).

A7：Up Floating CN Balloon with Hot and Cool Current

Hot and Cool Current in Up Floating CN Balloon the Heat Engine. 2019/6/3

This is an explanation to keep upward floating velocity by heat engine due to singular CN property.



⑴**Heat Flow Account......**<VP=vapor gas>

CN is {H_2O with heat}absorber and in which heat flows lower T_0(air) to higher $T_0+\delta T$(balloon). This is not the 2nd law destroyer.**Principle of Clausius**: *It is impossible to flow heat from lower to higher in cyclic action without nothing change, but only heat flow.*

⑵**Fluid Flow Account.**

CNs with surround air gas become hotter to go upward, while VP losing colder air flow downward.As the consequence,balloon becomes to absorb exterior air gas with vapor.Top surface of balloon is to collide with exterior air gas to lose surface heat.

⑶Conditions for Keeping Clouds Egg Shell(the Upward Floating Heat Balloon)

⒜It is told heavier particles(CNs)in fluid field is to form clusters, but not be diffused to widely spreaded.Thus gathered CNs become kernel bones of Clouds Egg.

Chen L, Goto S, Vassilicos J. 2006. Turbulent clustering of stagnation points and inertial particles. *J. Fluid Mech.* **553**: 143–154, doi:10.1017/S0022112006009177.

⒝The upward going CN balloon has nothing solid surface shell,but air gas one which are to collide with exterior air gas.However invasion surface skin depth is estimated very about R/12,where R is about radius of the Big Egg<see **A3**>..

⒞Day of Cloud Making is only fine day without clouds,when wind may be weaker.Note wind turbulence energy decreased by $1/z^2$～(10m/1000m)=1/10000 where z is altitude from ocean surface.That is,higher altitude air flow may be luminar one,but not strong turbulence.

⒟In fact,so called aerosol launched from ground surface becomes clouds nuclei.Some of those may have fallen to ground,while others are to go up by something mechanism of upward floating. So far in authors surveying WEB information,none seems to discuss the mechanism.Thereby,professional researchers must make the exact study.

(4)Latent Heat Reaction in Vapor to Liquid is Heat Separation toward Cold and Hot.

(a)In closed heat system,energy conservation law claims nothing energy creation,but keeping total amount.Thereby,generated heat at CN must be compensated by loss heat in air gas losing vapor.Note latent heat generation is a kind chemical reaction but not heat conduction.This fact enables superficial heat flow from lower to higher temperature !!.

It is generating chemical coupling between CN surface and water molecular.That is,the energy is lower than that of decoupling state of CN and vapor H20.Note chemical bonding energy is negative due to attraction force.That is, latent heat is negative chemical bonding energy.Thus this is not 2nd law destroyer,but very lucky for us(magic CN!).

$0 = dQ(CN) - dQ(\text{air gas losing vapor})$. ⇒ $0 = \mu\, dN(CN) - dQ(\text{air gas losing vapor heat})$.

(b)Meaning of Chemical Potential＝Gibbs Energy≡G≡ μ N.

Internal energy＝molecular momentum energy＋chemical bonding energy－work energy

＊$U = TS + \mu N - PV$.→ $\mu N \equiv G \equiv U - TS + PV$.

＊PV＝Force at surface boundary of closed system×boundary displacement.

This may be boundary condition for Dynamical Equation System(→H).

$H = \Sigma_k (p_k^2/2m_k) + V(x,\ldots,x_k,..) = TS + G$...micro dynamics

heat energy＋chemical bonding energy in closed system

$U = \Sigma_k (p_k^2/2m_k) + V(x,\ldots,x_k,..) - PV = TS + G - PV$

dV.P

(c)The Whole View.

$\rho = (P/T)(M/R)$;; $(3/2)PV = (3/2)(m/M)RT = TS$=heat energy=molecular kinetic

$dU = dQ - PdV + \mu\, dN$; ; $G = U - TS + PV$＝not heat energy,.but chemical bonding one

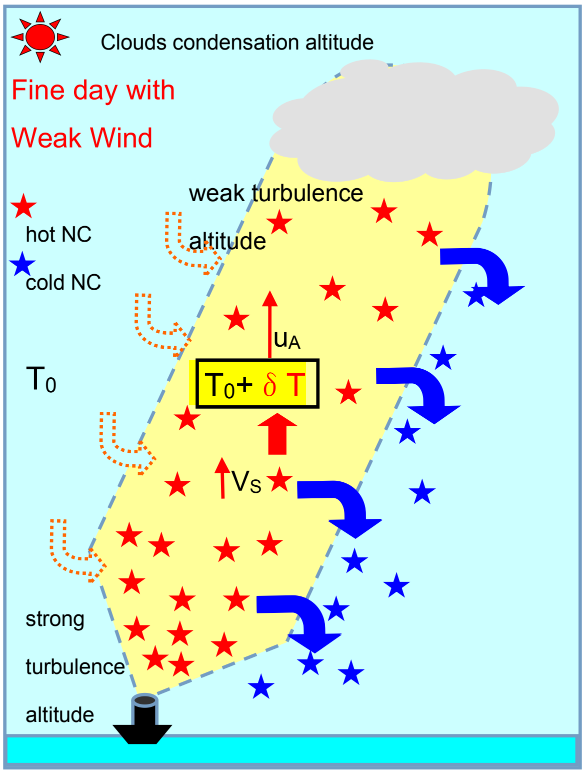
$\delta\rho_h/\rho_h = -\delta T^+/T_0$.	$\delta\rho_c/\rho_c = -\delta T^-/T_0 + \delta M/M$.
hot air gas with <CN＋vapor>	cold air gas without vapor
$dU_h = -PdV^+ + \mu\, dN > 0$	$dU_c = -PdV^- + dQ(\mu\, dN^-) < 0$
becoming liquid from vapor is chemical reaction with latent heat emission in CN,but not pure heat conduction or heat convection.	vapor is certainly heat of molecular kinetic energy before becoming liquid.

☞:hot parcel may lose energy due to PdV and buoyancy propulsion force.

⑸**The Whole View of Upward Floating CNs,**

Note actual upward velocity V_S of CNs is

$V_S = u_A - u_{VD}$ = upward velocity of air − viscous dragging velocity.



It is not that left scheme has proved, but circumstantial evidences indicates. Especially author failed to get reaction rate of vapor water transition in NC(salt).

If the rate is rapid,reaction in lower altitude is to generate larger heat causing strong buoyancy.As those goes up, heat generation is to be weaker.However time for reaching clouds condensation altitude might be shorter.

If the rate is slower,buoyancy might be weaker to take longer time to reach clouds condensation altitude.

Note there are both upward and downward air currents due to latent heat reaction at NCs. Those reaction may not occure at once when salts are launched from spraying chimneys, But it takes longer time in upward going way.Then some NCs are to fallen due to cold air,while some NCs are going upward due to hot air.The heat reaction is to be kept till absorption saturation point or clouds condensation point.

A8：Clouds Forming Physics toward Cloud Making Machine.

Following is minimum knowledge in Designing Cloud Making Machine(by salt spreading).

(1)In haste,you should jump here.

The types of clouds: everything you need to know

https://www.zmescience.com/science/types-of-clouds/

CLOUD DEVELOPMENT

https://www.weather.gov/source/zhu/ZHU_Training_Page/clouds/cloud_development/clouds.htm

(2)**Liquid water content in clouds(LWC/m^3).**

By this value,necessary salt density/m^3 for cloud generating is calculated.

Cloud liquid water content(LWC), drop sizes, and number of droplets

http://www-das.uwyo.edu/~geerts/cwx/notes/chap08/moist_cloud.html

The vast majority of these cases have quite low LWC (less than 0.1 g/m^3) with only about 17% of the cases having LWC greater than 0.3 g/m^3.

Cloud liquid water, mean droplet radius, and number density measurements using a Raman lidar

https://agupubs.onlinelibrary.wiley.com/doi/10.1029/1999JD901004

See Page(31,417),

the average diameter;$r \sim 30\mu m$,

the max number:$N \sim 10^8/m^3$.

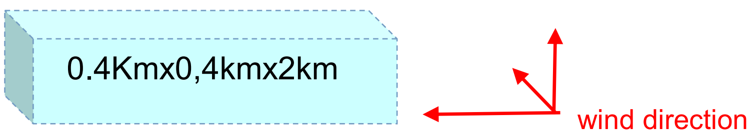
Then $LWC = N \rho (4/3) \pi r^3 = 10^8/m^3 (1000Kg/m^3)(4\pi/3)(30x10^{-6}m)^3 = 0.01g/m^3$

(3)**Size of Clouds Volume**(depth x width x length).

By this value,necessary total salt amount for cloud generating is estimated.

A sample of cloud size～0.4Kmx0,4kmx2km

2km may be NC dust length along wind direction(+turbulence diffusion) ,while 0.4Kmx0,4km may be dust vertical and horizontal turbulence diffusion length perpendicular to wind direction(this is authors opinion).



The Size Distribution of Cumulus Clouds in Representative Florida ...

https://journals.ametsoc.org/doi/pdf/10.1175/1520-0450%281969%29008%3C0046%3ATSDOCC%3E2.0.CO%3B2

A9 : Risk Factors for Breaking Upward Flow Condition.

In the matter of course,if wind is wild enough,CN uplifting becomes in vain.

⒜**Stronger Downward Wind**

⒝**Stronger Vertical Wind**

Albedo engineering to intercept heat input to earth may take long years to accomplish climate stability.Thereby study on CMM weather environment is decisive to accomplish effective engineering.Also caution for salt spreading bad influence to land vegetation would be necessary, if the project years would become long..This is a betting for which we opt wild climate bad influence or the bad for vegetation especially for global agriculture.
http://www.777true.net/Rapid-CO2-Absorption-with-Mineralisation-of-CO2-by-OLIVINE.pdf
http://www.777true.net/100pct-Renewable-Energy-is-Possible.pdf

A10：Realizability of CLOUDS MAKING MACHINE<the Imagined Parameters>

Following assumed parameters{①～⑤} could not be exact,but merely imagined by author.

In order to make clouds at lowest altitude of water condensation to clouds(1km～3km), necessary salt cloud nuclei density in cloud may be order of (0.01 g/m^3)/3～0.001 g/m^3?.

①**LWC**(liquid water content in cloud)～0.01 g/m^3..............this is minimum estimation?.

http://www-das.uwyo.edu/~geerts/cwx/notes/chap08/moist_cloud.html

②necessary salt cloud nuclei density＝**LWC/(3~10?)**＝0.001g/m^3....this is also minimum?

＊Salt water saturation concentration is about 30%,

③**Assumed Clouds Volume V_C**＝0.5km?x2.5km?x200km(/24h)

The Size Distribution of Cumulus Clouds in Representative Florida ...

④Salt amount for V_C＝V_C(0.001 g/m^3.)＝2.5x10^5Kg....<this is 100%efficiency??>

Sea water pumping rate＝(1/0.03)2.5x10^5Kg/24hx60min.....＊3% Salt sea water

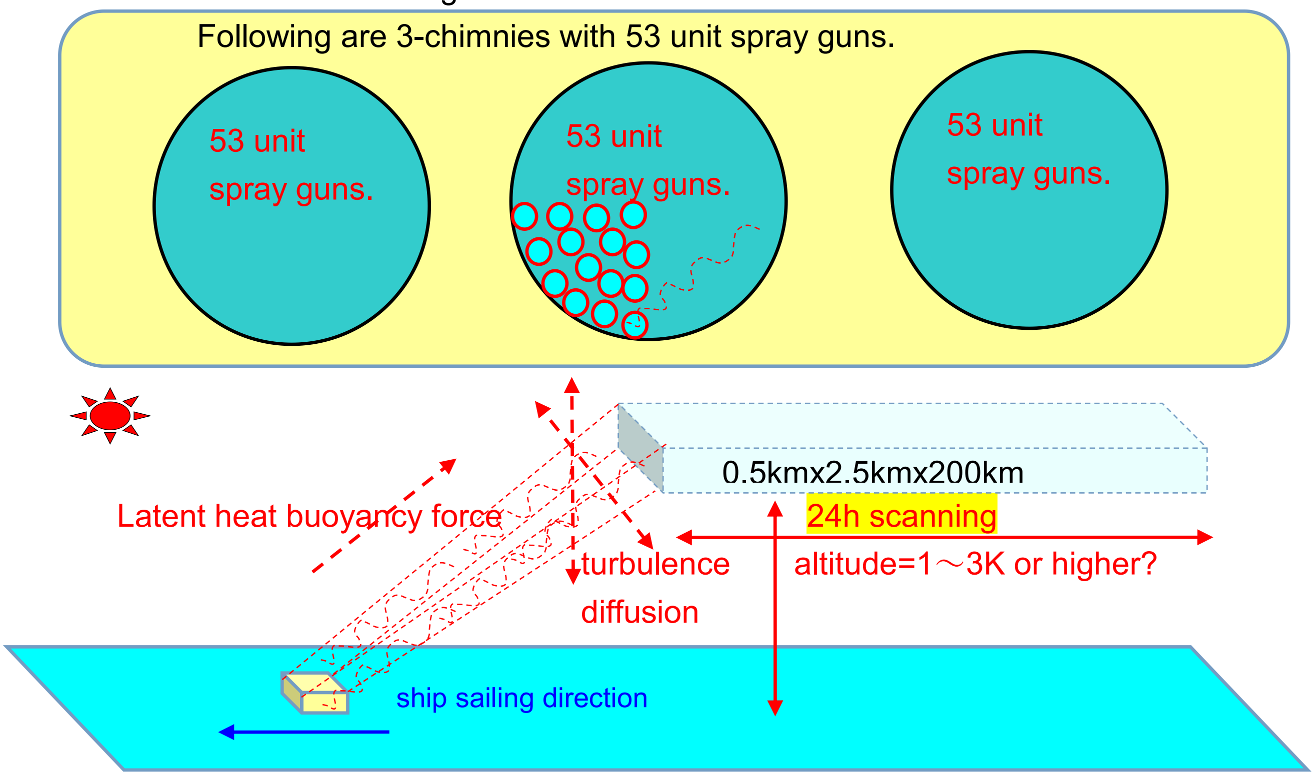
＝5800Kg/m＝97Kg/s. ....sea water spraying

<*30 kg/sec of 0.8 micron drops* ;*Salter et al. (2008)*>.

⑤Unit Sprayer(US)：10g/s＝600g/m

＊Spraying speed of author's seems less than 1g/s.

Number of US＝97Kg/0.6＝160 units



REFERENCE;

⑴***Simulations of a Demonstration of Cloud Albedo Change***

http://www.homepages.ed.ac.uk/shs/EPSRC%20SPRAY%203/

Salter Satellite alb..> 27-Aug-2009 15:39 2.2M

Design work on the sea going hardware and a possible spray generation system rated at 30 kg/sec of 0.8 micron drops is well-advanced, Salter et al. (2008).

⑵Latham, J. 1990. Control of global warming. Nature **347** pp 339-340.

⑶***Save the Arctic sea ice while we still can!*** 2015/03/06

http://arctic-news.blogspot.jp/2015/03/save-the-arctic-sea-ice-while-we-still-can.html

⑷***Introduction to Cloud Physics***<*Japanese version*>

https://repository.kulib.kyoto-u.ac.jp/dspace/bitstream/2433/189509/1/bussei_el_033210.pdf

<<the 1st Principle Micro Kinetic Theory(thermo-fluid-dynamics)of Cloud>>

Ⅰ**State Equation** of air gas with vapor one:$PV = \rho R_D T$

Ⅱ**Fluid Equation** of spreaded particles of high density due to momentum conservation law .

ⅢEnergy Flow Equation due to **energy conservation law**.

ⅣContinuous Equation due to **mass conservation law**.

<<Modified Micro Kinetic Theory for Macro Cloud>>

At here,this is entirely the same as weather(climate)dynamics.

ⅤMacro Cloud is too big to calculate by Micro Kinetic theory the 1st Principle ,
so they employed hyper droplet model(maybe a coarse grain method) .

⑸A very coarse approximation method in Solving NS Equation.

https://members.elsi.jp/~hiroki.ichikawa/pdf/stokes.pdf

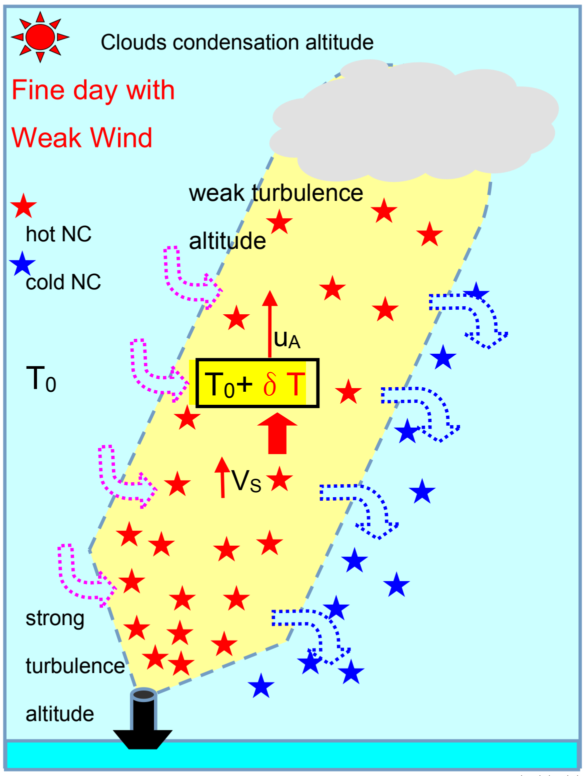
⑹As for Thermodynamics Foundations.

A.Harajima, Thermodynamics-Statistical Mechanics,Baifuhkan,1966,Tokyo.

A11:Reaching Time to Clouds Condensation Altitude in CN Launching.

Chimney Smoke Model is employed in which,local density(vapor and heat)flow equations are assumed to be averaged one at a whole chimney(coarse grain-ing).CN clusters are assumed stable by turbulence to form bones of chimney smoke.If turbulence is strong enough,chimney bones is broken.Otherwise,chimney smoke may go upward by the heat.

$V_S = u_A - u_{VD}$ = upward velocity of air－viscous dragging velocity.



(1)Clouds Condensation Altitude(=CCA).

$h_{CC} = \int_0^{T_{CC}} dt V_S(t) = \langle V_S(t)\rangle \int_0^{T_{CC}} dt = \langle V_S(t)\rangle T_{CC}$...

(2)T_{CC}＝Reaching Time to h_{CC}.

(3)u_A＝upward velocity of air gas.

$\fallingdotseq [4Rg(\delta T(t)/T_0)]^{1/2}$...................

by buoyancy force due to δT.

(4)u_{VD}＝viscous dragging velocity

$= (2/9)\langle r^2(\rho - \rho_0)g/\mu\rangle$...

...minimum upward velocity of air gas

(5)salt upward going velocity.→T_{CC}。

$V_S(t) = u_A - u_{VD}$

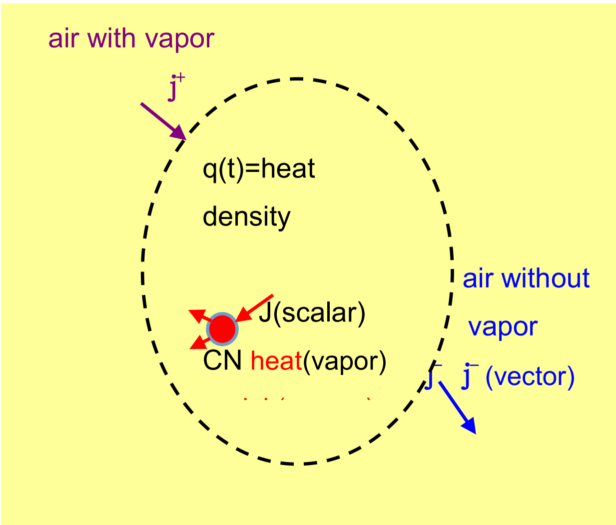
$= [4Rg(\delta T(t)/T_0)]^{1/2} - u_{VD}$................

＊$\mu = 1.73\mathrm{x}10^{-5}$kg/m.s....viscosity of air gas.

＊$\rho = 2.16\ \mathrm{x}10^3$kg/m^3........CN=salt density.

＊$\rho_0 = 1.3$Kg/m^3....air gas density at T=288K

＊The Meaning of Continuity Equation in (9)(10)(11).



〈**this is account principle**〉

q≡(heat,mass,..)density of fluid matter

j≡ ρ v＝densityx**velocity**=current density

J≡flow source or sink to unit volume.

Account Principle in unit time & unit volume.

Increase of heat amount/unit time at a volume

=dQ/dt

=input-output current density at the boundary surface＋sink or source of flow to unit volume.

dQ/dt＝-div**j**＋J.

Asset increase/year ＝[import,export +domestic consumption or production]/year.

From conclusion to tell,action for vapor density uniformity induces vapor input into vapor absorbed volume with CN,while CNs catch heat and cold air without vapor is to go down.

(8)**Accumulated Heat Account** in unit volume heat balloon $=\delta T(t)C_P$

$=$Total {heat generation by latent heat $+$ heat exchanging at boundary) in $1m^3$.

$\delta T(t)C_P=q(t)-q_0=\int dt_0^t[J_{qw}(t)][1+\theta(A(t),B(t))]>0$......(8).buoyancy origin..<see(10)(11)>.

(a)$\delta T(t)=$Temperature difference between inner balloon(chimney)and outer air gas(T_0)

(b)$C_P=$specific heat of unit volume air gas$=1KJ/deg.m^3$.

(c)$q(t)=$"averaged heat density" in chimney smoke. ＊$q_0=$heat density of T_0 air gas.

(9)$w(t)=\int_0^t dt\langle dw(t)/dt\rangle$......... ＊time of CN launching=t=0.

$w(t)$ =mass density of vapor(the heat carrier) at time=t.

(10)$q(t)=\int_0^t dt\langle dq(t)/dt\rangle$.......this is the dominant player in this report !!!.

$q(t)=$virtual averaged heat density in chimney smoke.

(9)**Vapor Density Continuity Equation.**<gas vapor→liquid water>transition in salt(water) surface. ＊Position coordinate=**x** is vanished by virtual space averaging but ,not boundary<div..>.

$dw(t)/dt=-div(j^+_w+j^-_w)+J_w=$in-output vapor density current at boundary$+$sink flow to **CN**.

$\fallingdotseq 0$.............. vapor density uniformity in quasi-equilibrium state.

(a)j_w is defined as vapor density current,however the actuality is air gas flow with vapor.

(b)$j^-_w=0$. this is cold air gas flow without vapor due to CNs absorption.

(c)$0\fallingdotseq dw(t)/dt=-div(j^+_w)+J_w=0$ is due to vapor density uniformity in quasi-equilibrium state.

(d)After all,J_w become latent heat emission at CNs.→(10)

(e)N_s=salt density in chimney smoke.

(f)$J_w=\alpha w(t)N_s$=this is chemical bonding reaction flow of vapor to salt to generate heat.

Author failed to collect this *reaction rate* data<the rate is determined by density product>.

It is this vapor flow that determine latent heat flow $J_{qw}(t)$ at CNs<see(10)>.

(10)**Heat(Energy)Conservation Law Equation.**

*note $Q_w=$vapor latent heat$=44KJ(w/0.018Kg)$,→$(Q_w/0.018Kg)\equiv H$. →$HJ_w=J_{qw}$;

$dq(t)/dt=-\gamma u_A^2-div(j^+_{qw}+j^-_{qw})+J_{qw}\fallingdotseq J_{qw}>0$

$=-$surface pushing force energy+(in+out)put of air gas heat$+$latent heat at CN.

$=$(in+out)put of air gas heat$+$latent heat air gas after all → $\delta T(t)C_P$.....(8)

(a)surface pushing force energy$=-\gamma u_A^2\fallingdotseq 0$....see (11)(b)

(b)$j^-_{qw}=$**output** of cold air gas without vapor is to warm volume,<also cooling can be> .

(c)$j^+_{qw}=$**input** of external air gas with vapor is to cool volume.

(d)$0\fallingdotseq -div(j^-_{qw}+j^+_{qw})$?.colder air gas output warms volume,exterior air gas input cool hot volume due to the temperature difference.Those are likely to cancell with each others !?....see (11)(c)

(e)$J_{qw}(t)=HJ_w=$flow of latent heat to CN at first,but at air gas after all→$C_P\delta T(t)$.

This flow is determined by vapor reaction flow in J_w in (9).

(11)**Circumstantial Evidence of Heat Balloon CN Hypothesis.**

To make problem simple to solve, chimney smoke model is employed in which, local density(vapor and heat)flow equations are assumed to be averaged one at a whole chimney(coase grain-ing method). CN clusters are assumed stable by turbulence to form bones of chimney smoke. If turbulence is strong enough, chimney bones is broken.

(a)If buoyancy is weaker than downward force, being massive clouds nuclei in clouds condensation altitude must be transported by wind turbulence diffusion only. However the force is dice throwing causing half of CNs must be fallen down. If so that, the density of CNs at clouds condensation altitude seems enough the density. This is authors opinion.

(b)stationary top surface pushing force energy in advection derivative.

$\oiint dV\langle \mathbf{u}.\mathrm{grad}\rangle\mathbf{u} = \oiint dV[\mathrm{grad}(\mathbf{u}^2/2) - \mathbf{u}\mathrm{x}\mathrm{curl}.\mathbf{u}] = \oint dS\cdot(\mathbf{u}^2/2) - \langle\mathbf{u}\rangle \mathrm{x} \oiint dV\mathrm{curl}.\mathbf{u}] =$

$= \oint d\mathbf{S}\cdot(\mathbf{u}^2/2) - \langle\mathbf{u}\rangle \mathrm{x} \oint\langle d\mathbf{S}\mathrm{x}\mathbf{u}\rangle = -\langle\mathbf{u}\rangle \mathrm{x} \oint\langle d\mathbf{S}\mathrm{x}\mathbf{u}\rangle = \oint d\mathbf{S}.u^2.$

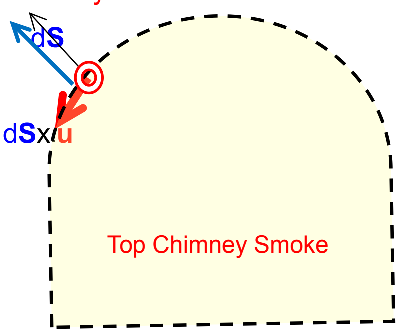
= current source gradient + curving acceleration force.

1st term is something similar with scalar potential gradient due to current source of jet blow. In this process, there seem nothing such events. 2nd term is just curving acceleration due to flow at curvature surface of top chimney smoke portion. The integral employ following middle value theorem.

$\int_a^b dx.F(x)G(x) = \langle F(x')\rangle \int_a^b dx.G(x)$..........$[a < .x' < b]$

As the consequence, the force become evident to be triple vector product of $\langle\mathbf{u}\rangle \mathrm{x} d\mathbf{S}\mathrm{x}\mathbf{u}\rangle$.

The force direction is perpendicular with surface or parallel with dS. The force seems PdV in chimney effect scheme.



The work PdV must be payed by heat balloon. However if chimney is longer enough, the energy must be payed only by top running heat balloon, while the many follower must not pay. As the consequence, the energy could be negligible in enough grown whole chimney smoke. This scheme is similar with *array in bicycle team or emigrant birds in which only top runner must work harder.*

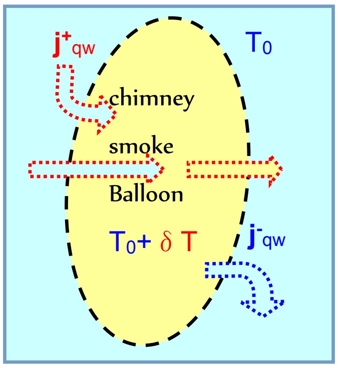
(c)**Heat(Energy)Conservation Law Equation**

$dq(t)/dt = -\gamma u_A^2 - \mathrm{div}(\mathbf{j}^+_{qw} + \mathbf{j}^-_{qw}) + J_{qw} \fallingdotseq J_{qw} > 0$............(10) so long as weak turbulence !!

$0 \fallingdotseq dw(t)/dt = -\mathrm{div}(\mathbf{j}^+_w) + J_w$............(9)

Input-output flows and latent heat at CN determine temperature of volume. Then it is certain that J_{qw} and cold output $\mathbf{j}^-_{qw}$ warm volume. While exterior input $\mathbf{j}^+_{qw}$ cools hot volume. So long flow is small, volume temperature do not become T_0. If turbulence is weak enough, the intensity of $\mathbf{j}^+_{qw}$ and $\mathbf{j}^-_{qw}$ might be almost the same due to the complement flow relation.

(d)Input and Output Air Gas(AG)Current at Chimney Smoke Boundary.



At a whole view,input and output AG current may be cancelled with each other in order to balance pressure between outer and inner chimney smoke balloon. However,as for outer rather stronger turbulent wind,those will try to penetrate in and out the balloon,they rob heat from balloon in general.If the size of balloon is enough larger, heat robbed may become less.

Thus problem becomes comparison between turbulence intensity vs balloon size.

$dq(t)/dt = -\gamma u_A^2 - \mathrm{div}(j^{+}_{qw} + j^{-}_{qw}) + J_{qw} \fallingdotseq J_{qw}(t) > 0$ ....(10) in weak turbulence

(e)Turbulence Stirring to Cool Balloon.Even as though $q(t) > q_0T_0$.

$q(t) = \int dt_0^t[-\mathrm{div}(j^{+}_{qw} + j^{-}_{qw})] + \int dt_0^t[J_{qw}(t)]$

$\quad = \int dt_0^t[J_{qw}(t)][1 + \theta(A(t),B(t))] \geqq q_0$....................................(11) in turbulence stirring

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By any strong turbulence,balloon temperature never become lower than T_0.→$q(t) \geqq q_0 = C_pT_0$.

The turbulence robber never steal heat more than past accumulated heat in the balloon.

$q(t) = \int dt_0^t[J_{qw}(t)] + \int dt_0^t[-\mathrm{div}(j^{+}_{qw} + j^{-}_{qw})] \equiv \int dt_0^t[J_{qw}(t)][1 + \theta(A(t),B(t))] \geqq q_0$.

＊(A(t),B(t))≡turbulence heat dissipation coefficient≧0..

$\theta(A(t),B(t)) \equiv \{\int dt_0^t[-\mathrm{div}(j^{+}_{qw} + j^{-}_{qw})]\} / \{\int dt_0^t[J_{qw}(t)]\}$.

＊A≡something turbulence intensity parameter

＊B≡something balloon diameter.

$q(t)/q_0 = < \int dt_0^t[J_{qw}(t)]/q_0 > [1 + \theta(A(t),B(t))] \geqq 1$.

$q(t)/\int dt_0^t[J_{qw}(t)] = [1 + \theta(A(t),B(t))] \geqq 1$.→ $\theta(A(t),B(t))] \geqq 0$. this is very important.

If $\theta(A(t),B(t)) = 0$ =without turbulence for all time,$q(t) = q_0 + \int dt_0^t[J_{qw}(t)] > q_0$.

If not so, $\theta(A(t),B(t)) > 0$;;$q(t) = q_0 + \int dt_0^t[J_{qw}(t)][1 + \theta(A(t),B(t))] > q_0$.

Thus even turbulence being,$q(t) > q_0$.That is,the robber can not keep heat stealing,but while robber take some rest time,$q(t) > q_0$.Thus if $J_{qw}(t)$ is enough intensity,buoyancy could be !.

The intensity is determined by salt-vapor reaction rate.