Arctic Cooling by spreading sea water to make cloud in order to cut insolation .

Petition to research institutes for emergent establishing the technology !!!2015/9/19

Cloud generating acts insolation input reduction(albedo effect),which is decisive factor for global heat budget balance.Cloud generating is determined by **aerosol density** which becomes cloud condensation nuclei(**CCN**) in conditions of {**temperature,pressure, humidity and wind velocity**}.Hereupon here emerged a proposal method to intercept global warming by spreading sea water to make cloud to insolation cut .Especially this method could be applicable to Arctic Cooling. Arctic ice retreat had already become **positive feedback:** ice retreat→insolation reflection down→sea water temperature rise→ice retreat. The ice lid would be vanished in summer within few years from 2015.Therefore spontaneous ice sheet recovering will never be by anymore.Thus **Arctic Cooling geo-engineering** become a decisive game allowed nothing defeating.Author is almost ignorant on **cloud engineering**,so he opted sea water spreading method.The reason is sea water is free and **salt** is no hazardous to health and environment.

[1]:Arctic Cooling by spreading sea water to make cloud in order to cut insolation .

Sea-going hardware for the cloud albedo method of reversing global warming

13 November 2008

http://rsta.royalsocietypublishing.org/content/366/1882/3989.full#sec-7

Climate 'tech fixes' urged for Arctic methane *17 March 2012*

http://www.bbc.com/news/science-environment-17400804

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

Fortunately researchers are increasingly confident that a stratospheric aerosol haze, produced from sulphur dioxide, SO2,could provide significant cooling of the Arctic for modest expenditure of the order of a few billion dollars per year.This type of cooling could be replaced by cloud brightening using ultra-fine seawater droplets when the technology is ready for large-scale deployment within a year or two.

＊red characters are by author

Note World military budget＝**1.7T$**/y,World Oil cost＝**26T$**/y !!

How to Make Clouds for intercepting solar heat in Arctic

http://www.777true.net/How-to-Make-Clouds-for-Intercept-solar-heat-in-Arctic.pdf

This is authors page.

[２]:summary : Aerosol Spreading for making cloud toward insolation cut.

⑴A **cloud droplet** grows by **humidity absorbing** by cloud condensation nuclei(**CCN**) of **aerosol**(small particle of salt,sulfide,soot,...).Note sea water is free and salt become CCN,but not hazardous to health and environment.

⑵Average value of cloud droplet radius is told about **10μm**.If the radius grow to be about 0.1mm,those become **rain droplet**<vanishing cloud>

⑶**Albedo Effect by Aerosol Increasing.**

Increasing aerosol density(CCN particle number)is to cause sun reflection rate higher.
CCN density increasing causes cloud droplet radius smaller and droplet number larger.

⑷**Only sea water without water can be salt CCN.**

At first step,**salt CCN making** by sea water spraying in lower height ,with higer temperature and with higher evaporation pressure must be **toward sea water evaporation**.
Note initial sea water itself could not be CCN,because it could not be even cloud droplet.
On the contrary,initial sea water must release humidity by evaporation in environment of higher temperature and with higher evaporation pressure.**Only sea water without water can be salt CCN.**

＊sprayed sea water droplet should be small as possible in order to be quickly evaporated.
⇒**spray nozzle radius** must small as possible. →0.8μm<⑺Stephen Salter>

⑸In 2nd step,**such salt CCN must be lifted up to higher height by uprising wind.**

In higher height with lower temperature and with lower evaporation pressure ,such salt CCN particles could grow to cloud droplet by humidity absorbing.<this situation is similar with **cumulonimbus** growing>

⑹sprayed sea water droplet radius is determined by spray nozzle radius size.
Author is not expert on this problem,however this may be difficult technical point.
In author's survey in products in Japan,most are about 1mm,there could not be μm order.The most small radius of hypodermic needle is 50μm.
Thereby,that 0.8μm is amazing ？！

Ultrasonic nozzles,wikipedia

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

Ultrasonic Atomization of Liquids

http://scitation.aip.org/content/asa/journal/jasa/34/1/10.1121/1.1909020

The number-median diameter of the particles produced was found to be a constant fraction, 0.34, of the capillary wavelength;

Ultrasonic Atomization Technology

http://www.sono-tek.com/ultrasonic-nozzle-technology/

Many very fine droplet spraying might take many high cost nozzle ??.

(7)**Cloud volume scale and necessary CCNs amount:How much sea water ??**

This is a problem how much sea water can make how much volume cloud ??.

Following are elementary and very coarse calculation.The principle is as follows.

cloud volume(cumulus)×the water density/cloud droplet average weight

＝cloud droplets amount＝CCNs amount ∝ **sea water amount sprayed.**

The fundamental idea for calculation is **partitioning ratio** **in chemicals mixed**.

partitioning ratio table for	***unit volume cloud : CCN mass : sea water mass***	
cloud droplet	average cloud droplet radius	r～**10** μ m
	average cloud droplet volume	$V=4\pi r^3/3=4.2\times10^{-15}m^3$.
	water density	$\rho_w=10^3Kg/m^3$
	average cloud droplet weight	$m_C=V\rho_w=4.2\times10^{-12}Kg$
water density in cloud (cumulus)		$\rho_C=0.2\sim0.5g/m^3=0.0002\sim0.0005Kg/m^3$
http://snowball.millersville.edu/~adecaria/ESCI340/esci340_cp_lesson01_cloud_properties.pdf		
(NCC number/m^3) $N_C=\rho_C/m_C$.		$N_C=0.000275/4.2\times10^{-12}\fallingdotseq6.5\times10^7/m^3$
(NCC weight/m^3) $N_C x m_s$		$N_C x m_s=6.5\times10^7/m^3\times9\times10^{-15}kg=5.9\times10^{-7}Kg$
Salt CCN average radius～1 μ m. solid salt density＝2170Kg/m^3		Salt CCN average weight $m_s=4\pi r^3/3\times2170Kg/m^3=9\times10^{-15}kg$.
salt density/sea water		salt~0.035K g /1Kg
cumulus volume : CCN mass $1m^3$(cumulus) : $N_C x m_s=5.9\times10^7/m^3\times9\times10^{-15}kg=5.3\times10^{-7}Kg$. salt mass : sea water mass salt 0.035Kg : 1Kg sea water＝5.3×10^{-7}Kg : 1.7×10^{-5}Kg＝0.015g sea water. $1m^3$(cumulus) : CCN mass : sea water＝**$1m^3$: 5.9×10^{-7}Kg : 0.015g**		

example calculation_1)**cloud volume＝15km×15km×5km.**

＝sea water amount＝1.7x10^{7}K ｇ

example calculation_2)sea water spraying amount/unit time by **cloud life time＝5 days**.

1.7x10^{7}K ｇ /**5**(24x3600s)＝39Kg/sec

Conclusion:fundamental tasks must be solved are ⑷⑸⑹⑺.

[３]:Tasks for Emergent Aero-sol Climate Engineering.

At least,we must have proved **an actual machine** of cloud making by fine sea water spreading method.before political debates.This is **the highest priority emergent task**, while author could scarcely get the know-hows.

⑴**Basic Laboratory Experiment** with the theoretical analysis**.**

In a box with certain condition of {temperature,pressure,humidity density},

try and observe for sea water spreading(sea water droplet size)to make cloud.

⑵**R&D on spraying nozzle,**

⑶**R&D on spraying ship with wind-turbine and the control system.**

⑷**Surveying on climate parameters of actual Arctic field**

for implementation of sea water spreading machines.

Interannual Variations of. Arctic Cloud Types:

Relationships with Sea Ice and Surface. Temperature.

http://www.atmos.washington.edu/~rmeast/BarrowPresI.pdf

⑸**Management on research and development with personal and financial source.**

⑹**Advertisement strategy to get global support on the R&D**

toward actual implementation in Arctic.