The influence aerosol exerts on the night sky brightness
〜Investigation from a brightness observation in the night sky in Shinzyuku ward〜

Kaijo High School Earth Science Culb

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Purpose
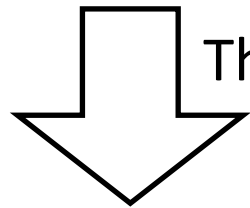
Our study purpose is…
Elucidation of the mechanism that a night sky is bright

The picture of Shinjuku at night which we took from our school

A conventional idea

Artificial light

This time

NSB

particles floated in the air
len , PM2.5 ......

There is no precedent researched the influence of aerosol......

We find out how much influence aerosol exerts on NSB for the first time !

Method …

- observation by <u>SQM</u>

This counts the number of photon per fixed time and , converts it into **the magnitude a square arcsecond(mag/□")** and , registers it
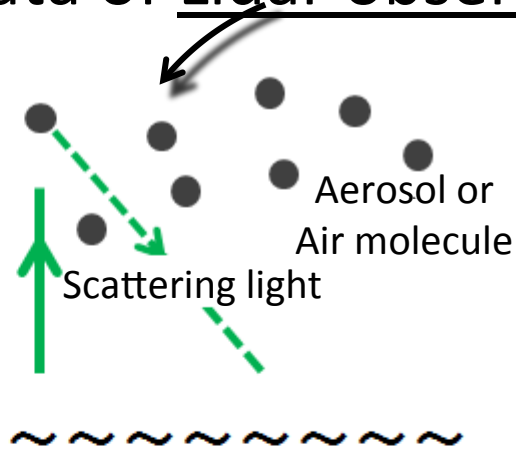
Observation condition…

- place : rooftop of our school (33m above the ground)
- term : Oct , 2012 ～ now
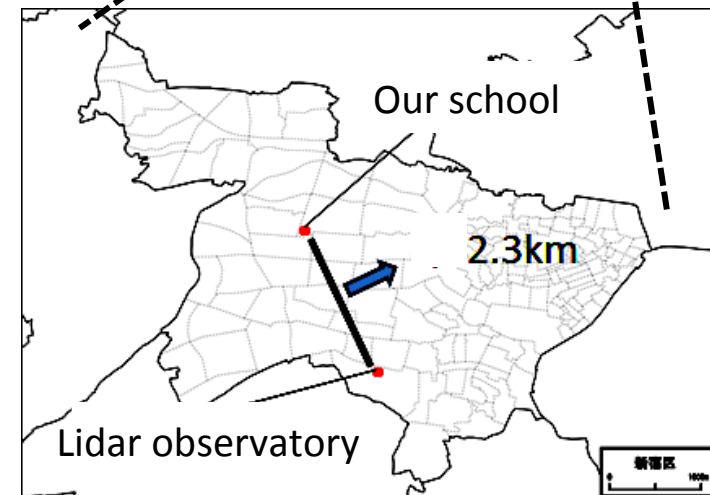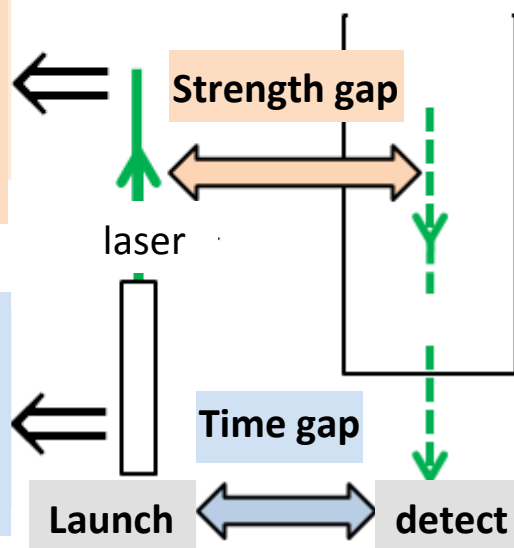- interval : 5 minutes
- direction : zenith

Set up SQM

・We used the data of Lidar observatory near our school

Aerosol or
Air molecule

Scattering light

Shinzyuku ward

Understand
**the state of
the atmosphere**

Strength gap

laser

Understand
**The observation
altitude**

Time gap

Launch　　　　**detect**

Our school

2.3km

Lidar observatory

Location relation between our school and observatory

Set of brightness change of the sky

Night sky become darker over time a little

magnitude
(mag /□")

No moon&
No cloud

The influence
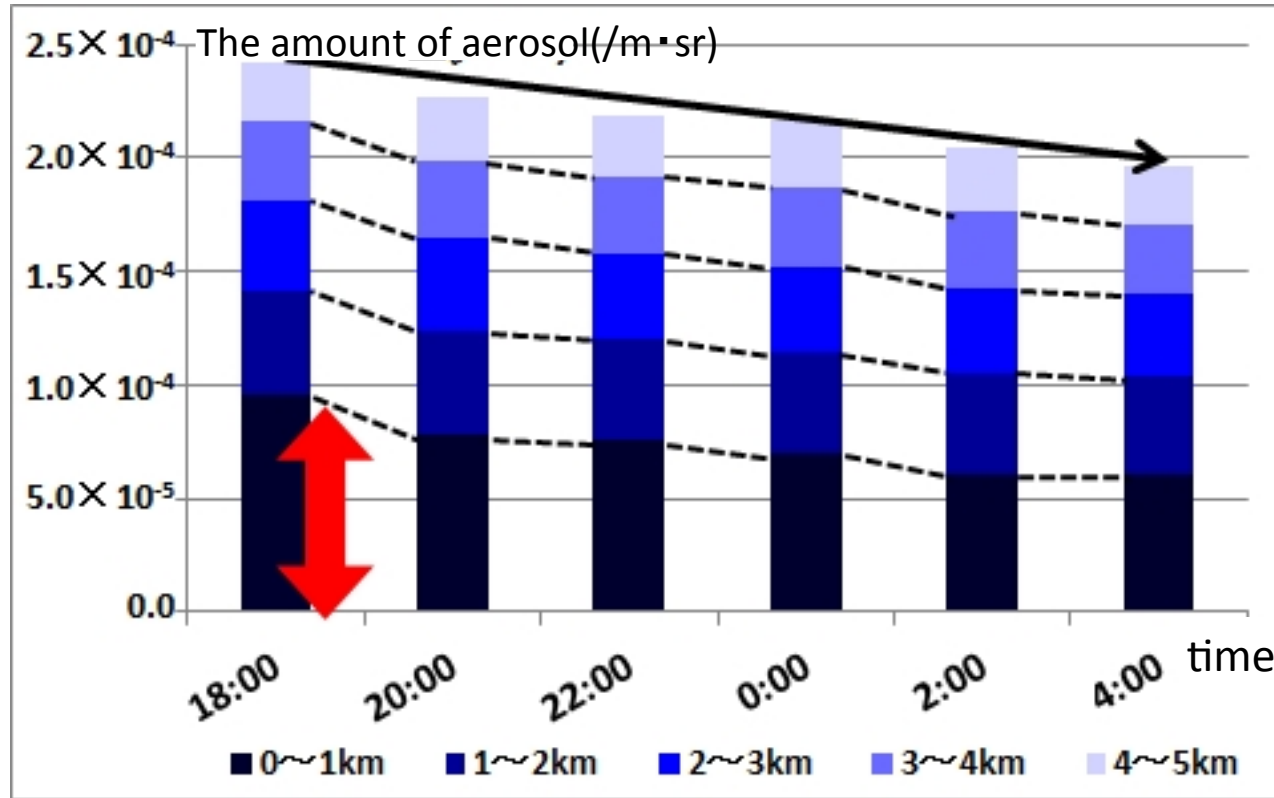of cloud

In day , SQM shows the error：0

Time(o'clock)
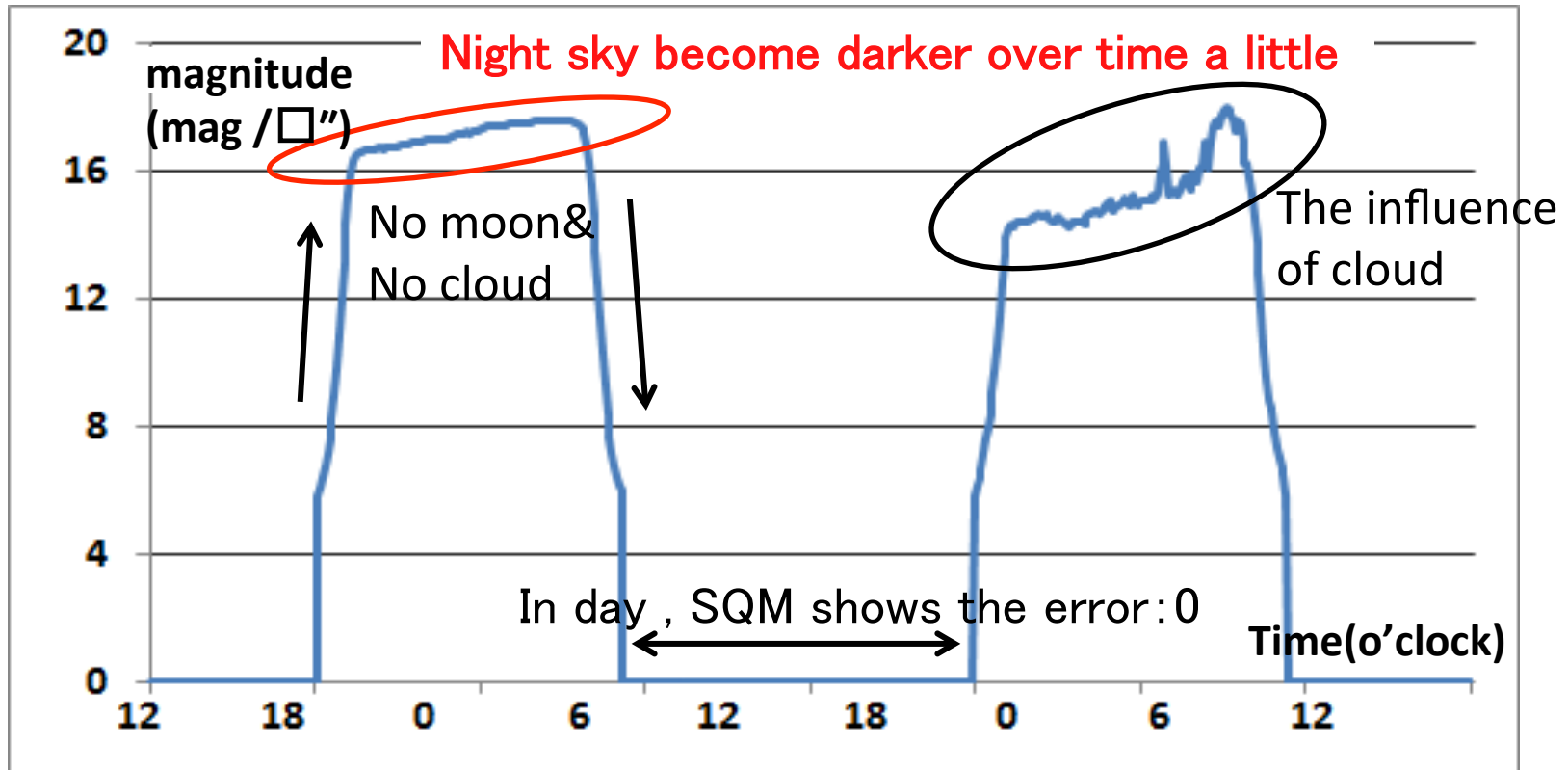
An example that we observed the sky brightness in our school (May . 7～9 , 2013)

※the days there was a cloud or the moon
was removed from the analysis with aerosol.

Observation result (Aerosol)

Time change in vertical distribution

time change of aerosol until an altitude in 5km (1/12,2013)

・In night , Aerosol decreases over time
  (⇐because the atmosphere is stable , and aerosol sinks.)

・The amount of aerosol increases as the altitude decreases

Artificial light → ❌ → aerosol → NSB

want to remove it's influence of change

want to research the influence...
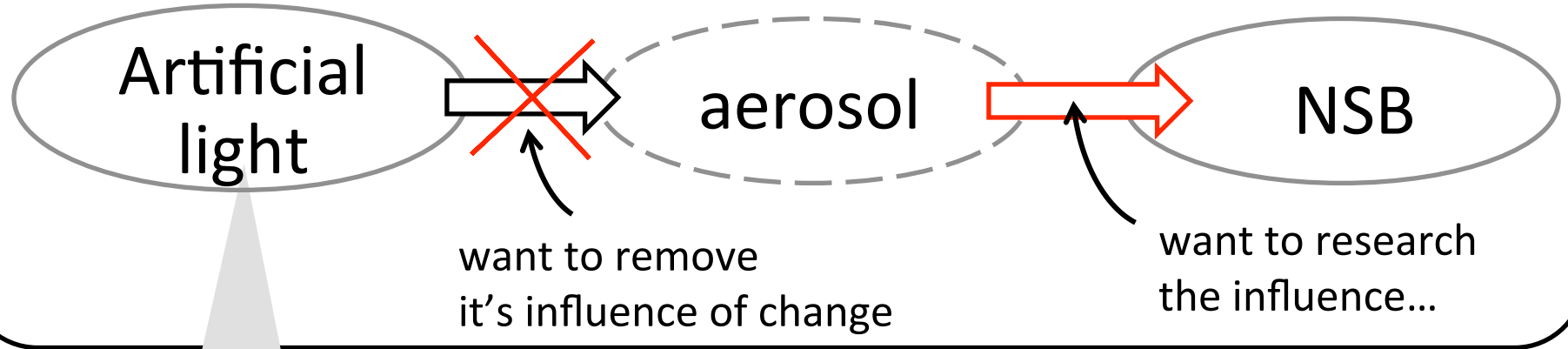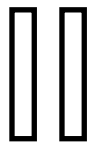
We suppose that it is always fixed variation pattern
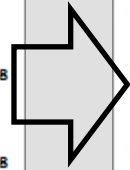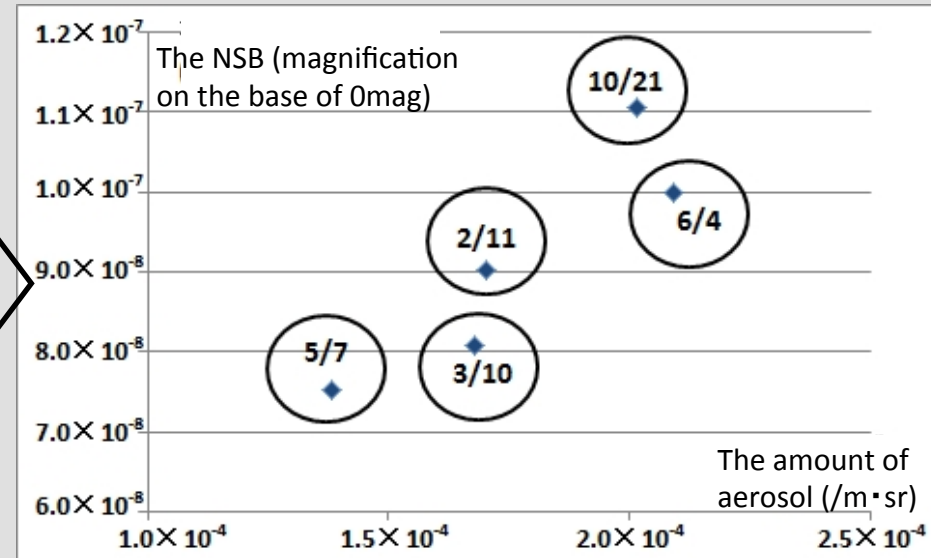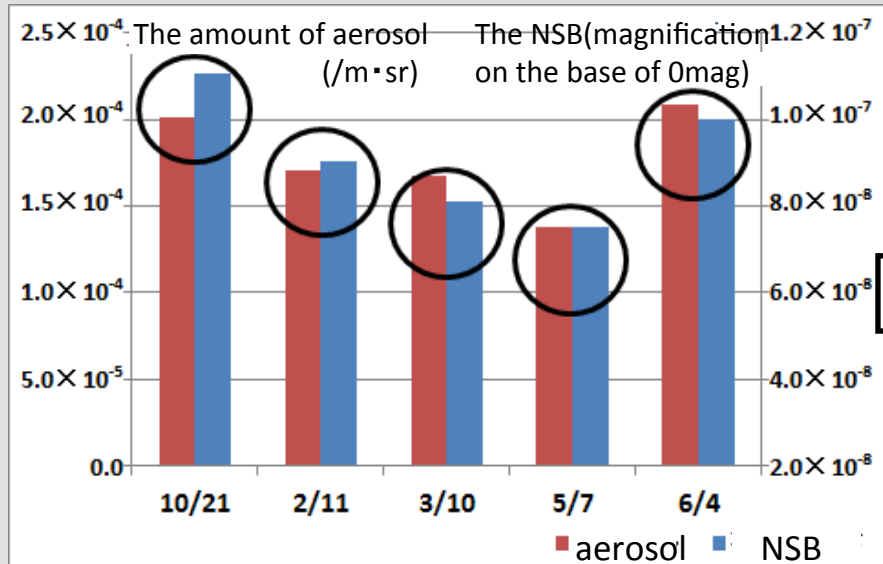
↓

To analyze the data of various day only if it observed at same time , the artificial light become constant.

‖

this can removes the influence of time change of it!

Analysis method (example)

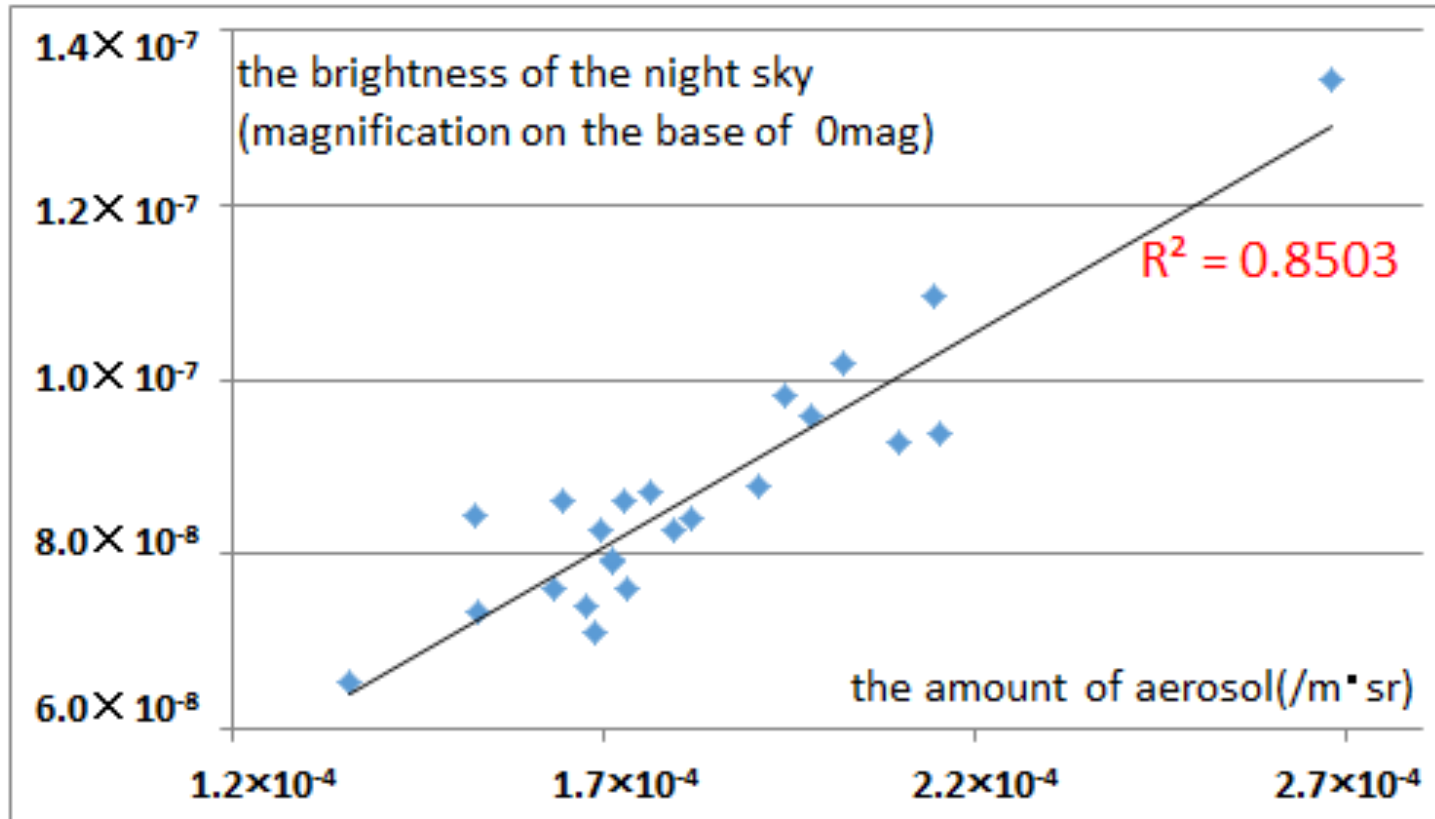※we converted the NSB into the magnification of brightness on the base of 0mag

The NSB and the aerosol at 0:00 in various day

plot based on both value every observation day

‖

The relation between the NSB and the aerosol at 0:00

Analysis result

the relation between the NSB to the aerosol until altitude in 4km

a strong positive correlation(in other time , R is 0.75～0.96)

⇨ As the aerosol increases ,
The night sky become brighter

change the aerosol which we compare with the NSB ......

① **for every altitude by turns from the ground**

② **every 300 meters by turns**

comparison

The NSB at ◯◯

time

comparison

The aerosol at ◯◯

The aerosol at ◯◯
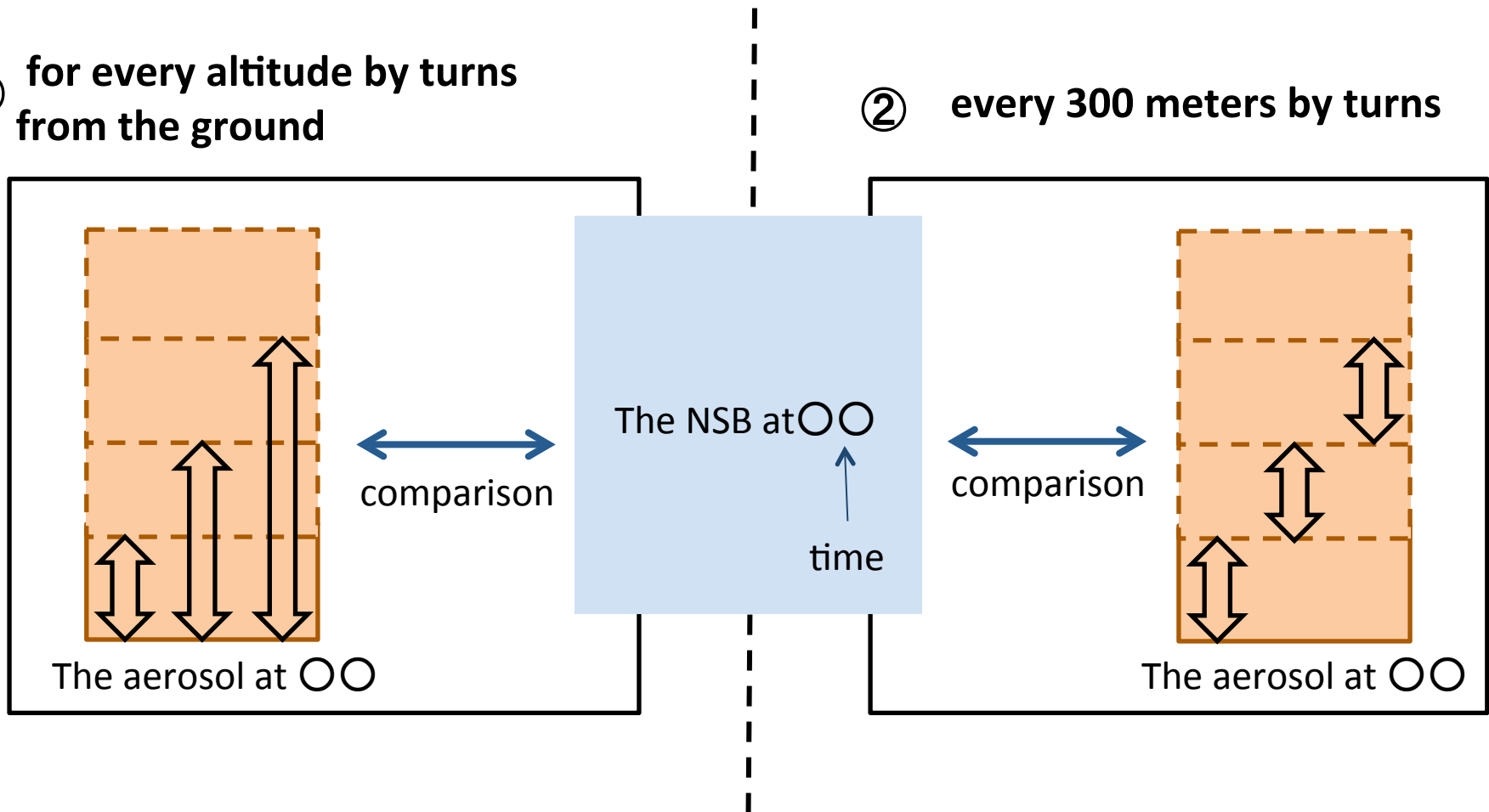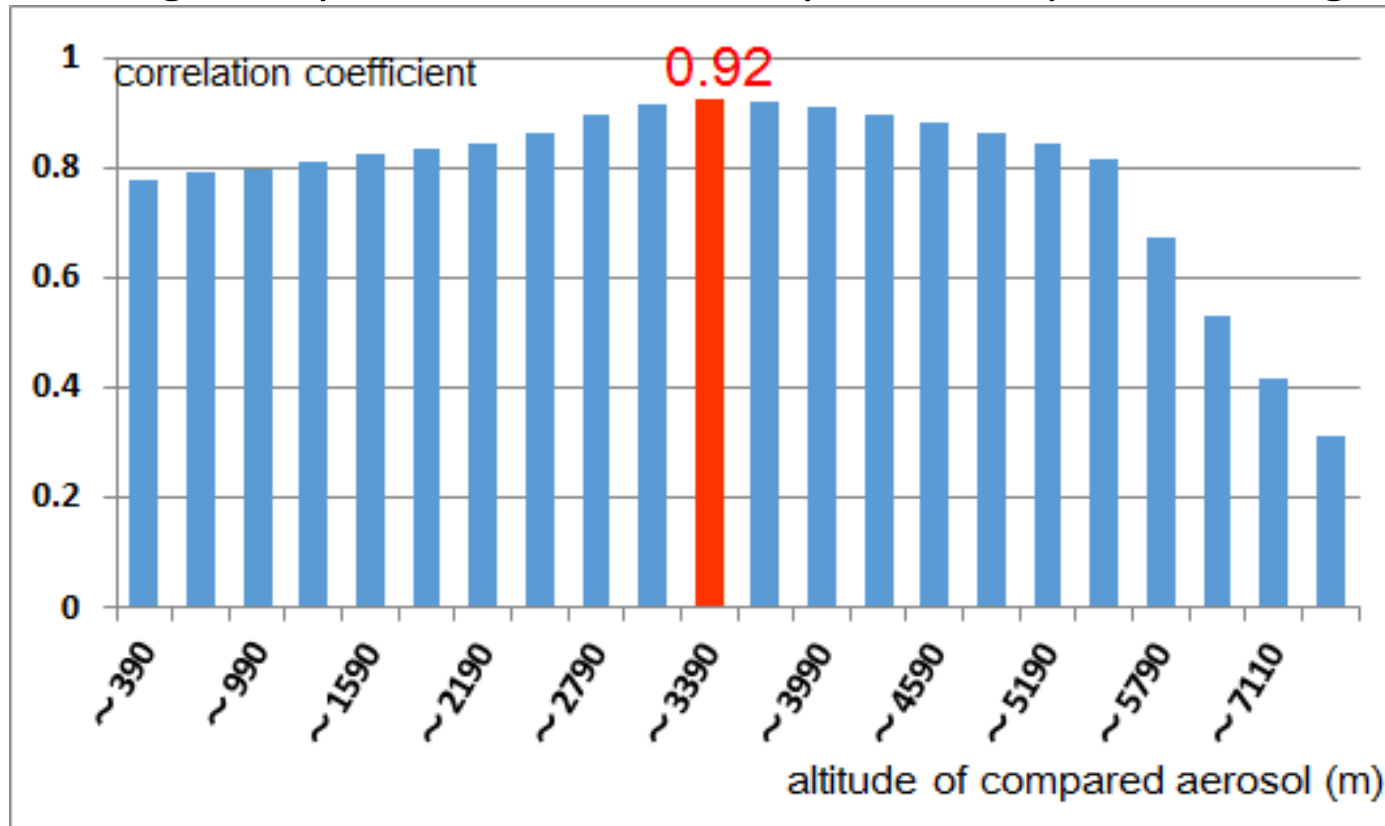
Analysis separating This 2 pattern

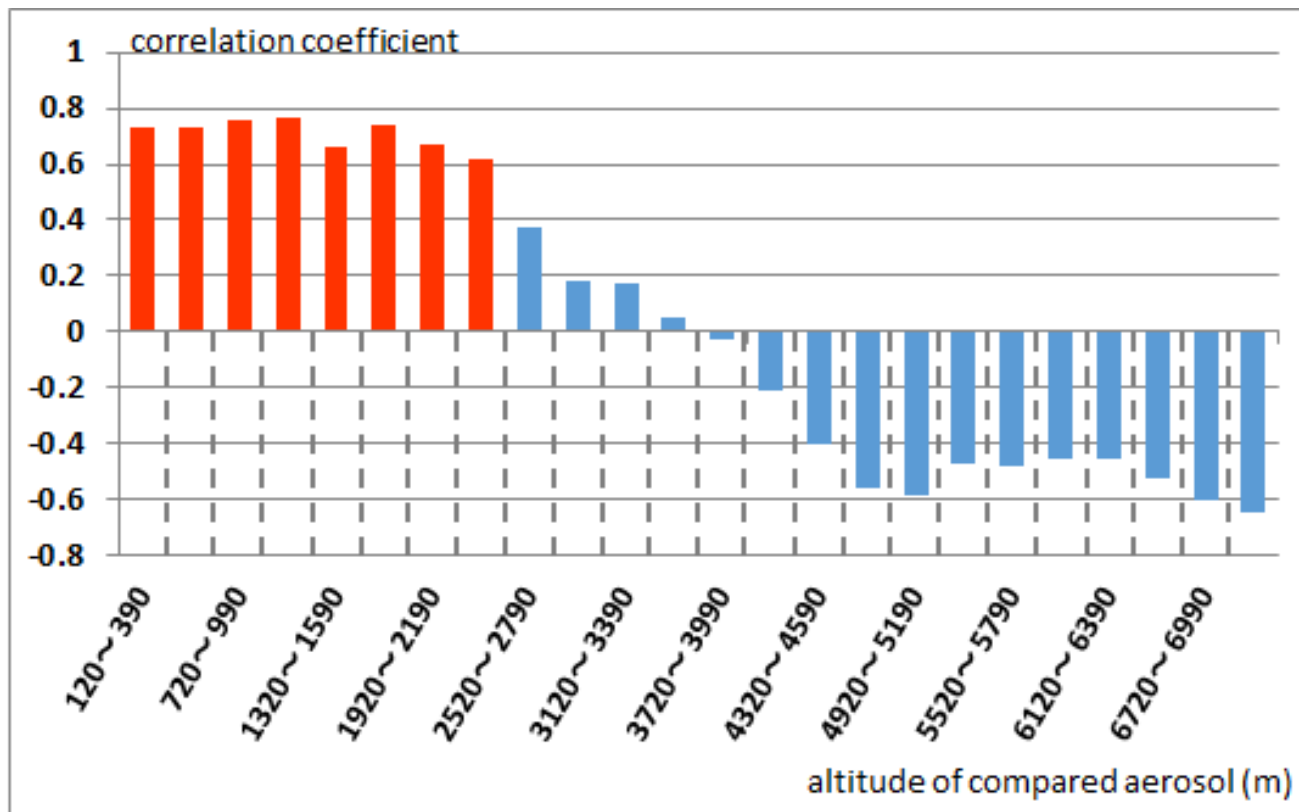the change of correlation coefficient
when we change compared aerosol for every altitude by turns from ground

⟹ aerosol from ground to an altitude in 4km affects the brightness of the night sky.

The change of correlation coefficient
when we change compared aerosol every 300 meters by turns

⇨ especially , aerosol from ground to
an altitude in 2km strongly affects it.

Conclusion

The altitude

Not influence

The strength of influence

4km

aerosol from ground to an altitude in 4km affects the NSB.

2km

especially ,
aerosol from ground
to an altitude in 2km strongly affects the NSB.
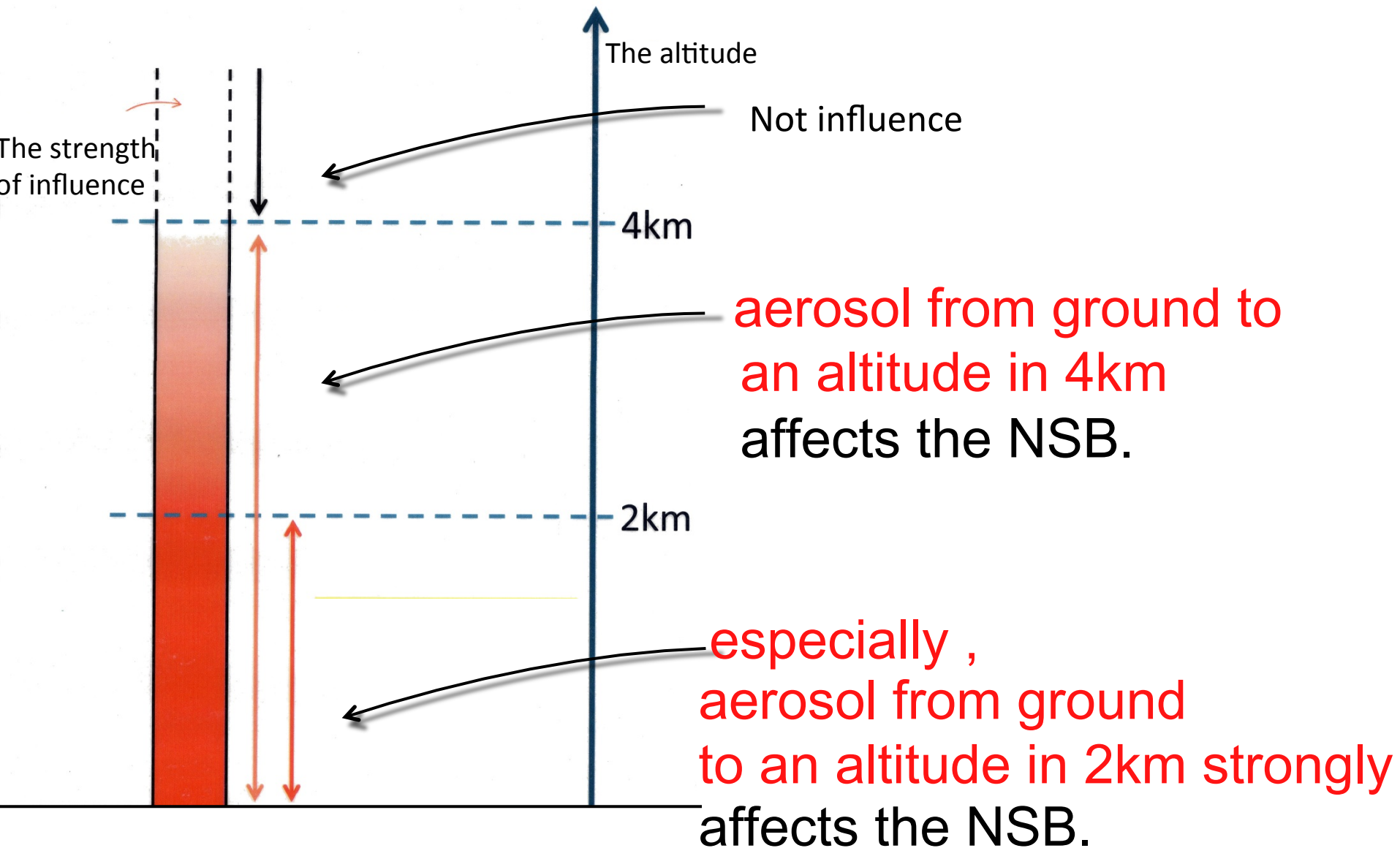
List of references

・Ministry of the Environment
『light pollution control measures guide line〜to be the good light environment〜』
・ＳＳＨ Ichinomiya high school「Survey on the brightness of the night sky」
the part of observation data of Hachinohekita high school ,

Mitodaini high school , Yokohama Science Frontier high school , Tsu high school
・Japan Meteorological Agency　search the climate data in past
http://www.data.jma.go.jp/obd/stats/etrn/
・AstroArts astronomical simulation software「StellaNavigator Ver.9」
・Google Map
https://maps.google.com

・Japan Association of Aerosol Science and Technology
http://www.jaast.jp/hanashi/
・"Usable"blank map
http://www.freemap.jp/
・NIES　atmosphere Survey by Lidar
http://www-lidar.nies.go.jp/~cml/Japanese/LidarText/LidarInt.htm
・NIES Lidar observation home page
http://www-lider.nies.go.jp

Gratitude

People named bellow cooperate with us when this study proceed.
We thank to take this opportunity.

Dr. Zyunichi Watanabe (NAOJ Vice –Director General)
Mr.Takeshi Uemura(Kaijo Earth Science Club adviser)
Dr.Nobuo Sugimoto(NIES, Head of Advanced Remote Sensing Section ,
                          Center for Environmental Measurement and Analysis)

Thank you for your attention.