Relationship between clouds over Fukui City and near-surface climatic elements

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- Result
- Consideration

Introduction

Introduction

cumulonimbus cloud

nimbostratus cloud

Introduction

Laws of cloud form appearances exist?

▼

Relationship with atmospheric conditions exist?

Introduction

Examine the atmosphere

radiosonde

examine the state of the atmosphere in the sky up to approximately 30 km.

Observations are conducted at approximately 700 locations nationwide

Introduction

No radiosonde flying in Fukui

▼

Using it is impossible

▼

Relationship to atmospheric conditions near the ground, not above

Introduction

Relationship between the climatic elements near the surface and cloud formations exist？

Introduction

In the weather forecast

Use surface data such as wind speed, cloud cover, atmospheric pressure, humidity, etc.

▼

No cloud forms are used

Method

Method

correcting period

nearly 5 months from mid-June to October

10 hours from 8:00 a.m. to 6:00 p.m.

Method

brinno
time-lapse camera

・Install toward Fukui, where the Fukui District Meteorological Observatory is located.

・Take a picture of the sky over Fukui City every 10 minutes.

Method

Gather climate elements near the ground.

Use data from the Fukui District Meteorological Observatory.

Fukui District Meteorological Observatory

Takefu High School

Method

式１　$T_L = 1/[1(T_d-56)+\ln(T/T_d)/800]+56$

式２　$T_L=2840/[3.5\ln(T)-\ln(e)-4.805]+55$

式３　$T_L=1/[1/(T-55)-\ln(f/100)/2840]+55$

LCL=(T-TL)/9.8×1000(乾燥断熱減率の式）

ヘニングの式(式４)　LCL=125×(T-Ta)

Method

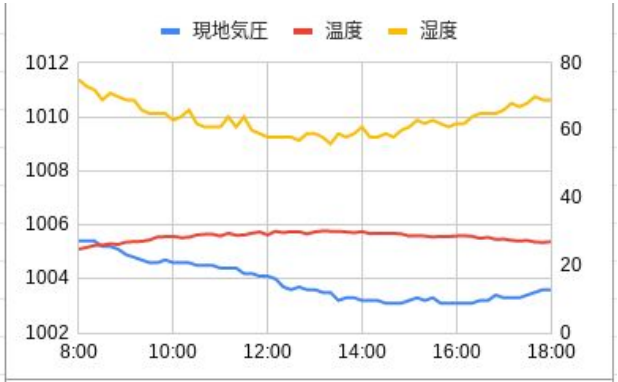
- fluffy
- cloud base is flat
- Cloud base altitude is 1200m

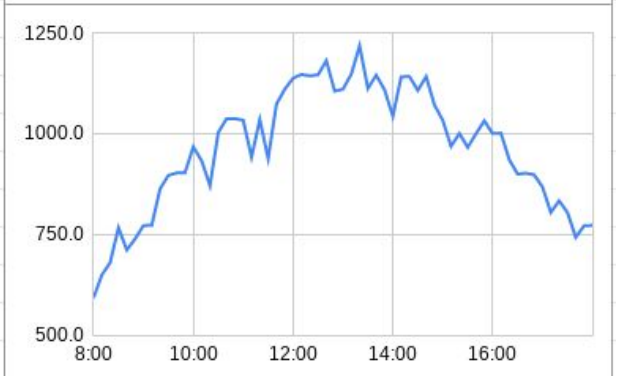
▼

it is called a cumulus cloud

Method

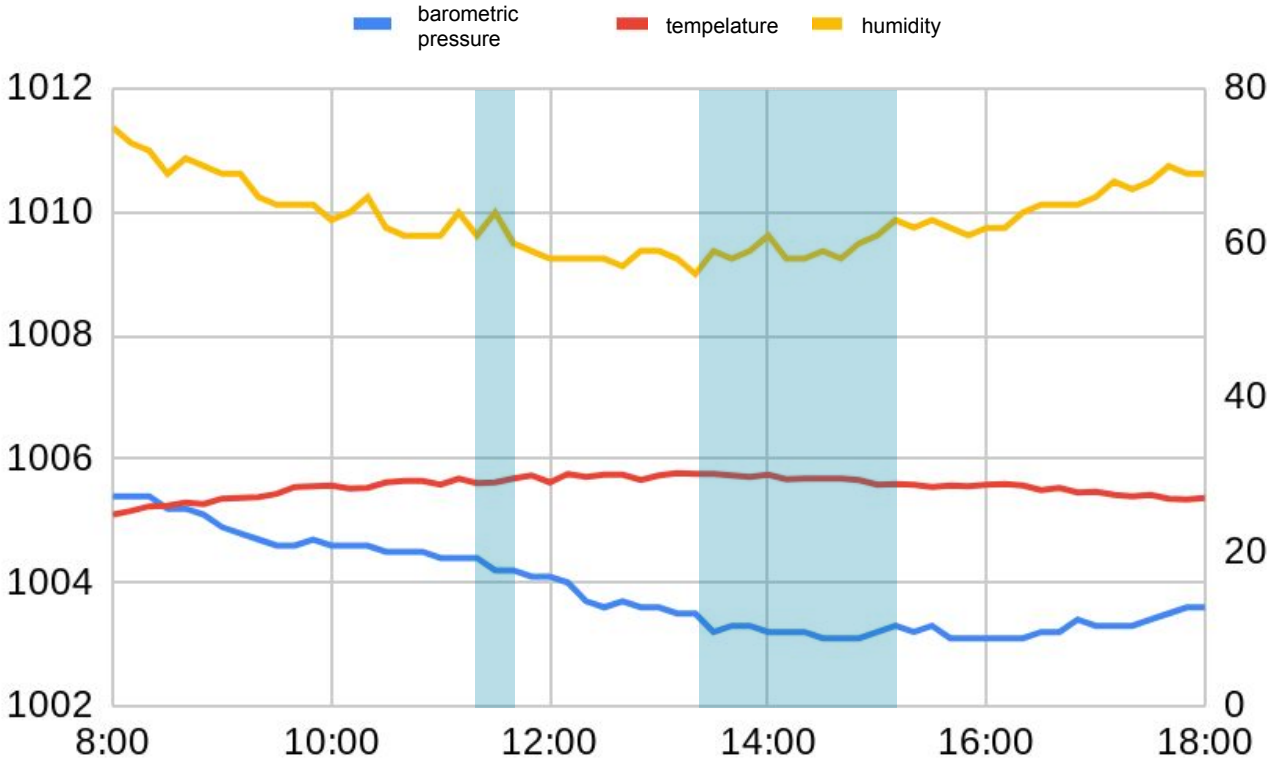
時刻	現地気圧	海面気圧	温度	湿度	平均風力	風向	雲の種類1
8:00	1005.4	1007.4	24.8	75	1.6	南	
8:10	1005.4	1007.4	25.3	73	1.5	南	
8:20	1005.4	1007.4	25.9	72	1.4	南南東	
8:30	1005.2	1007.2	26	69	1.6	南南東	
8:40	1005.2	1007.2	26.4	71	2	南南東	
8:50	1005.1	1007.1	26.2	70	2.3	南南東	
9:00	1004.9	1006.9	26.9	69	2.6	南	積雲
9:10	1004.8	1006.8	27	69	1.9	南南西	雲なし
9:20	1004.7	1006.7	27.1	66	2.3	南南西	雲なし
9:30	1004.6	1006.6	27.5	65	2.2	南南西	雲なし
9:40	1004.6	1006.6	28.4	65	2.4	南南西	積雲
9:50	1004.7	1006.7	28.5	65	2.4	南	積雲
10:00	1004.6	1006.6	28.6	63	1.2	南西	積雲
10:10	1004.6	1006.6	28.2	64	1.5	西南西	積雲
10:20	1004.6	1006.6	28.3	66	1.5	南西	積雲
10:30	1004.5	1006.5	29	62	0.7	南西	積雲
10:40	1004.5	1006.5	29.2	61	1.4	西北西	
10:50	1004.5	1006.5	29.2	61	1	西	
11:00	1004.4	1006.4	28.7	61	2	北西	





Result

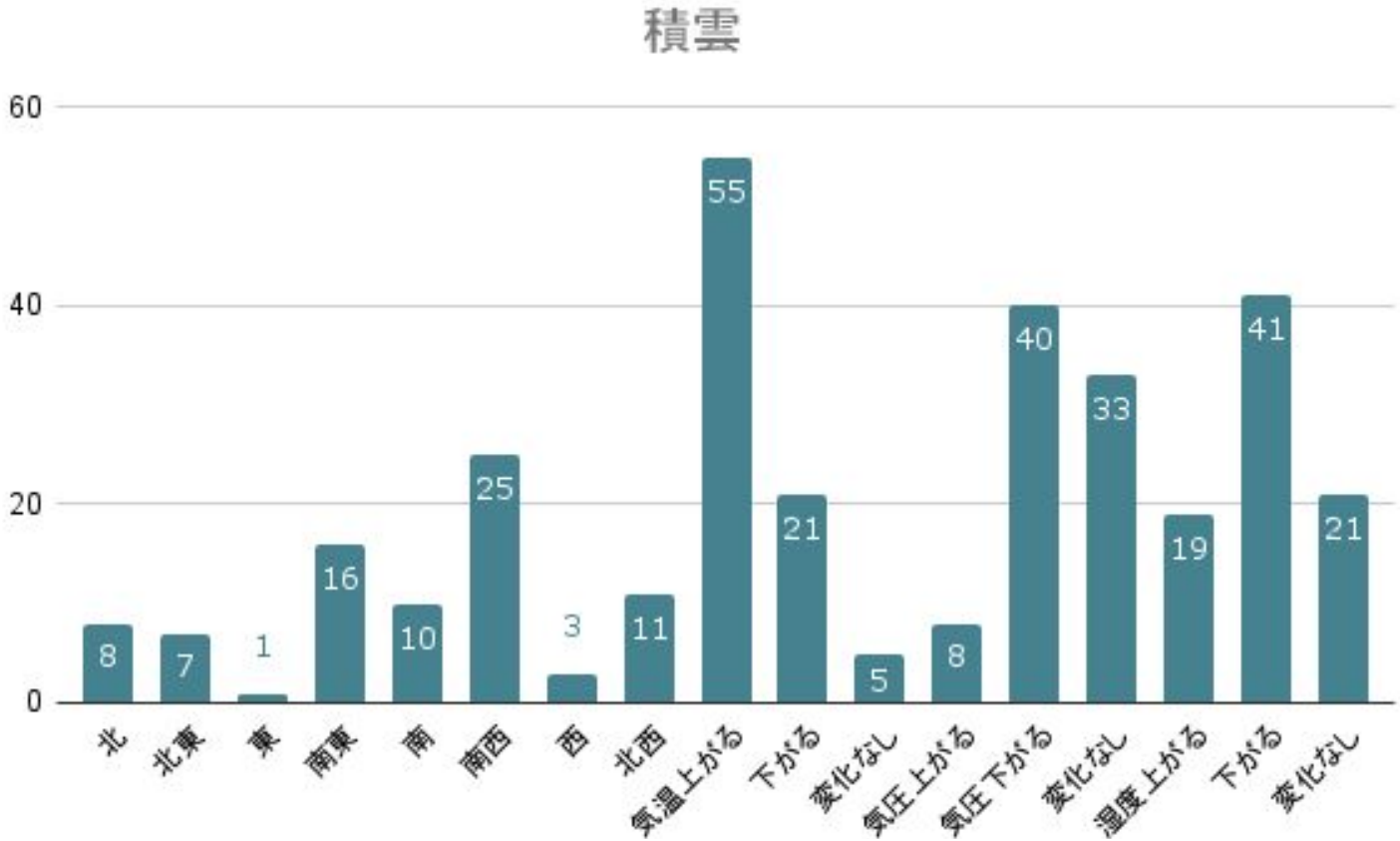
Result1.cumulus cloud



Most observed could

６月２２日の例

Result.1　cumulus cloud

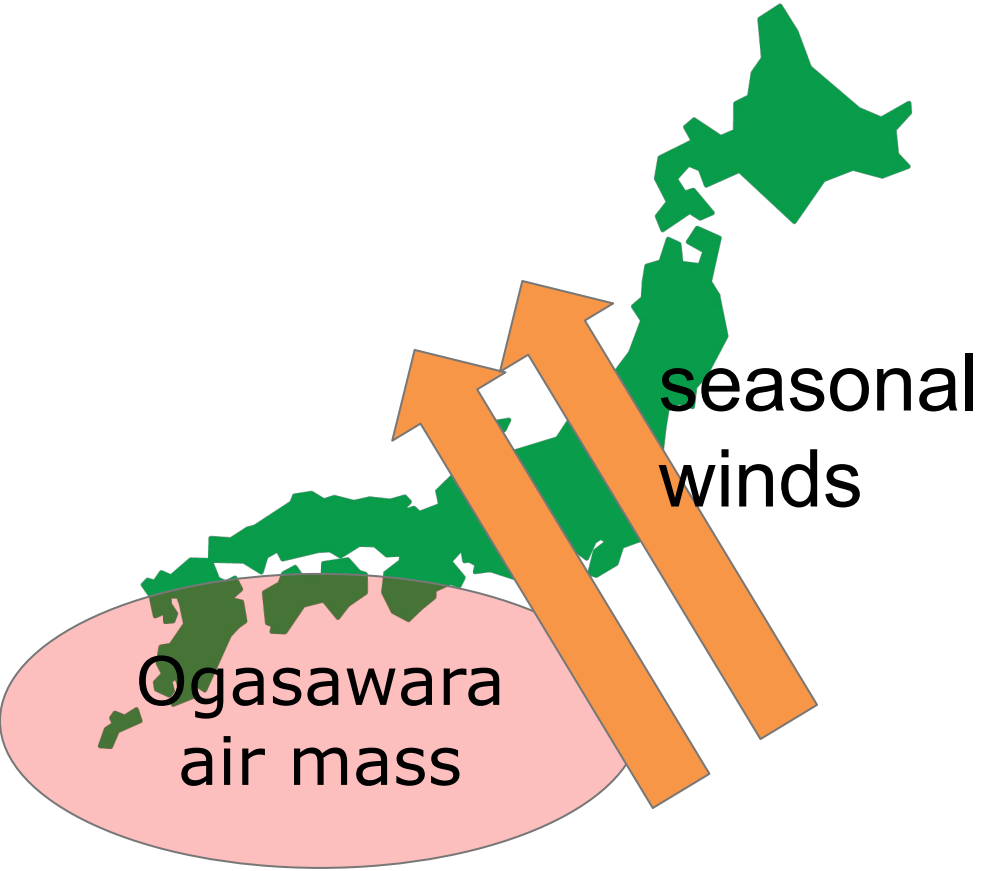


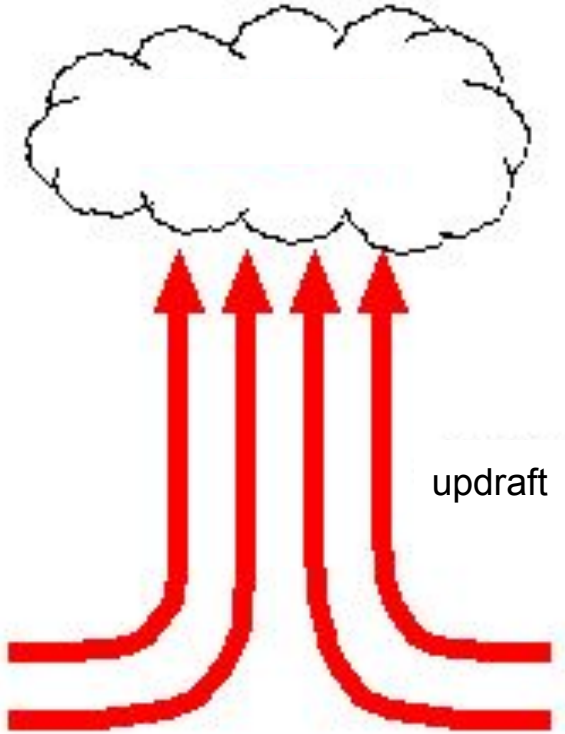
81observation

Result.1 cumulus cloud

wind direction	Southeast, Southwest
temperature	up
humidity	down
atmospheric pressure	down

Result.1 cumulus cloud

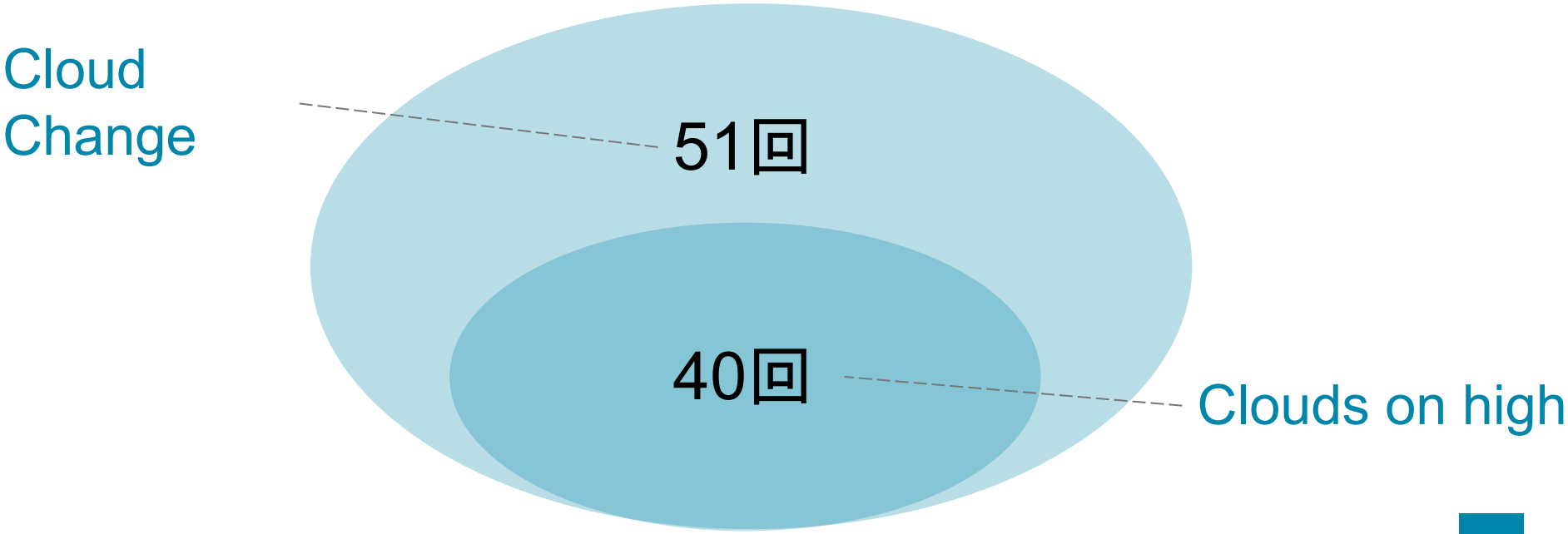




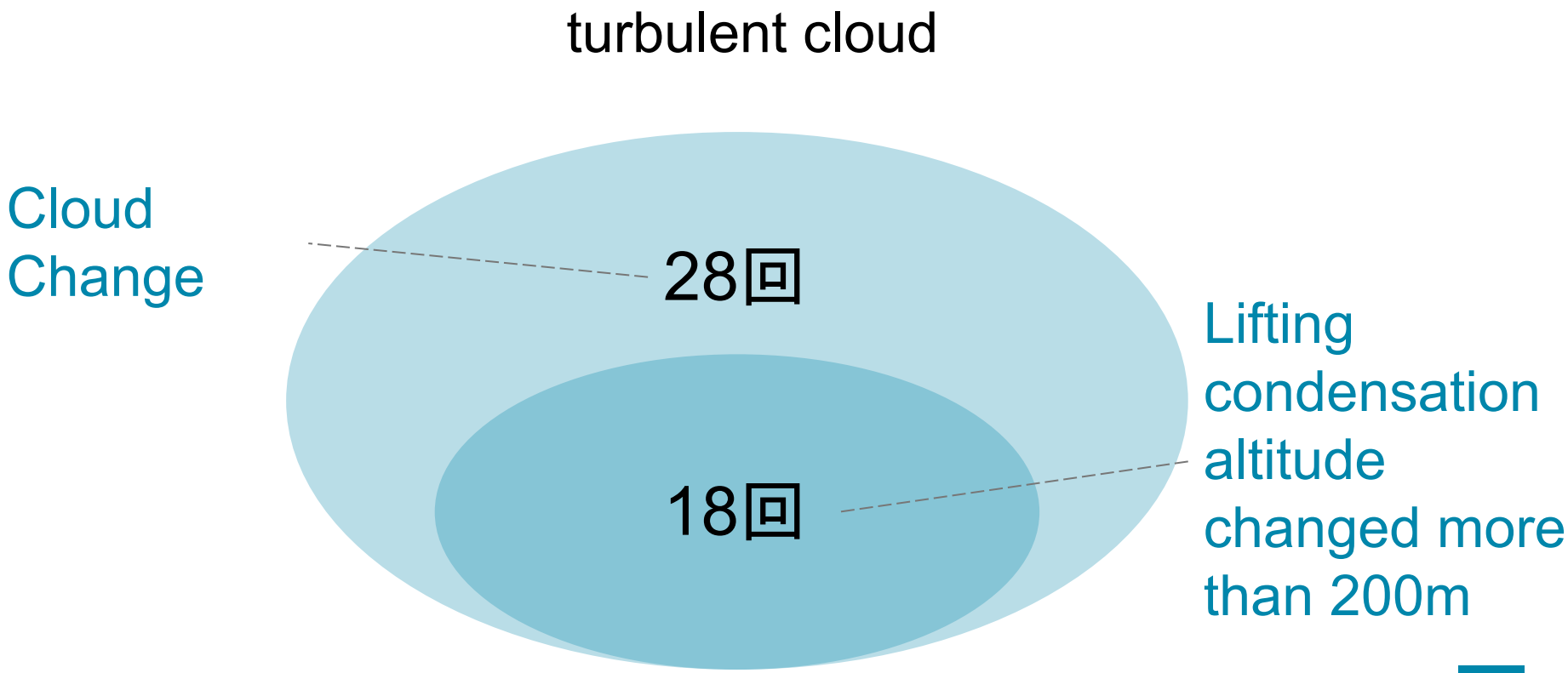
結果2

Changes in lifting condensation altitude and Relationship between the occurrence of turbulent clouds

Result 2.1 Relationship between changes in lifting condensation altitude and the occurrence of turbulent clouds



Result 2.1 Relationship between changes in lifting condensation altitude and the occurrence of turbulent clouds



Discussion 2: Relationship between changes in lifting condensation altitude and the occurrence of turbulent clouds

Before turbulence clouds develop.

Lifting condensation altitudes are higher because higher than turbulent clouds.

Tendency to have higher clouds than turbulence clouds before turbulence clouds develop

結果3

Change in wind direction during turbulent cloud development

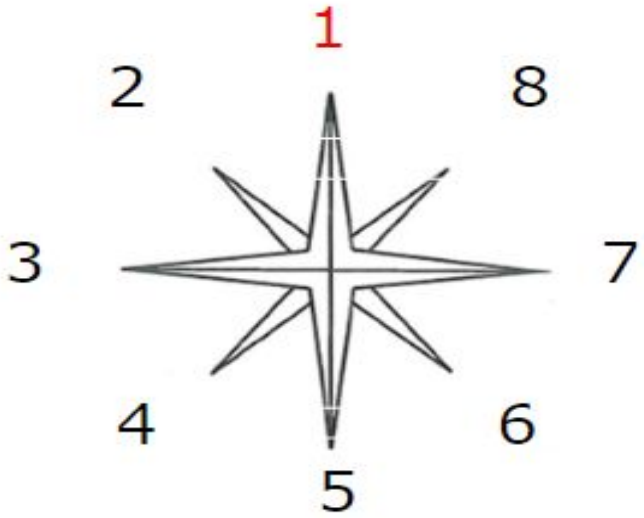
Result 3: Change in wind direction during the occurrence of turbulent clouds

wind direction north▶「1」

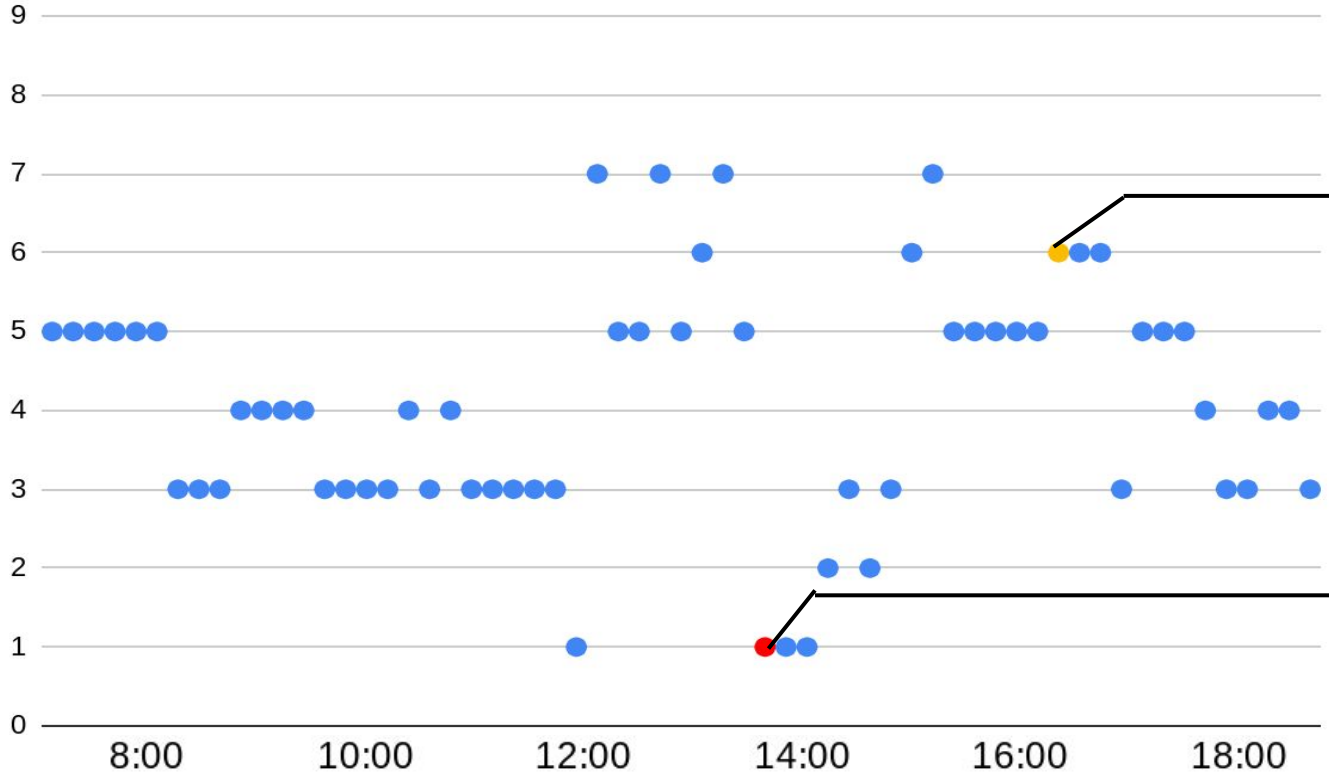
wind direction northeast▶「8」

We checked every

10 minutes.



Analysis 3: Change in wind direction during the occurrence of turbulent clouds



Turbulent clouds disappear

Occurrence of turbulent clouds

result3 Change in wind direction during turbulent cloud development

Before and after the occurrence of turbulent clouds, about 80% or more of the time, the wind direction changes dramatically.（90° or more）

There is little trend in the changing wind direction.

Consideration 3: Change in wind direction during the occurrence of turbulent clouds

Changes in atmospheric pressure

When clouds occur. Changes in updrafts and downdrafts

The wind direction changes.

結論と今後の展望1

Organize and analyze data to identify trends

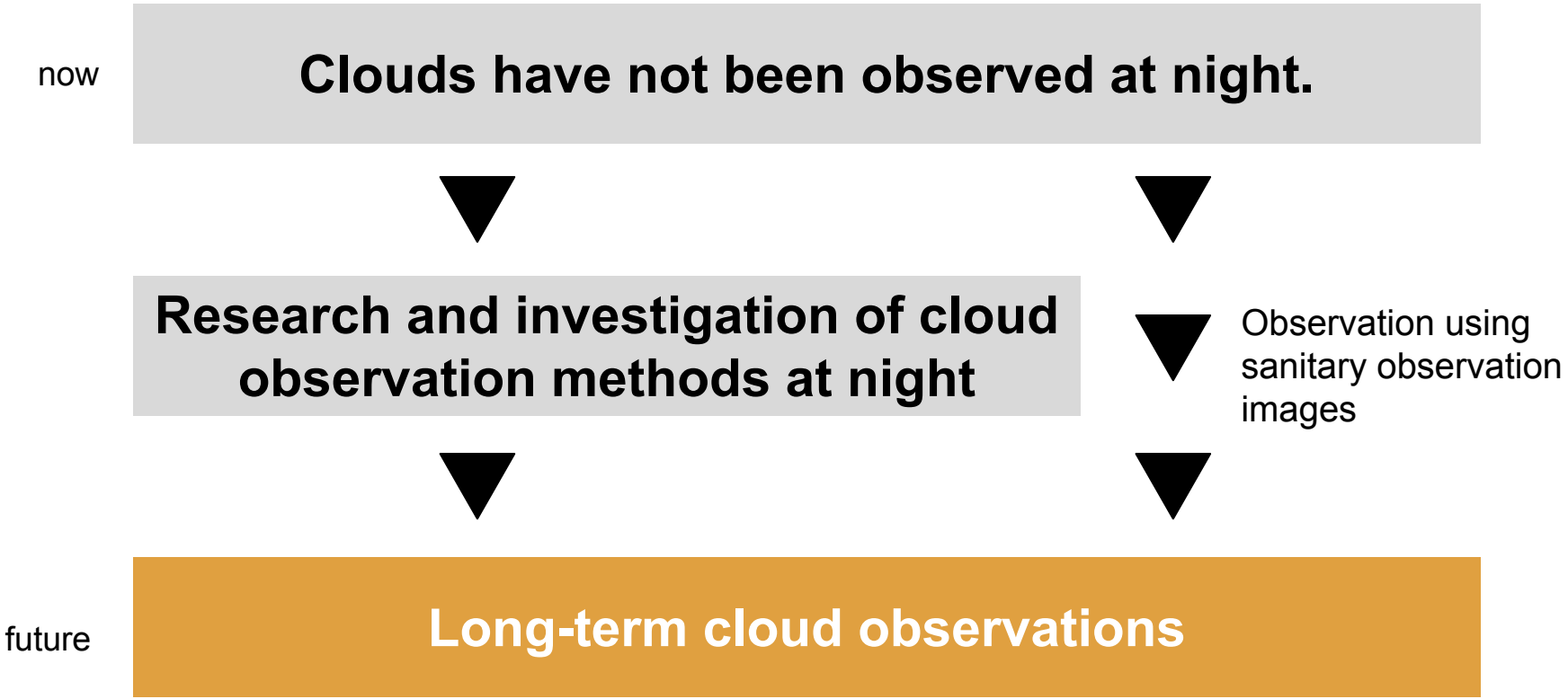
Not fully understanding the physical factors

Consider fluid motion and topography

now

future

結論と今後の展望2


now
Clouds have not been observed at night.
Research and investigation of cloud observation methods at night
Observation using sanitary observation images
future
Long-term cloud observations

References

- 浜島書店編集部（2013年）「ニューステージ地学図表」浜島書店
- “持ち上げ凝結高度の計算式”.01/15/2006. http://es.ris.ac.jp/~nakagawa/met_cal/lcl.html.(06/21/2022)
- 国土交通省気象庁.“過去の気象データ検索” 福井地方気象台.毎秒更新.https://www.data.jma.go.jp/obd/stats/etrn/index.php?prec_no=&block_no=&year=2022&month=&day=&view=.(02/08/2023）
- 国土交通省気象庁.“Naha Aviation Weaher Station”.那覇航空測候所. 10/18/2022.https://www.jma-net.go.jp/naha-airport/kansoku/ceilo/ceilo.html(06/09/2022)