Comparison and analysis of atmospheric conditions in Japan and Australia

Research Background

I've been researching the SDGs and other topics and became interested in air pollution

What determines the state of the atmosphere, and does it vary from country to country

I wanted to find out.

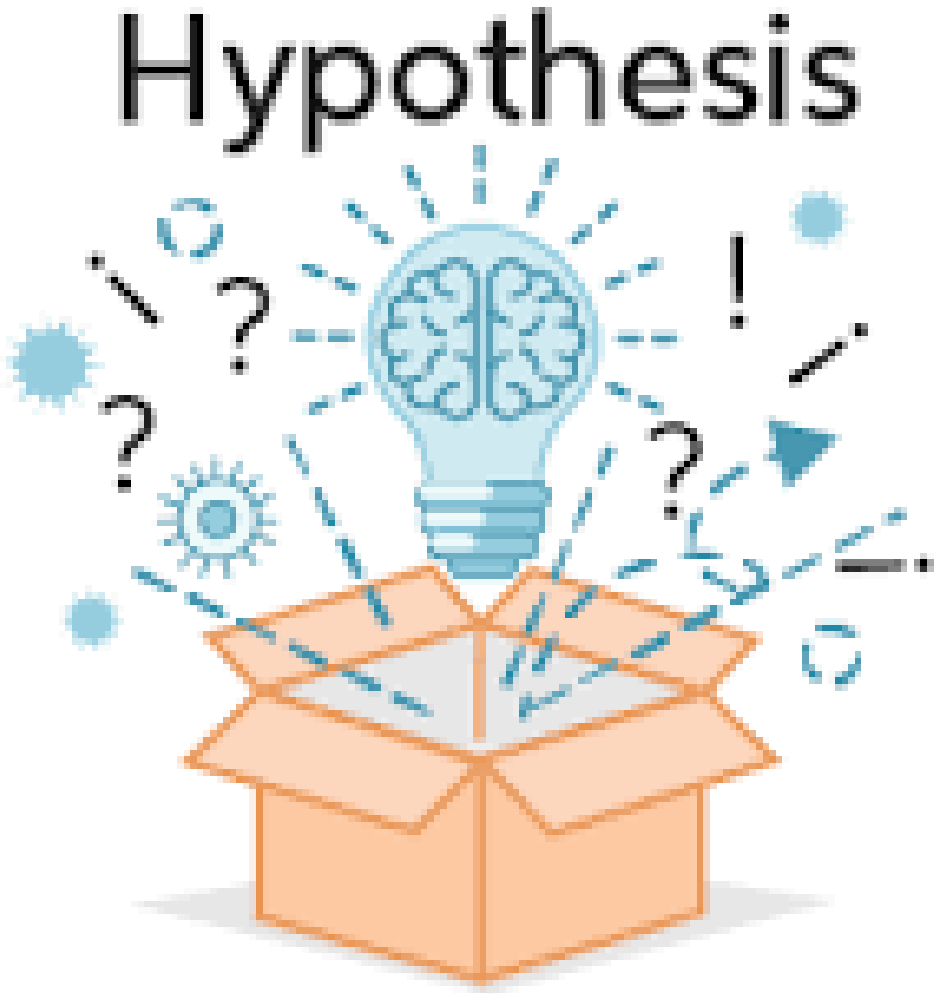
Research Content

Measure and compare atmospheric conditions in Japan and Australia to determine what factors commonly affect the atmosphere.

Research Question

What factors affect atmospheric conditions?

Do these factors change between Japan and Australia?



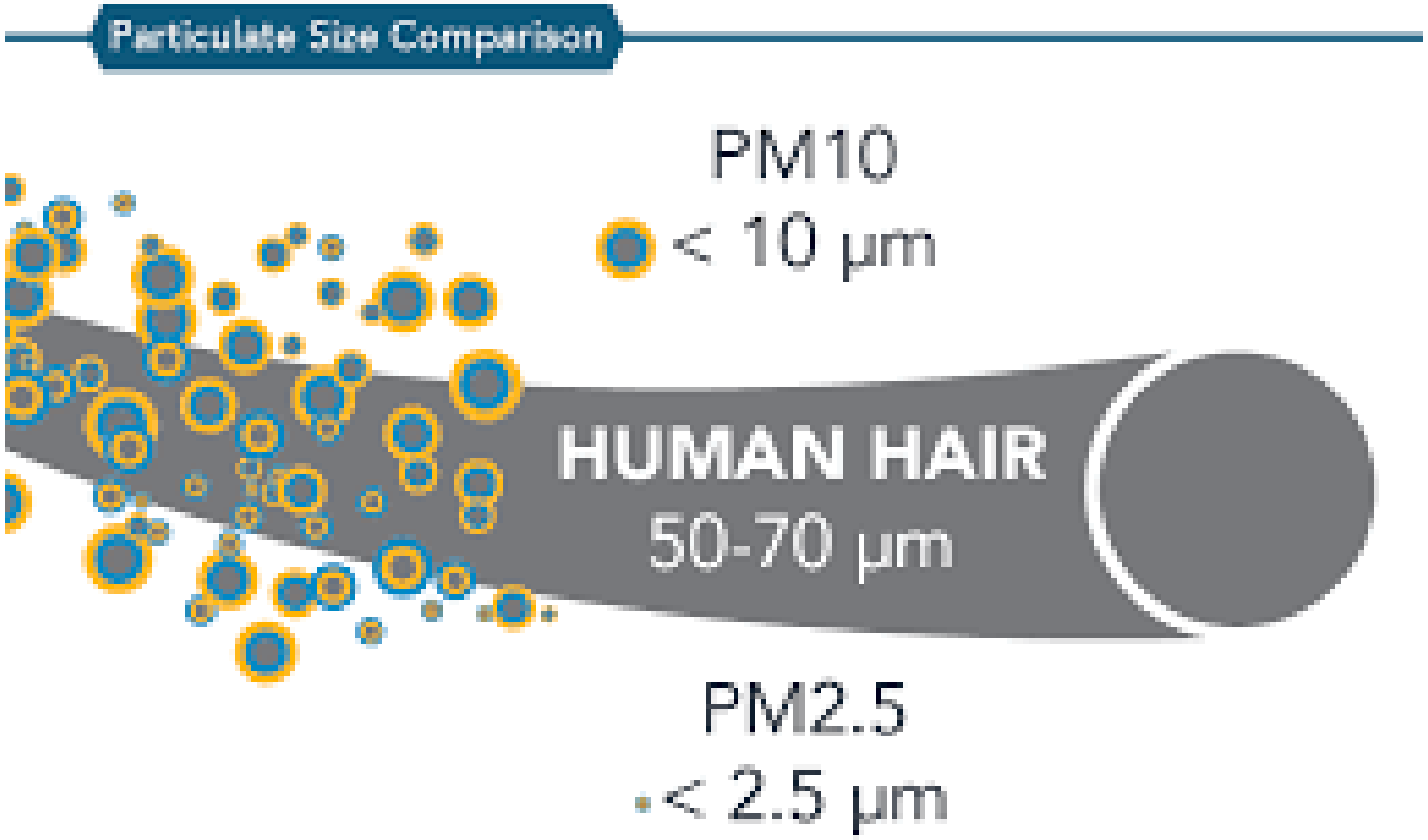
Hypothesis

Factors determining atmospheric conditions are the same in Japan and Australia.

cause

Smoke from factories and exhaust fumes from cars pollen,volcanic ash, and dust

PM2.5

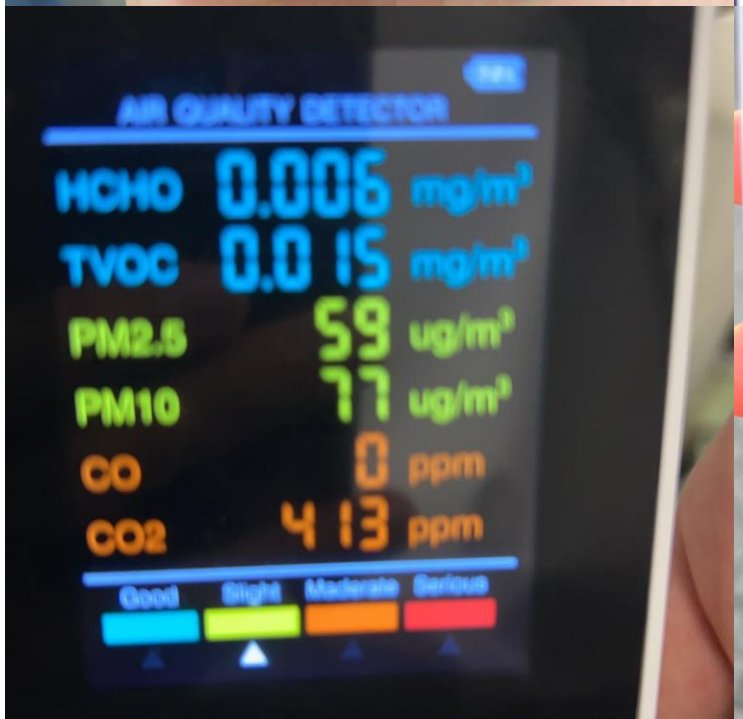

Particulate Size Comparison
PM10
< 10 µm
HUMAN HAIR
50-70 µm
PM2.5
< 2.5 µm

measure

MEASURE PM2.5 IN VARIOUS LOCATIONS SUCH AS URBAN AREAS, RURAL AREAS, FACTORIES.

SEARCH FOR COMMONALITIES IN THE COLLECTED DATA AND CONSIDER THEM

Measurement Results



Measurements 2024 home 2-5 p.m.

date	8/19	8/20	8/21	8/22	8/23	8/24
temperature(℃)	33	31	36	35	35	37
weather	rainy	sunny	sunny	cloudy	sunny	rainy
density(μg/㎥)	31	81	42	23	30	31

date	12/21	12/22	12/23	12/24	12/25	12/26
temperature(℃)	9	10	8	12	10	13
weather	rainy	sunny	sunny	sunny	sunny	rainy
density(μg/㎥)	37	51	46	29	30	30

Measurements in Japan　2024

date	8/2	8/2	9/11	11/13	12/13	1/4
temperature(℃)	38	37	33	20	8	10
weather	sunny	sunny	sunny	sunny	cloudy	sunny
place	Nagoya(city)	mountain	factory	mountain	factory	zoo
density(μg/㎥)	43	18	67	24	77	44

Measurements in Australia　2025

date	3/5	3/5	3/6	3/7	3/8	3/8
temperature(℃)	30	30	30	29	31	29
weather	sunny	sunny	sunny	sunny	sunny	sunny
place	Marymede college	Melburne city	Melburne University	La Trobe University	factory	Botanic Gardens
density(μg/㎥)	36	45	62	24	68	22

Result in Japan

As in previous studies, PM2.5 concentrations were low in mountainous areas and other areas far from cities, while PM2.5 concentrations were high in cities and industrial areas.

There seemed to be little relationship between temperature and PM2.5 concentrations.

PM2.5 concentrations were often higher the day after a rainy day.

Result in Australia

- As in Japan, PM2.5 concentrations were high in urban areas and factory positions, while PM2.5 concentrations were low in more natural areas.
- Overall, PM2.5 concentrations were slightly lower than in Nagoya.
- There were differences in PM2.5 concentrations even among universities located in the same Melbourne.

Consideration in Japan

When examining the days when PM2.5 concentrations were high, we found that many of the days had high amounts of yellow dust coming from China. Also, to include that PM2.5 concentrations were high after a day of rain.

We could predict that there is a correlation between PM2.5 concentration and the amount of DSS, and that DSS would be more likely to fly after rainy days.

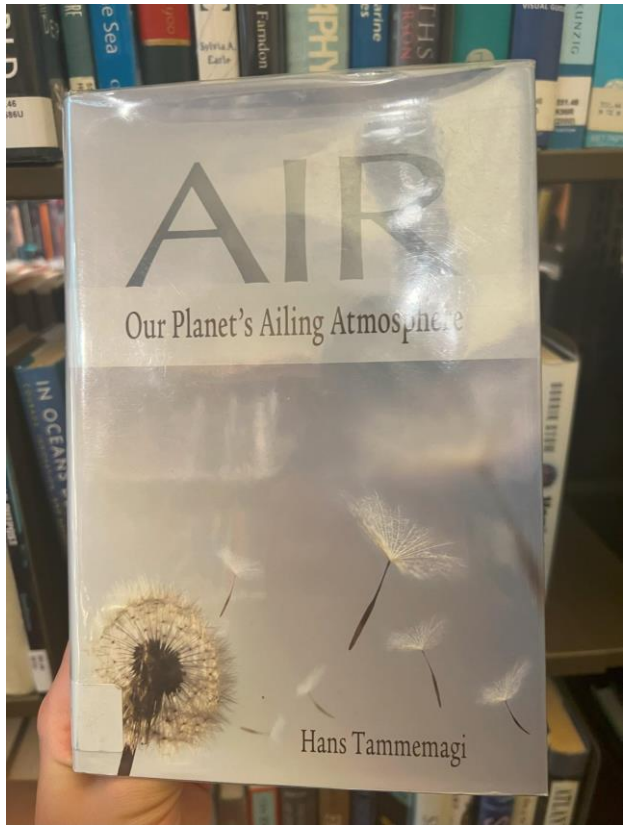
If the above discussion is correct, we can also expect that the PM2.5 concentration will remain the same on days after rainfall, since there are no continents around Australia and the area is less affected by DSS from outside the country than Japan.

Consideration in Australia

- I thought that the reason why the overall PM2.5 concentration was low was because the population density was lower than in Japan, and it was less susceptible to influences from other continents.
- I felt that the amount of nature and the number of people on campus differed from university to university, which led to the difference in PM2.5 concentrations.

Activities in Australia

- Measurement of PM2.5
- Research at Melbourne libraries
- Conversations with University Professors



Limitations of the study

- Small sample of data
- Limited geographic area
- Other possibilities
- Performance of measuring equipment

Future Outlook

Verification and further forecasting of the Japanese considerations based on the data collected in Australia.

Verification of other factors.

References

Obispado, Nuevo Leon, メキシコ大気汚染：リアルタイムPM2.5大気汚染指数（AQI）(aqicn.org)

PM2.5分布予測 - 日本気象協会 tenki.jp

微小粒子状物質(PM2.5)に関する情報 | 大気環境・自動車対策 | 環境省

PM2.5まとめ[全国のPM2.5情報・予報サイト]