**After-class Report of Introduction of Atmospheric Science**

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**Week: 7, 8**

**Summary of class content**

大氣觀測 (10/18, 林博雄教授)

1. Important history of atmosphere observation:
2. 1830 Robert FitzRoy (first minister of British Weather Bureau): ocean meteorology measurement
3. 1930 Vilho Vaisala: Radiosonde
4. 1947 Radar
5. 1960s: Rocket, Satellite (first mission: carry camera into space)
6. World Meteorology Organization (WMO):
7. Precursor: International Meteorology Organization (IMO)
8. Purpose: observation standardization, global weather data exchanging
9. International Weather Festival: 3/23, having different topic each year.
10. Website of data exchanging:

Weather bureau of each countryregional weather bureau GTS

1. Ground observation:
2. Basic parameter: pressure, temperature, relative humidity, wind velocity, wind direction, rainfall…
3. Added parameter: evaporating volume, acidity of rain, intensity of rain…
4. Human observation: visibility, weather phenomenon…
5. Meteorological balloon:
6. Usually filled with helium
7. Rising 150~300 m/min
8. Common using electromagnetic wave:
9. S-band: about 10 cm, observation distance 400~500 km, usually use in long distance monitoring.
10. C-band: about 5 cm, observation distance 100~200 km, usually use in leading airplane landing.
11. X-band: about 3 cm, observation distance 50 km, usually use in researching.
12. Polarization electromagnetic wave: usually use in precipitation
13. Two types of satellite:
14. Stationary satellite: usually for long term observation of the same place
15. Polar orbital satellite: usually for global weather data collection.
16. Ocean meteorological observation:
17. Buoy: for sea surface phenomenon observation
18. Argo: for vertical change of conductivity, water temperature…

晶片上的大器與海洋NWP (10/25, 吳俊傑教授)

1. The development of computer the ability of calculating of computer updatedcalculating models more accurate, faster.
2. The development of quantum computer solve the problem of additional producing heat from CPU higher speed
3. Numeral weather prediction is original to atmospheric dynamics equation and physical equation.
4. Difference between models:
5. Governing equations
6. Ways to calculate
7. Ways to decide grids
8. The concept of NWP is from Bjerknes in 1904, his though is phenomenon in atmosphere is decided by physics laws.
9. The problem of NWP:
10. Accurate realization of initial state of atmosphere.
11. Sufficient understanding of physical laws.
12. Experiment of Richardson in 1922: predict 6 hours of air pressure and momentum in atmosphere.

But he fail to proof the thought of NWP is correct due to bad model, bad initial condition…

1. As supercomputer develop, the speed of parallel computing becomes faster and faster.
2. Small difference of the initial condition can cause immense difference between the consequences of weather phenomenon.
3. DOTSTAR:
4. Purpose: collecting data from the center of typhoon
5. Experiment method: using airplane to drop dropsonde(weather observation instruments ).
6. Challenge: affecting original airline
7. Target observation: choosing specific region to get important data and get error reduction for 20% in the forecast period of 60 hours.

**Experience of the Class**

In the first week, professor had share us the basic knowledge of observation of atmosphere. Observation is the most fundamental and important part of the whole process of produce weather forecast and the prediction of climate change. With the instruments become more and more accurate, the quality of weather data improved. But there are still some restrictions of observation: lack of data of special structure, lack of data of specific region. However, I think these problems can be solved as technology improve.

In the second week, professor introduce numeral weather prediction. As computer updating, the computing ability can also update. Thus, it can conduct large volume of parallel calculations. In the new generation, the quantum computer may can replace supercomputer and become a better tool to integrate and compute data.

The basis of NWP is atmospheric model, if the model can be more accurate, the forecast can be more precise. However, the limitation of binary computer affects the consequences of computing a lot. Because once there is a little bit difference of initial conditions, the consequences will become different (butterfly effect).

I’m interesting the most in the establishment of atmospheric model, how the initial conditions and physical laws affect the process of weather phenomenon; how the difference been made between different models and how great it affects.