

**KWAME NKRUMAH UNIVERSITY OF SCIENCE AND
TECHNOLOGY**



INTERNSHIP REPORT AT GHANA METEOROLOGY AGENCY

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INTRODUCTION

Ghana Meteorology Agency (GMET) exists to provide efficient and reliable meteorological information by collecting, processing, archiving and dissemination of meteorological information to end users. Ghana Meteorology Agency has twenty-two (22) synoptic stations. The work of Ghana Meteorology Agency is to provide public weather forecast on daily basis on radio and television, provide meteorological information to meet international set standards to undertake collaborative work with Agricultural Agencies and others on meteorological related matters and provide expert advice. Through this internship, I have got to know much about the real working environment of Ghana Meteorology Agency that was not different from my course of study and their various units in which they work. In the various units, some collect data, process data and archive before forecasting the conditions of the weather to the public. This has gained me much interest and enlighten me in my course of study.

During the internship, my group spent three (3) weeks from 21st November, 2022 to 9th December 2022. On the day of arrival, we were assigned to Pent Hall block B at University of Ghana Legon for our stay for 3 weeks. On the first day of reporting, 21st November, 2022 we went to the various enclosure and units (Central Analysis and Forecasting Office, and studio presentation) at Ghana Meteorology Agency at Accra by Mrs. Pella who led us into the various units and introduced the workers to us. On the first week 21st to 25th November, 2022, I was assigned to Central Analysis and Forecasting Office (CAFO), On the second week 28th November to 2nd December, 2022 I was assigned to the Marine Unit, and on the third week, 5th to 9th December I was assigned to Basic Network. On the first week 21st to 25th November at Central Analysis and Forecasting Office (CAFO), where Mrs. Felicity Ahafianyo happens to be the head of the entire unit. I learnt about how to analyze and forecast Mean Sea level Pressure (MSLP), Surface Plot, wind chart, Convective Available Potential Energy (CAPE), Divergence chart (DIV), Low Level Jets (LLJ) and Tephigraph (TPHI). Our daily reporting time at CAFO was 8am and then close at 4pm. But from 2pm to 4pm we do chart discussions, where one of the workers present the forecast of the day before we close, we also did presentation on what we learnt on Friday 25th November, at CAFO.

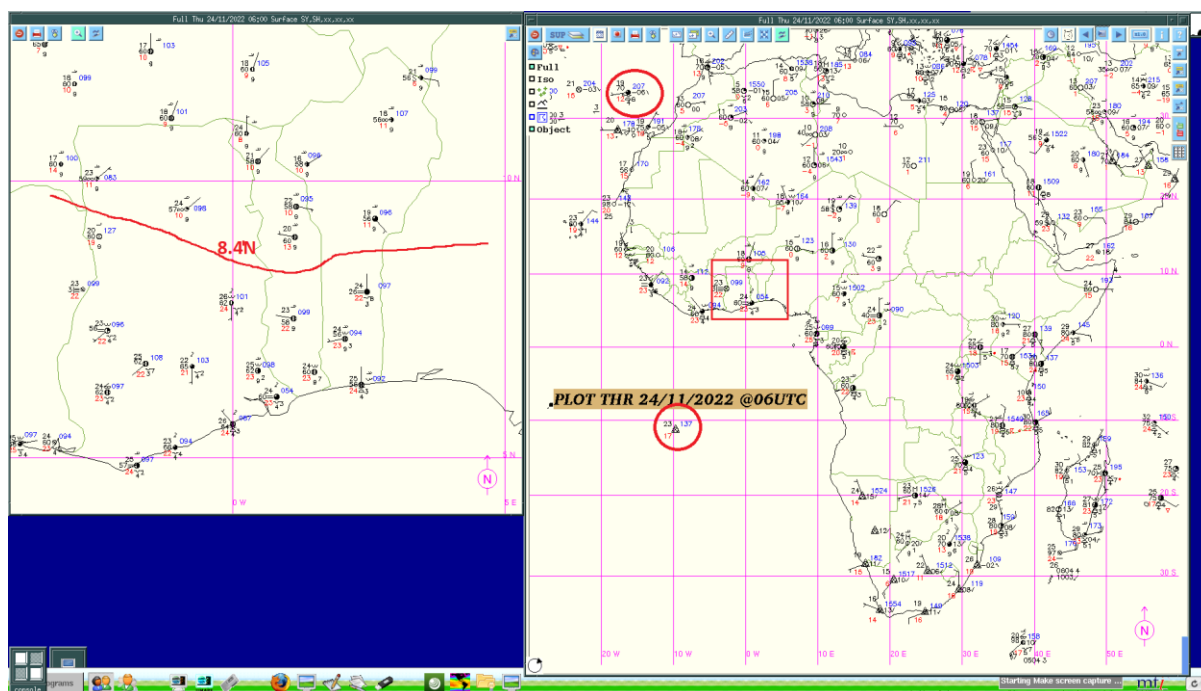
On the second week 28th November to 2nd December, 2022, I was assigned to the Marine Unit, where Mr. Adom Derkye happens to be the head of the entire unit and assisted by Mr. Thomas Biney. At the marine unit, they present the coastline and maritime forecast for Ghana. They mostly give weather warnings of the state of the sea whether it is calm, rough or dangerous. Individuals can also check the state of the sea by dialing *920*88# on a phone. They are also in charge of providing efficient and reliable meteorological information by collecting, processing, archiving, analysing and dissemination of findings or meteorological information to end vessel users on the ocean.

On the third week, that was the last week 5th to 9th December, 2022, I was assigned to Basic Network, where Mr. Richmond Obeng happens to be the head of the entire Basic Network. Basic Network is the basis of Ghana Meteorology Agency, they record all the meteorological elements and make sure all the instruments are working correctly as supposed to be, after recording the data, they transfer the recordings to a notebook and keep it for future use or immediate emergencies, they also analyze the data before sending the data to other units before forecasting it out to the public.

CENTRAL ANALYSIS AND FORECASTING OFFICE

On the first week 21st to 25th November at Central Analysis and Forecasting Office (CAFO), where Mrs. Felicity Ahafiany is the head of the entire unit. I learnt about how to analyze and forecast Mean Sea level Pressure (MSLP), Surface Plot, wind chart, Convective Available Potential Energy (CAPE), Divergence chart (DIV), Low Level Jets (LLJ) and Tephigraph (TPHI)

SURFACE PLOT



The chart above is a surface plot at 06UTC, in which we located the Inter Tropical Boundary (ITB) to be 8.4°N , which means the Northern part of the country or the synoptic stations above the ITB, will experience no rainfall activities, and 1 degree south from the ITB will experience short rains, and cloudy conditions and 4 degrees south from the ITB will experience more rainfall. This chart shows what happened at the synoptic stations at the specific time it was captured, it also shows the past and present weather conditions, Visibility, dewpoint, and pressure at various synoptic stations

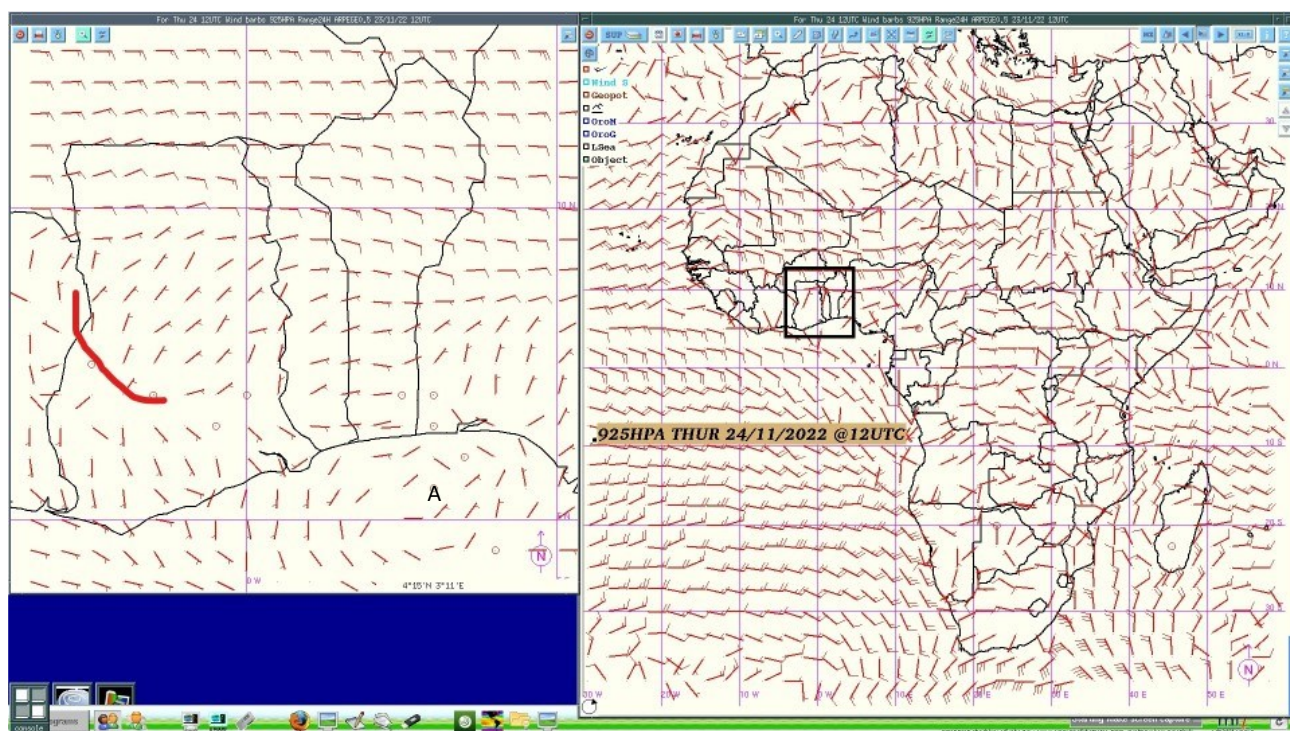
The Inter Tropical Boundary (ITB) is where two different air masses meet, for example moist and dry air. From the chart below, dry winds (those winds are from the maritime but pass through continentals which makes the air dry before reaching Ghana) from the Azores meet the moist winds from St. Helena which creates the ITB. The highest pressure at the Azores is 1020.7hpa and St. Helena is 1013.7hpa which means the pressure from St. Helena is greater than the Azores so it will push the ITB a bit forward to the northern part of the country as shown below. Example at Kumasi there was no present weather condition, with a visibility of 12km, and wind speed of <5 knots, dewpoint temperature 22° and an air temperature of 25° , pressure of 1010.8hpa, and the winds are blowing from South west to North East, sky cover of 9/10 oktas.

CENTRAL ANALYSIS AND FORECASTING OFFICE

WIND CHART AT A PRESSURE LEVEL OF 925HPA

A wind chart showing the pressure levels at 925hpa @12UTC, at the northern parts of Ghana there are easterly winds(the winds are blowing from the east), and at the transition the winds are blowing North East and also have some convergence at Sunyani and its surrounding areas, since the winds from North East and South East will meet at Sunyani and its surrounding areas, and it's likely for those synoptic stations to experience rainfall, at the coastal areas the winds are blowing from South East. Convergence occurs when winds from different areas meet at an area or point, on the chart convergence occurs when the wind barbs face inwards. Divergence occurs when winds move from one region to different places, on the wind is when wind barbs face outwards.

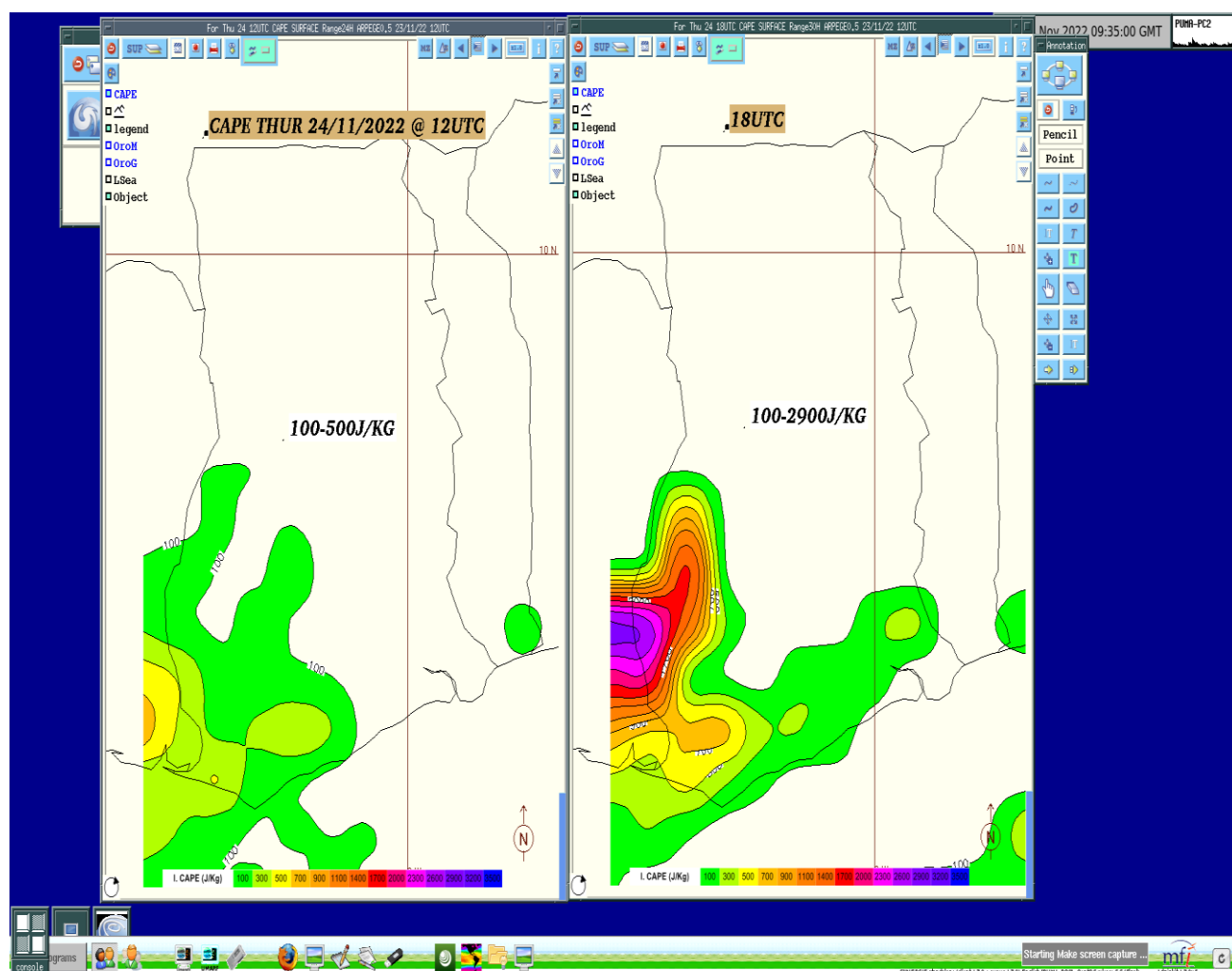
Winds are blowing from South East of the maritime to the coastline areas which will make those synoptic stations moist, at the Northern part of Ghana since the winds are blowing from countries like Libya, Chad, Nigeria, Benin, Togo, and passes through some parts of Ghana, which will make the Northern part of the country experience a dry weather conditions, and countries like Libya and Chad are desert countries, so winds from those areas will carry some dusts to the northern parts of Ghana, which will make the northern part experience haze and poor visibility



CENTRAL ANALYSIS AND FORECASTING OFFICE

CONVECTIVE AVAILABLE POTENTIAL ENERGY(CAPE)

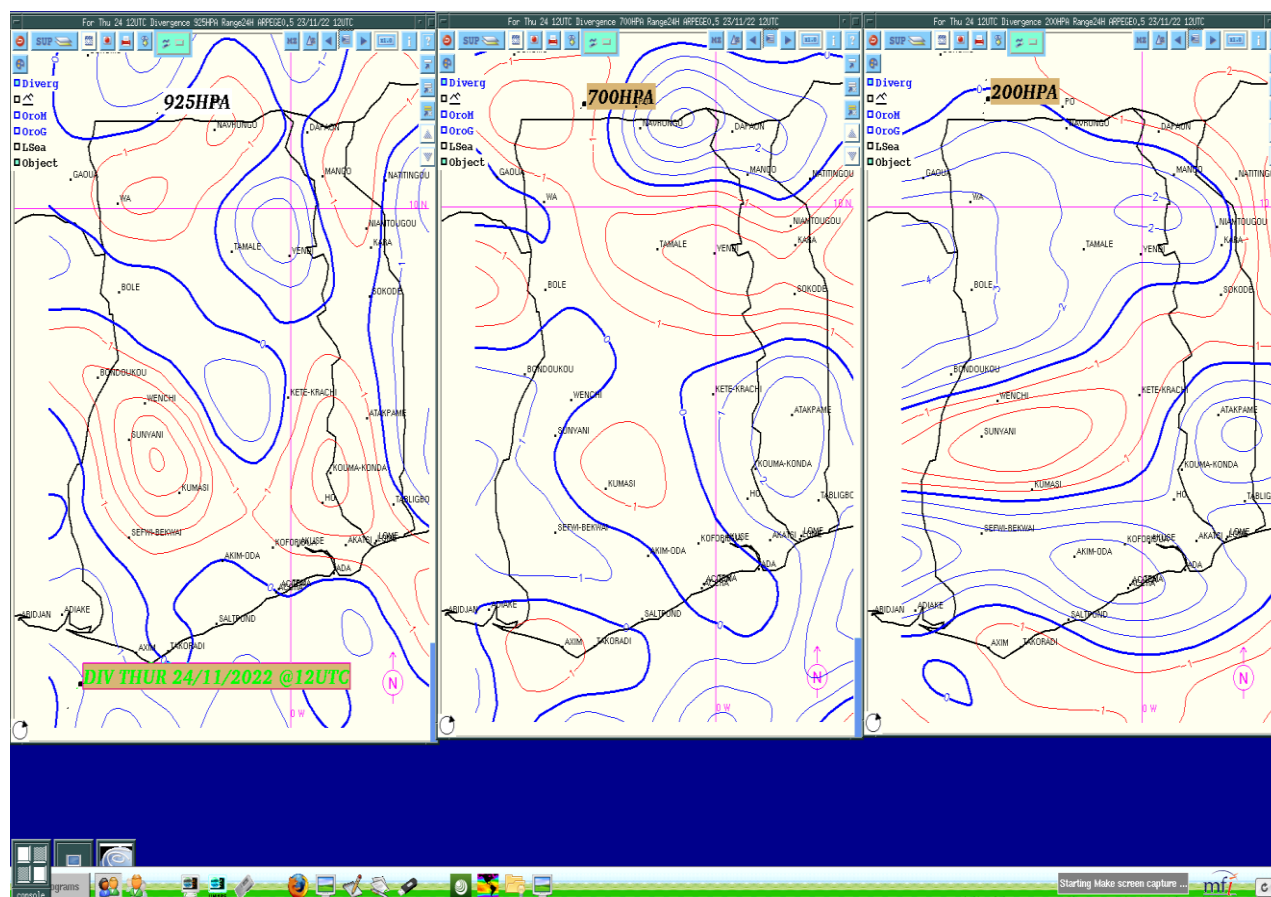
At central analysis and forecasting office, I learnt of Convective Available Potential Energy. A chart showing Convective Available Potential Energy on Thursday, 24th November, 2022, @12UTC and @18UTC respectively. Looking at the legend below the color tells how strong energy is around that area for any convective activities to occur. On Thursday 24th November, 2022. @12UTC in the afternoon the energies are not that much higher, from the legend, the highest energy ranges from 100-500J/KG which means the energy around the south-western part of the country going up to the middle and some part of the transition, their energies are not strong enough for convective activity but we usually do not do analysis based on one chart, but we compare various charts since they are interconnected, and at 18UTC in the evening the energies has increased, ranges from 100-2900J/KG, from the legend at the specific places along the borders of Ghana and Cote D'Ivoire there should be some convective activities occurring around areas of Sunyani, Wenchi and surrounding areas, since we cannot based on one chart there will be convective activities if only the other charts are also showing convective activities around those areas.



DIVERGENCE CHART(DIV)

The chart below is a divergence chart @12UTC on 24th November, 2022.

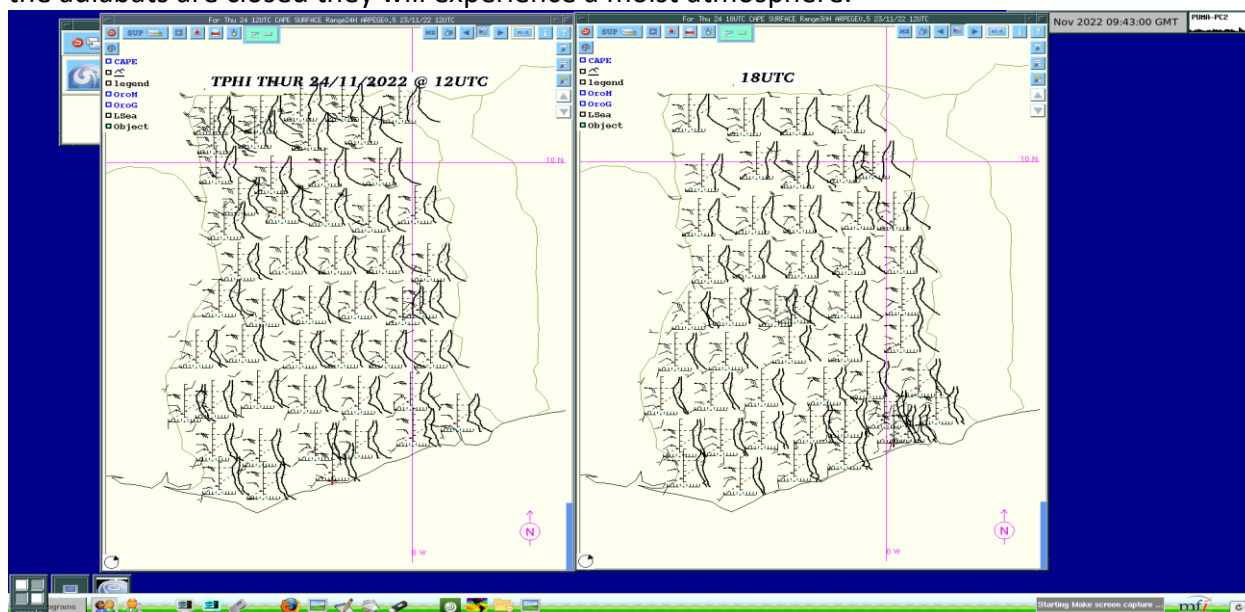
At the pressure level of 925hPa, there were some convergences at Sunyani, Wenchi, Kumasi, Sefwi Bekwai, at 700hPa there were some convergences at Kumasi and Divergence at Wenchi, Sunyani, and Sefwi Bekwai, at a pressure level of 200hPa there were some convergences at Sunyani, Wenchi, and Kumasi, so Kumasi will experience Cloudy conditions without rainfall.



SYNOPTIC STATIONS	PRESSURE LEVELS			EXPECTATIONS
	925hPa	700hPa	200hPa	
Kumasi	convergence	convergence	convergence	Cloudy conditions without rainfall
Sunyani	Convergence	Divergence	Divergence	Short rainfall
Sefwi Bekwai	Convergence	Divergence	Divergence	Short rainfall
Akuse	Convergence	Divergence	Divergence	Short rainfall
Akatsi	Convergence	Divergence	Divergence	Short rainfall
Ho	Convergence	Divergence	Divergence	Short rainfall
Wa	Convergence	Convergence	Divergence	Perfect condition for rainfall
Navrongo	Convergence	Divergence	Divergence	Short rainfall

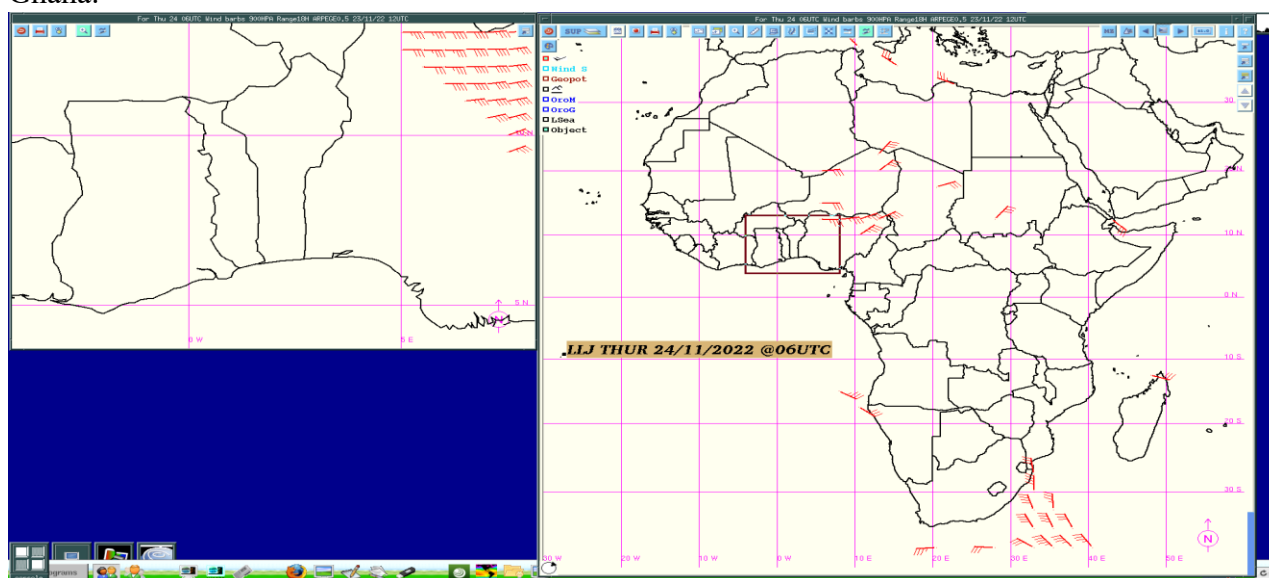
A TEPHIGRAPH

This is a tephigraph @12UTC and 18UTC. On 24th November, 2022 at 12UTC in the afternoon, the adiabats are open at the Northern part of the country which means they will experience a dry atmosphere and at the transition some adiabats are closed and others have open meaning some places will be dry and others will be moist at the transition sector, and at the coastal areas the adiabats are closed meaning those areas will be more moist. At 18UTC in the evening the northern part of the country will experience a dry atmosphere since the adiabats are open at the northern part, at the transition the adiabats are open they will experience a dry atmosphere but not as much as the northern part, at the coastal areas since the adiabats are closed they will experience a moist atmosphere.



LOW LEVEL JETS(LLJ)

Below is a Low-level Jet chart @06UTC on 24th November, 2022. From the chart jets are moving from Chad which passes through Nigeria, Benin, Togo, and to the upper or northern parts of Ghana which will cause poor visibility, and hazy conditions at the northern parts of Ghana.



MARINE UNIT

On the second week 28th November to 2nd December, 2022, I was assigned to the Marine Unit, where Mr. Adom Derkye is the head of the marine unit and assisted by Mr. Thomas Biney, they give the coastline and maritime forecast for Ghana.

At the marine unit I learnt about the Oceanic Parameters and the effects of the parameters on fishing activities

Ocean and atmospheric parameters

Oceanic Parameters	Atmospheric Parameters
Sea Surface Temperature	Surface Wind
Sig Wave Height	Visibility
Tidal Wave	Expected Weather: Thunderstorms, Rains, Stronger Wind Speed
Wave Current	Surface Wind

Effects of the parameters on fishing activities

1. **Significant Wave Height:** The significant wave height is the average height of the highest one-third of all waves measured. It is used to determine the sea state (i.e., calm, rough or dangerous). High wave heights can sometimes be rough, very bumpy, and pounding when riding.
2. **Tidal Wave Height:** Tides are the rising and falling of the sea level. It is as a result of the gravitational pull of the sun and moon, typically reaching a high and low level twice a day. The rise and fall of tides can cause water levels to fluctuate by several feet and also can generate strong currents. Some tidal currents are strong enough that some boats cannot make headway against the current. Tides and fishing conditions are related because tides cause the movement of water. When there is an increase in current or water movement, fish are more likely to feed and are easier to catch.
3. **Wave Current:** Currents are the horizontal movement of water in and out of the shore. Like a boat, the current has a direction and speed. If a boat moves in the same direction as the current, it will move faster, and if it moves against the moving the direction of the current, it will be slower.

Current speed: Extremely high-speed currents to affect us one way or another. A boat can travel faster than its hull speed (maximum speed of the boat) only when it is traveling in the same direction as a current. When sailing against a current, a boat can never reach hull speed. It is the maximum possible speed any particular boat is able to travel in still waters. If the current is as fast as the maximum boat speed, a boat cannot go anywhere (More fuel will be used). If it is faster, the boat will actually sail in the direction of the current instead of forward. Current eddies are also fertile feeding grounds for marine life. So are areas with strong current flow over submerged ridges and mounds. Currents affect the availability of nutrients for plant growth, and thus the availability of food for marine animals. Eggs and larvae of fish and other animals drift with the currents from the spawning grounds to nursery areas where they feed and grow.

- ❖ Currents also influence where bottom-dwelling species such as crabs, lobsters, and shellfish settle as adults.
- 4. **Sea Surface Temperature:** Water temperature has a huge effect of the lives of the fish in our rivers, lakes and canals.
In extreme temperatures our fish stocks very survival is dependent on suitable water temperatures. It affects their ability to grow, to feed, to reproduce and the search for cooler water in the summer and warmer water in the winter will also affect where you will find them. Fishes dislike extreme changes in temperature, they much prefer consistent temperatures and gradual changes, so a vicious cold snap or a sudden hot spell are unlikely to be a good time for fishing. As temperatures rise, fish are able to digest food quicker, have more energy and feed more often. So, fishes become more active and generally are easier to catch.
- 5. **Sea Surface Winds (up to 10meters above mean sea level):** Winds, both magnitude (speed) and direction over the ocean drive other physical and chemical processes. Ocean wind is defined as the motion of the atmosphere relative to the surface of the ocean. Typically, ocean winds are measured very close to the ocean surface by buoys, platforms, ships and satellite remote sensing. The most common reference height for near-surface ocean wind measurements is 10 meters above sea level.
The wind not only produces currents, it creates waves. As wind blows across the smooth water surface, the friction or drag between the air and the water tends to stretch the surface. As waves form, the surface becomes rougher and it is easier for the wind to grip the water surface and intensify the waves.
- 6. **Visibility:** Poor visibility can be encountered at seas as well. Fog, though rare at high seas can be experienced. Other forms of precipitations (such as rains, snow etc.) can also affect how far a vessel/boat can see. Poor visibility combined with rolling of the vessel/boat can cause the operators to become disoriented. Poor visibility brings the greatest risk of collision with an obstacle or another vessel/boat.

IMPACTS OF EXTREME WEATHER AT SEA

- Loss of life.
- Loss of property
- Sustained injuries.
- Loss of time.
- Economic loss.

LOCALLY AGREED THRESHOLDS, COLOR AND NUMERICAL CODES Locally



CODE: 1

Green = Calm

Threshold: < 1.5m



CODE: 2

Yellow = Rough

Threshold: 1.4m >SWH< 2.5m



CODE: 3

Red = Dangerous

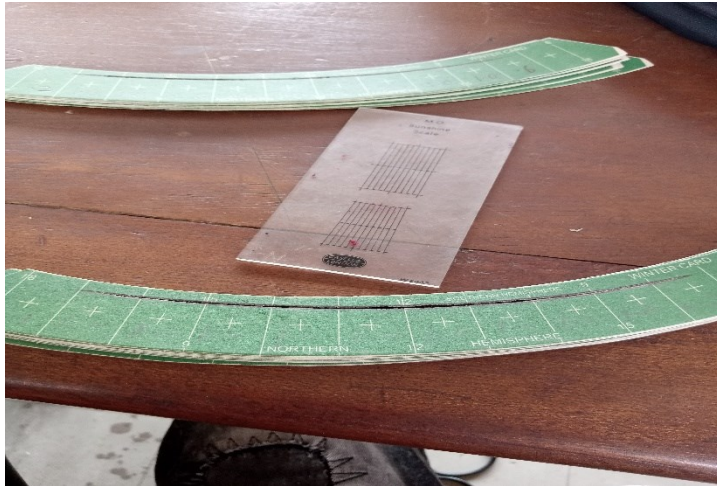
Threshold: > 2.5m

To check the state of the sea dial *920*88# on your phone

BASIC NETWORK

Lastly on the 3rd week, 5th to 9th December I was assigned to Basic Network, where Mr. Richmond Obeng is the head at the Basic Network, we visited the enclosure everyday between the synoptic hours 09UTC, 12UTC and 03UTC to take the readings of the various meteorological instruments available and analyze them.

Example: with the sunshine cards we measure the places burnt and record them after every month as shown below, and this was done by me



GHANA METEOROLOGICAL AGENCY
HOURLY VALUES OF SUNSHINE DURATION
Measurements are to be made to tenths of an hour. For No. sunshine hours, as the hourly values but write 0.0 for the total. For Mean length of day for the month, it is to be taken as the time in hour (tenths). Note that the figure in the column headings refer to Local Apparent Time (L.A.T.).

STATION.....**A.H.O.**.....**LONGITUDE.....20.2.2.**

Day	1-1	2-6	6-7	7-8	8-9	9-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	Total
1																5.4
2																0
3																8.9
4																7.9
5																8.1
6																6.4
7																9.3
8																8.3
9																9.7
10																9.4
11																6.5
12																6.3
13																3.8
14																1.8
15																5.3
16																5
17																8.9
18																7.0
19																7.7
20																7.2
21																6.5
22																9.0
23																6.3
24																7.8
25																4.3
26																5.6
27																6.9
28																7.2
29																8.0
30																6.3
31																205.8
Total																
Mean	11.1	21.6	24.2	24.8	25.6	25.9	19.6	26.2	20.5	6.3						
Number of days with duration in hours within limits indicated	00	0.1-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-7.0	7.1-8.0	8.1-9.0	9.1-10.0	10.1-11.0	11.1-12.0	12.1-13.0		Total
Mean length of day for the month																
Percentage of possible sunshine																

Computed by: Pinkrah Nana Checked by: _____

We were introduced to the various meteorological instrument available and also showed us the weather elements each instrument measures, and reasons why each is there. And were also taught on how to measure and know the types of clouds in the skies.

INSTRUMENTS AT THE GHANA METEOROLOGY ENCLOSURE



Visibility and clouds cannot be measured with an instrument, what blocks vision is visibility checkpoint examples are rain, haze, fog. The whole sky is 8 octas, Only Altostratus and Nimbostratus can occupy 8/8 octas, seasons depends on the movement of the sun, clouds don't move but they spread, clouds also do not move but they spread and dissipate

The instrument that are available at the enclosure are

- **Campbell-Stoke Sunlight recorder:** It measures the duration of the sun rays, not the intensity of the sunlight, it is made up of convex lens, which uses three cards the Winter cards (short curve), Summer cards (Long curve), Equinoctial cards (Straight). at various season. Each is placed from 6am to 6pm then it's being replaced the next day.

- **Stevenson's screen:** It is a shelter against precipitation and direct heat radiation from outside sources, it also protects the temperature from being influenced by direct or reflected sunlight. They are always painted white to better reflect the sun's rays. which contains both the dry bulb and the wet bulb, the Stevenson screen contains instruments including a hygrometer, a psychrometer, a barometer, and a thermograph, which measures the temperature, humidity, dewpoint, and atmospheric pressure. It also made of wood to prevent absorption and conduction of heat, and also has a stand of one meter high above the ground to ensure that air temperature readings are not affected by the temperature on the ground
- **Rain gauge:** It is used to gather and measure the amount of rainfall over a specific area, over a period of time, and the types of rain gauge that were available at the enclosure were farmers rain gauge, standard rain gauge, tilting siphon rain recorder, and electronic rain gauge.
- **Wind vane:** It is used to determine the direction of a blowing wind, and are kept at a high foot to prevent blockage of winds by buildings and trees or the instruments at the enclosure, the direction of the wind is taken at the cylindrical head of the wind vane
- **Cap Counter Anemometer:** It is used to measure wind speed. Readings are taken after 31seconds and then you subtract the initial from the final readings (Final readings – initial readings)
- **Pyranometer:** It is used to measure the short solar radiations from the sun
- **Piche Evaporimeter:** It is used to measure the rate of evaporation from a wet disc. It is filled with water and covered with a Piche disc, and it's also located in the Stevenson's screen
- **Actinograph:** It is used for determining the intensity of direct solar radiation.

CHALLENGES FACED DURING THE INTERNSHIP

1. Water problems at Pent Hall

There were some days where there was no flow of water, where we were supposed descend downwards and fetch water downwards to upstairs (2nd floor) for our activities, such as washing, bathing, cleaning and cooking

2. High Transportation fares

The distance from Pent hall block B at University of Ghana Legon is about four Kilometers (4km) to Ghana Meteorology Agency at Mompasem, when walking will take you about 1 hour 20 minutes that was quite a trek, so we were taking Bolt and Uber throughout our journey in and out, which cost 20gh for just a ride from Pent hall block B to Ghana Meteorology , so in and out a day was about 40gh, so the car take only four passengers where share the fare among ourselves so each person pays maximum 10gh a day.

3. Inadequate food vendors at Pent

Since there were insufficient food vendors at Pentagon Hall and closed areas, we were used to be walking to Atomic Junction for cheap food that is about 1 hour walk in and out, which was not all that safe because we used to meet strangers on the way asking for help.

4. Few weeks at Ghana Meteorology Agency

We spent few weeks at the internship, because of that we could not visit all the various units at Ghana Meteorology Agency to know their real working environment that could also help in our understanding of our course of study.

CONCLUSION

Finally, the internship was succesful and I had a usefull experience. This internship has let me know my weaknesses and strength in my field of study, I was able to gain practical skills like how to measure and reset the instruments at the enclosure, when to take readings, and to use measurement from the sunshine card to calculate the amount of sunshine over a specific area, at the Basic Network. I alsoo gained new knowledge at Basic Network, CAFO where I learnt how to forecast and also interprete some charts like Wind chart, divergence chart, convective availabe potential energy charts(CAPE), surface plots, mean sea level pressure (MSLP), low level jets (LLJ), and Tephigraph.

At marine unit I gained new knowledge on how to take readings like temperature, precipitation, clouds, humidity waves, snow cover, thunderstorms and winds using the ventusky and windy app with a 3D map showing development of weather in a broader area in a very interesting way. I also met many new people who encouraged us to take our programe of study very serious and also gave some advice and rules at the work place. I achieved many of my learning goals and was able to understand better of some courses, that was taught at lectures. I really enjoyed this internship and I enjoyed at CAFO than all the units.

Through this internship, I got to know much about the real working environment of Ghana Meteorology Agency that was not different from my course of study, and also got to know that they have various units but not just one unit, which some collect data, process data, and archive, before forecasting the conditions of the weather, which has made me gained much interest in my course of study than before.