How tropical cyclones affected temperature, pressure, and humidity in Universitas Pendidikan Indonesia

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Abstract. Tropical cyclone which occurred in Indian Ocean can affected the weather parameters such as temperature, pressure, and humidity in some regions in Indonesia. Universitas Pendidikan Indonesia which located in West Java is one of the region that the affected by tropical cyclone. Therefore, the study to learn how tropical cyclones affected temperature, pressure, and humidity in Universitas Pendidikan Indonesia is needed. The study was done by processing the data generated through the Automatic Weather Station then analyze the behavior of the weather parameters such as temperature, pressure, and humidity in the area of Universitas Pendidikan Indonesia throughout 15th November 2017 until 15th December 2017. This study concluded that the tropical cyclone can affected the weather parameters such as temperature, pressure, and humidity in the area of Universitas Pendidikan Indonesia.

1. Introduction
Tropical cyclones is a rapidly rotating storm system that characterized by a low-pressure center, a closed low-level atmospheric circulation, strong winds, and a spiral arrangement of thunderstorms that produce heavy rains. This phenomenon causes a destructive wind to an area about 155 km from its center. The fastest wind speed is found on the radius of 12.4 km to 18.6 km from the center of the cyclone at wind speeds of up to 93 km/h [1].

Tropical cyclones derive energy primarily from evaporation in the ocean and the associated condensation in convective clouds concentrated near their center, as compared to midlatitude storms that primarily obtain energy from horizontal temperature gradients in the atmosphere. Additionally, tropical cyclones are characterized by a warm-core that relatively warmer than the environment at the same pressure level in the troposphere. The greatest temperature anomaly generally occurs in the upper troposphere around 250 hPa. It is this unique warm-core structure within a tropical cyclone that produces very strong winds near the surface and causes damage to coastal regions and islands through extreme wind, storm surge, and wave action [2].

On November 27, 2017 Tropical cyclone cempaka began to occur in southern Central Java, about 100 km south-south of Cilacap at 8.6 degrees south and 110.9 east longitude, while Tropical Cyclone Dahlia emerged after Cempaka Tropical Cyclone weakened and away from Indonesia on 29 November 2017. Tropical Cyclone Dahlia appears in the area 470 km southwest of Bengkulu at 8.2 degrees southern latitude and 10.8 degrees east longitude. [3,4]. In this paper, we will discuss how the tropical
cyclone affected the weather parameter such as temperature, pressure, and humidity in Universitas Pendidikan Indonesia which is located about 4000 km away from Indian Ocean.

2. Methods
The methods which used for studying the effects of tropical cyclones to weather parameters is by gathering data of weather parameters then we plotted the data into graph in order to learn the pattern of each weather parameters and how its affected each other. Various weather parameters such as temperature, pressure, and humidity in Universitas Pendidikan Indonesia which is located in Bandung, Indonesia when the tropical cyclone occur have been successfully measured by applying Portable Weather Logger (Portlog™) Rain-wash Automatic Weather Station (PRAWS) with 1 Hz accuracy for 163893 data [5]. We gather the data of weather parameters in Universitas Pendidikan Indonesia throughout 15th November 2017 until 15th December 2017 using Automatic Weather Station. We present the data as a graphic that show the behavior of weather parameters that affected by the tropical cyclones.

![Portable Weather Logger (Portlog™) Rain-wash Automatic Weather Station (PRAWS)](image)

**Figure 1.** Portable Weather Logger (Portlog™) Rain-wash Automatic Weather Station (PRAWS) with 1 Hz accuracy for 163893 data which applying in Universitas Pendidikan Indonesia.

3. Results and Discussion
In Figure 2 we can see that temperatures are relatively low when tropical cyclones occur. It caused by the cloud build up in the area around Tropical Cyclones. The cloud build up makes the area clouded so the sunlight which reach earth surface is reduce causing the temperature in the area around Tropical Cyclones is decreased. The average temperature before the occurrence of tropical cyclone is 22.26 °C and then the average temperature when Tropical Cyclone Cempaka occurred is 21.18 °C and the average temperature at which Tropical Cyclone Dahlia occurred is 21.19 °C and then the average temperature as tropical cyclone over is 22.68 °C. The tropical cyclones phenomenon could be observed from the behaviour of temperature in figure 2. We can see that during the Cempaka Tropical Cyclones the temperature at 25th November 2017 to 28th November 2017 is lower than previous date. Then, the
temperature is increased again at 29th November 2017 in which the Cempaka Tropical Cyclones over and the temperature is decreased again at 30th November 2017 to 3rd December 2017 in which the Dahlia Tropical Cyclones occur. The Temperature finally normal again after 4th December 2017.

Figure 2. Time Dependent Temperature throughout 15th November 2017 until 15th December 2017.

Figure 3. Time Dependent Pressure throughout 15th November 2017 until 15th December 2017.

In Figure 3 we can see that the pressure is relatively lower when tropical cyclones occur. It caused by the cloud build up in the area around Tropical Cyclones. The cloud build up makes the area clouded so the sunlight which reach earth surface is reduce causing the temperature in the area around Tropical Cyclones is decreased. The average pressure before the occurrence of tropical cyclone was 996.68 mBar then average pressure when Tropical Cyclone Cempaka occurred was 996.07 mBar and average pressure when Tropical Cyclone Dahlia occurred was 995.02 mBar then average pressure when tropical cyclones over is 998.09 mBar. The tropical cyclones phenomenon could be observed from the behaviour of pressure in figure 3. We can see that during the Cempaka Tropical Cyclones the pressure at 25th November 2017 to 28th November 2017 is lower than previous date. Then, the pressure is increased again at 29th November 2017 in which the Cempaka Tropical Cyclones over and the temperature is decreased again at 30th November 2017 to 3rd December 2017 in which the Dahlia Tropical Cyclones occur. The pressure finally normal again after 4th December 2017.
In figure 4 we can see that the air humidity is relatively more increased when tropical cyclones occur. Average humidity before the occurrence of tropical cyclones was 79.18% then average air humidity when Tropical Cyclone Cempaka occurred was 83.25% and average air humidity when Tropical Cyclone Dahlia occurred was 80.44% then average humidity after tropical cyclone has occurs is 77.42%. The tropical cyclones phenomenon could be observed from the behaviour of humidity in figure 4. We can see that during the Cempaka Tropical Cyclones the pressure at 25th November 2017 to 28th November 2017 is higher than previous date. Then, the pressure is decreased again at 29th November 2017 in which the Cempaka Tropical Cyclones over and the temperature is increased again at 30th November 2017 to 3rd December 2017 in which the Dahlia Tropical Cyclones occur. The pressure finally normal again after 4th December 2017.

4. Conclusion

Weather parameters in Universitas Pendidikan Indonesia which is located in Bandung, Indonesia can be affected by the tropical cyclones that occur in Indian Ocean. The tropical cyclones make an area in Universitas Pendidikan Indonesia experience lower temperature, lower pressure, and higher humidity compared the condition before and after the tropical cyclones is occurred.

5. References

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