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Further Discussion on Temperature Field During Storms and Thermal Score in Typhoon Actives and Damages of Typhoons

Huong Chu Thi Thanh[1], Linh Tran Dinh[1], Dinh Tran Ngoc Huy[2, 3]

[1]Environment Department, Hanoi University of Natural Resources and Environment (HUNRE), Hanoi City, Vietnam

[2]Postgraduate Department, Banking University of Ho Chi Minh City, Ho Chi Minh City, Vietnam

[3]Graduate School of International Management Department, International University of Japan, Niigata, Japan

Email address:

ctthuong@hunre.edu.vn (Huong Chu Thi Thanh), tdlinh@hunre.edu.vn (Linh Tran Dinh), dtnhuy2010@gmail.com (Dinh Tran Ngoc Huy)

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Abstract: Background: As we know, tropical cyclones or hurricanes (TCs) and typhoons are one of the natural disasters causing considerable damage to our life, economy and society. Objective: This study goal is to explore damages of typhoons and the temperature field during storms operating in the East Sea under the influence of cold air over time. Methodology: To determine the activities of the cold surge, the study analyzes the evolution of the 24-hour sea level barometric value in the region of 20-250N; 105-1150E. This is the area that is often affected first when KKL operates in East Asia in general and Vietnam in particular. Then, cold surge is considered to affect the area when the 24-hour transformer has a value greater than 1hPa. Results: Studies showed that the effects were investigated from 1991 to 2011 based on archived data from the National Centers for Environmental Prediction and the National Center for Atmospheric Research (NCEP-NCAR) and the number of typhoons were sourced from the International Best Track Archive for Climate Stewardship (IBTrACS). Conclusion: research showed that most typhoons occurred in August and September, which was related to high temperature in the summer season and the southwest monsoon in the area. In Vietnam, Although Typhoons has dissipated, the rain after typhoon No. 4 has left 3 people dead and missing, more than 7,000 houses were flooded, tens of thousands of hectares of agriculture and fisheries were damaged.

Keywords: Thermal Core, Cold Air, Tropical Storm, Temperature, Typhoons

1. Introduction

Background:

In recent years, tropical cyclones or hurricanes (TCs) and typhoons are one of the natural disasters causing considerable damage to our life, economy and society.

Moreover, The characteristics of the temperature field structure in storms when affected by cold air will be analyzed based on the vertical structure of the temperature field when crossing the center of the storm in the longitude [1].

The maximum mean values of SST in May and June were related to the East Asian Monsoon. The average values of LHF were highest in July, and the mean values of SHF were highest in July and August. SHF varied gradually at different months compared with LHF. In addition, the average of precipitation rate was highest in November, which can be related to the northeasterly winter monsoon. The relationships of the aforementioned parameters were obtained using Pearson's correlation analysis. Moreover, the highest and lowest mean values of the parameters in different areas were considered, and their spatial relationships were analyzed.

The purpose of this study: to explore damages of typhoons and the temperature field during storms operating in the East Sea under the influence of cold air over time.

We summarize related studies:

First, study showed Storm surges and disastrous waves induced by cold air outbreaks, a type of severe weather

system, often impact the coastal economic development [2, 3, 4].

Second, study mentioned The hurricane season usually starts from May to December or from June to November) and gradually shifts from North to South with frequency that is higher in August, September [1]. From January to May, the frequency of storms is very small, even in February there is no storm.

Third, research found the sea surface temperature (SST) is an important factor in the supply of energy to typhoons (hurricanes, or tropical cyclones) and affects not only their formation, but also their track and intensity [44].

Fourth, scientists described temporal and spatial variations of sea surface temperature (SST), latent heat flux (LHF), sensible heat flux (SHF), and precipitation rate with typhoon activity over the South China Sea. This is fundamental to predict a typhoon's intensity and track [11-13].

Moreover, scientific researches need to be explore in this field [5-10, 14, 15].

2. Data and Method

2.1. Data

Storm Data

The storm data set including storm name, location, intensity (Pmin, Vmax) every 6 hours during its existence (from formation to disintegration) is provided by the Japan Meteorological Agency (JMA). Download from website: http://agora.ex.nii.ac.jp/.

2.2 Research Methods

Determining the Period of Operation of Cold Surge

To determine the activities of the cold surge, the study analyzes the evolution of the 24-hour sea level barometric value in the region of 20-250N; 105-1150E. This is the area that is often affected first when KKL operates in East Asia in general and Vietnam in particular. Then, cold surge is considered to affect the area when the 24-hour transformer has a value greater than 1hPa.

3. Findings and Discussion

3.1. Damages from Some Typhoons

Typhoon Durian formed in the Northwest Pacific Ocean from 13:00 on November 25, 2006. The storm moved westward and was very intense as it passed over the Philippine peninsula. Even, the wind speed near the center of the storm at 19h on November 29 was up to 53.5m/s. At 13:00 on December 1, 2006, Typhoon Durian moved into the East Sea with the strongest wind speed of about 38m/s. The storm weakened to a tropical depression then disintegrated on December 6 [35], [36]. Also during the period from November 27, 2006, a cold surge accompanied by a front affected the northern climate regions of Vietnam, causing the temperature in the area to drop from 5 to 70C. After that, the cold ải intensified, affecting Vietnam until 7:00 am on December 4, 2006, when it weakened.

Super Typhoon Noru has left at least six people dead and millions of people left with power outages and flooding after sweeping through the Philippines.

Super Typhoon Noru changed direction, suddenly strengthened on September 25 and made landfall in the northeast of the Philippines, causing flooding in areas north of the capital Manila.

In Vietnam, Storms and floods after the storm also injured 62 people; 3,364 houses were damaged or roofed off (Quang Tri 168 houses; Hue 419 houses; Da Nang 228 houses; Quang Nam 1,150 houses; Quang Ngai 1,352 houses; Gia Lai 7 houses; Kon Tum 27 houses; Nghe An 13 houses). Large floods after the storm caused 7,346 houses to be flooded (of which, in Nghe An province, 7,306 houses were flooded).

Regarding livestock, 1,724 cattle and 20,292 poultry died and were swept away by flood water.

Typhoon Noru damaged 5,372 trees. Regarding irrigation, roof erosion downstream of Hoc Coi dam in Nghe An); 500m canal erosion (Ha Tinh); 1,000m of dykes and sea embankments are damaged and eroded (Ha Tinh has 500m, Quang Tri has 500m); 12 dams and reservoirs were eroded. Regarding riverbank and coastal erosion: 2,660m of coastline in Thua Thien Hue were eroded and 1,040m of riverbank (Tha Thien Hue 320m, Ha Tinh 720m). The education sector was also heavily damaged, with 77 affected schools damaged in Da Nang City and the provinces of Thua Thien - Hue, Quang Nam and Quang Ngai. There were 1 boat and 8 small boats damaged and sunk at the anchorage.

As for the power system, when the storm overcame, 10,510 substations lost power temporarily, so far, the localities have finished overcoming. As of the evening of September 29, there was still one 110kV transmission line (belonging to the 110kV power grid) that had not been restored, causing Quang Nam province to still be without power in 147 communes.

(source: vneconomy.vn)

Figure 1. *Many places have damages after Noru typhoon in Phillippines (source: zingnews.vn).*

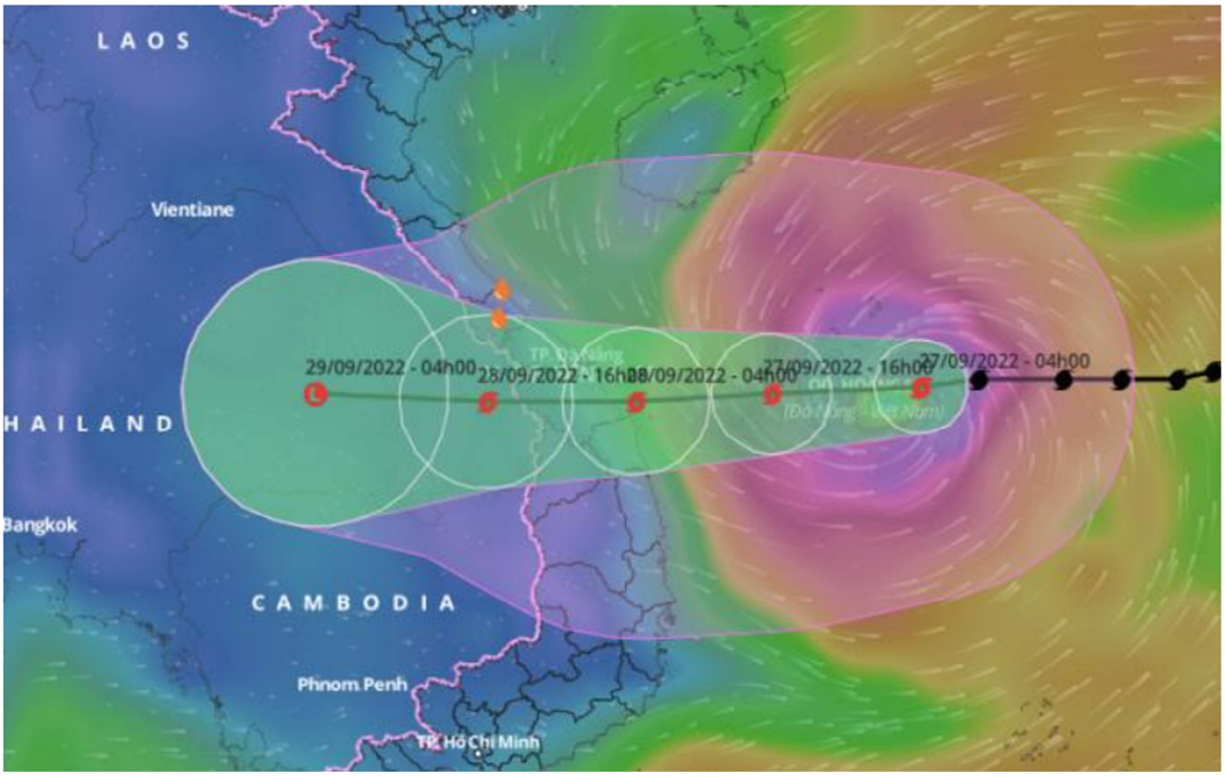

Figure 2. *Path of Super typhoon Noru (source: vneconomy.vn).*

3.2. Characteristics of the Heat Field in the Storm Before and After Cold Air Infiltration

Time of Cold Air Penetrates

During the time before the impact of the cold air, the temperature in the storm was still evident with a hot core in the center of the storm.

Storm surges and huge waves induced by cold air outbreaks (CAOs, also known as cold waves) adversely affect the economic development of coastal cities [1-3]. Researchers have simulated the marine dynamic environment during CAOs using numerical models and hindcasted the water level, currents, and waves separately.

Thus, the intrusion of cold air into the storm has increased the asymmetry of the temperature distribution in the storm. After the time of cold surge infiltrating into the East sea, the cold advection brought cold air in from the northern and western areas to make the temperature in these areas [16-18].

4. Conclusion

The results show that the temperature field in the storm under the influence of cold air has an asymmetrical distribution around the center at the center of the storm, after the cold air entered, the temperature was even lower in the eastern and southern parts of the storm.

Moreover furhter searches needed to be done in the field [18-20, 52-61].

In Vietnam, Although Typhoons has dissipated, the rain after typhoon No. 4 has left 3 people dead and missing, more than 7,000 houses were flooded, tens of thousands of hectares of agriculture and fisheries were damaged... Nowadays there are more research methods can be applied in this field [17-24, 35-39, 46-51].

Moreover, our research shows that together with the invasion of cold air in a process, the change in temperature characteristics is recorded much. After the intervention of cold air into East sea, from North and West, this caused temperature to increase slightly.

Last but not least, research showed that cold surge is considered to affect the area when the 24-hour transformer has a value greater than 1hPa. Studies showed that The effects were investigated from 1991 to 2011 based on archived data from the National Centers for Environmental Prediction and the National Center for Atmospheric Research (NCEP-NCAR) and the number of typhoons were sourced from the International Best Track Archive for Climate Stewardship (IBTrACS. And role of technology in predicting tropical huricanes and typhoons are important [23-30].

Author's Contribution

Developing ideas and choosing research methods: Huong C. T. T.; Data analysis and processing: Huong C. T. T.; Linh T. D.; Writing the manuscript: Huong C. T. T.; Linh T. D.; Revised: Dinh, T. N. H; Editing of the article: Huong C. T. T.

Conflicts of Interest

The authors declare no conflict of interest.

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