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Discussion of The Benefits on Drought Condition and Marine Ecosystem after Tropical Cyclones: Case Study in Vietnam

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OUTLINE

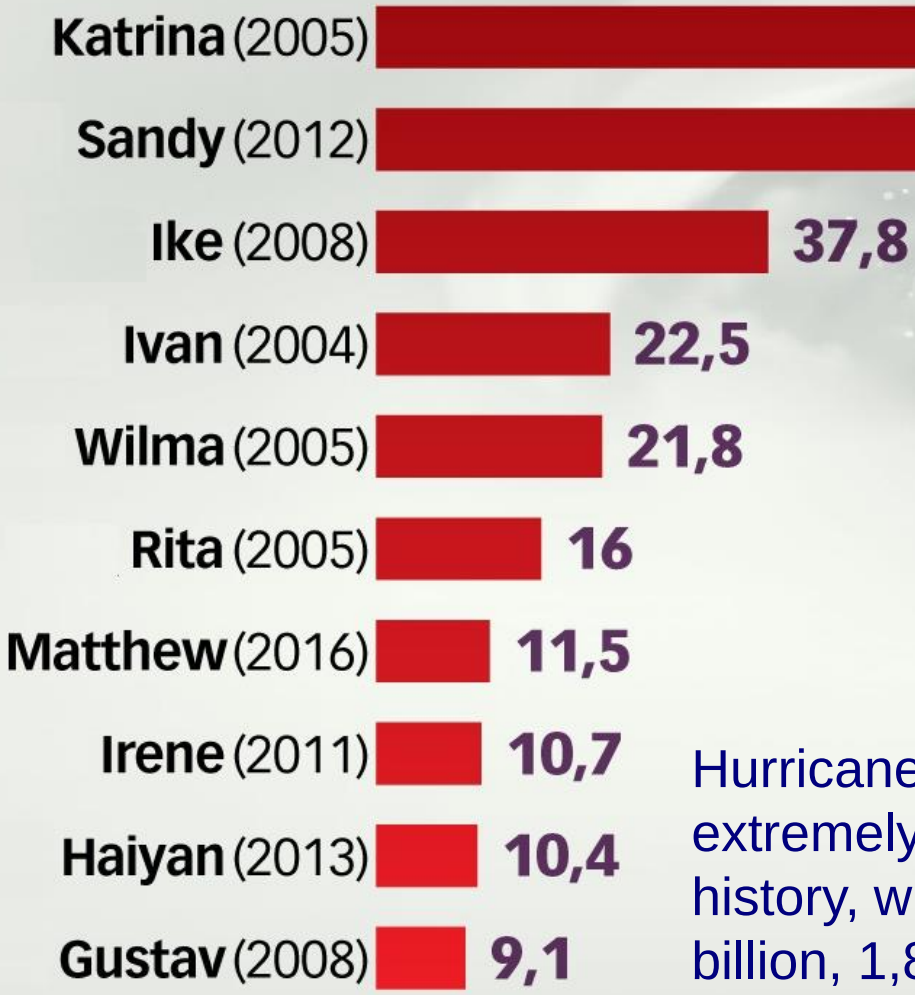
- Introduction
- Materials and Methodology
- Results and Discussions
- Conclusions and Outlooks

INTRODUCTION

Tropical cyclone (TC)/ tropical depression (TD)

- The natural disasters, because of the damage they cause to the economy, society and ecosystems where they pass.
- The frequency and intensity of TC/TD has increased (Kang & Elsner, 2015)
- Take so much time and money to reconstruct infrastructure and resettle down the local lives

Introduction



TC Haiyan (Philippines) (on 8 Nov 2013) was the TC with the strongest winds up to 315km/h and caused a damage estimated around $10.4 billion, 6,340 people died, 1,061 missing and more than 28,000 injured

Hurricane Katrina (on 29 Aug 2005) was extremely destructive and deadly TC in US history, with total property damage around $125 billion, 1,836 people died

(http://www.tuoitre.vn)

TC hitting Vietnam in 2017

- Doksuri (mid-September) was one of the strongest storm striking the northern of Central Vietnam during 28 years (total damage of $793 million

- Damrey (early November) was the strongest one to landfall to South-Central Vietnam since 2001 (total damage reached over $1 billion)

(https://www.wikipedia.org/)

http://www.planetanovosti.com

http://www.xaluan.com

INTRODUCTION

- Some benefits of TC/TD
  - provide the global heat balance
  - contribute to the total rainfall and bring precious water to drought areas. Besides that, they can reduce the temperature in such area as well as enhance air purification in the city
  - help to supplement nutrients from deep water to near surface, from inland to onshore and offshore through the rivers and run-off, and increase dissolved oxygen levels near the surface water and in the aquifers
  - spread spores and seeds further inland from where they normally grow and replenish inland plant life because of strong wind

(Soffar, 2017)

INTRODUCTION

- However, these benefits of the storm have not been addressed much in the management and mitigation of natural disasters.

- **The objective**
  - the good sides after TC/TD are discussed with case study of southern part of Vietnam Central Coast
    - benefit on drought area
    - benefit on marine ecosystem

MATERIALS AND METHODOLOGY

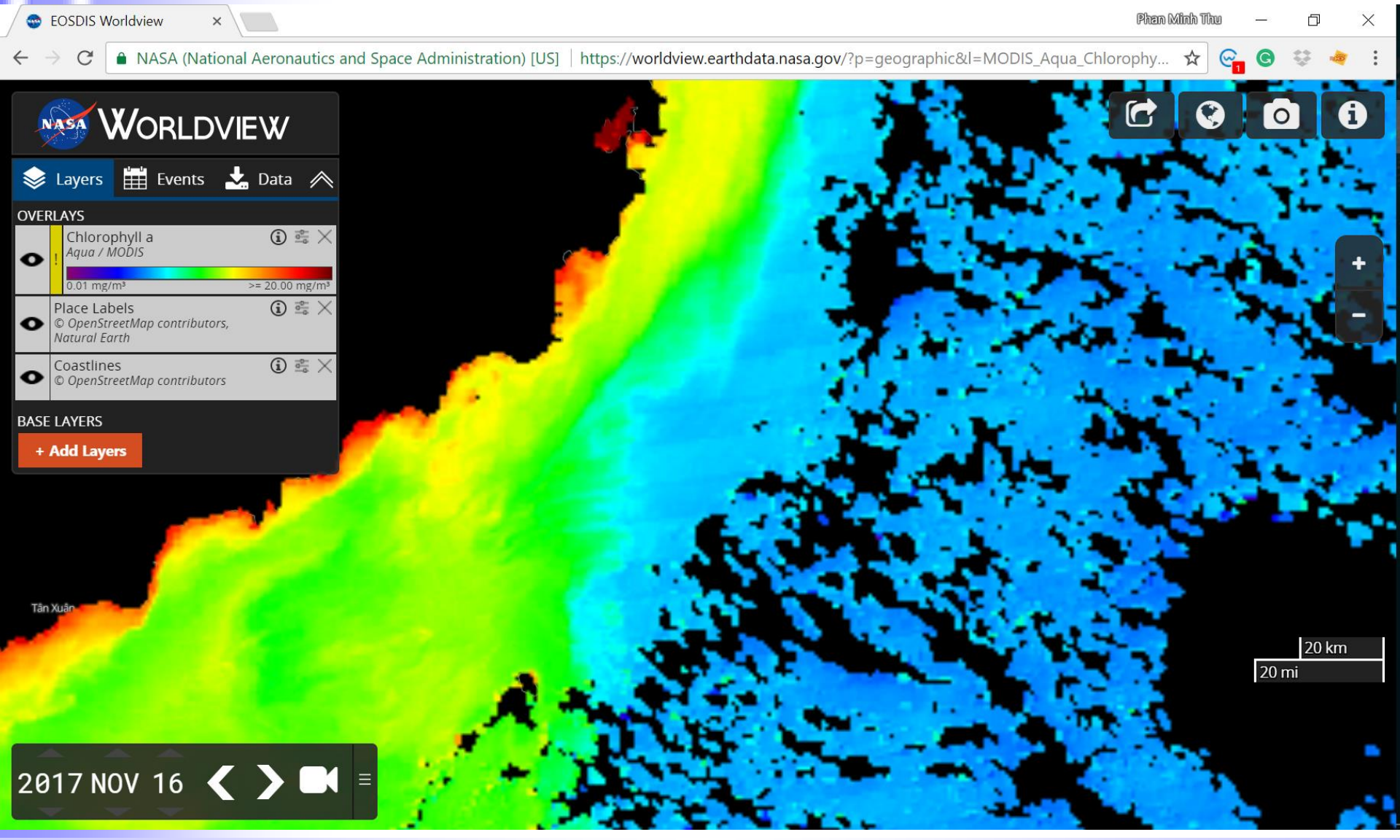
Materials and Data

- Daily rainfall from 2013 to 2016 and monthly rainfall data from 1977 to 2012 collected at Phan Rang Hydro-Meteorological Station (Ninh Thuan province) and provided by South-Central Regional Hydrometeorological Center

- Information of TC/TD was at https://www.wikipedia.org

- Daily MODIS L3 product of chlorophyll-a (chl-a) and daily GHRSST L4 product of sea surface temperature (SST) [https://worldview.earthdata.nasa.gov]

Daily MODIS L3 product of chl-a



Data analysis

- For drought condition:

  SPI (Standardized Precipitation Index)

  (Handbook of Drought Indicators and Indices (WMO & GWP, 2016))

  - SPI3 for basic drought condition
  - SPI6 for agricultural impact

- For marine ecosystem: daily chl-a and SST within ±10 days of TC/TD that affected to the study area.

Classification of SPI

SPI	Classification
≥ 2.00	Extremely wet
1.50 to 1.99	Very wet
1.00 to 1.49	Moderately wet
-0.99 to 0.99	Almost normal
-1.00 to -1.49	Moderately dry
-1.50 to -1.99	Severely dry
≤ -2.00	Extremely dry

(Guttman, 1999)

RESULTS AND DISCUSSIONS

Benefits on drought condition

Ninh Thuan Province

- located in southern part of Vietnam Central Coastal region
- highest temperature (26– 27^{o}C) and the lowest rainfall (700-800 mm in Phan Rang)
- tropical savanna climate
- two seasons:
  - rainy season (from Sep. to Nov.) and
  - dry season (from Dec. to Aug.)
- about 1 TC/TD event / year with heavy rain
- Heavy rains due to synoptic weather situations: TC/TD, ITCZ, cold NE monsoon, SW monsoon, low trough and so on.

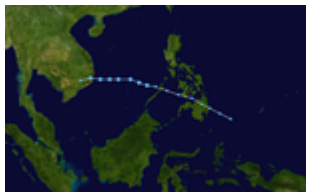
Benefits on drought condition

Information of TC/TD in Ninh Thuan province in 2013-2016

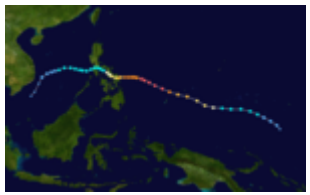
Phan Rang

TC Sonamu 2013

TD 30W (Wilma) 2013



TC Podul 2013



TC Hagupit 2014

Nov 2016 VNTD

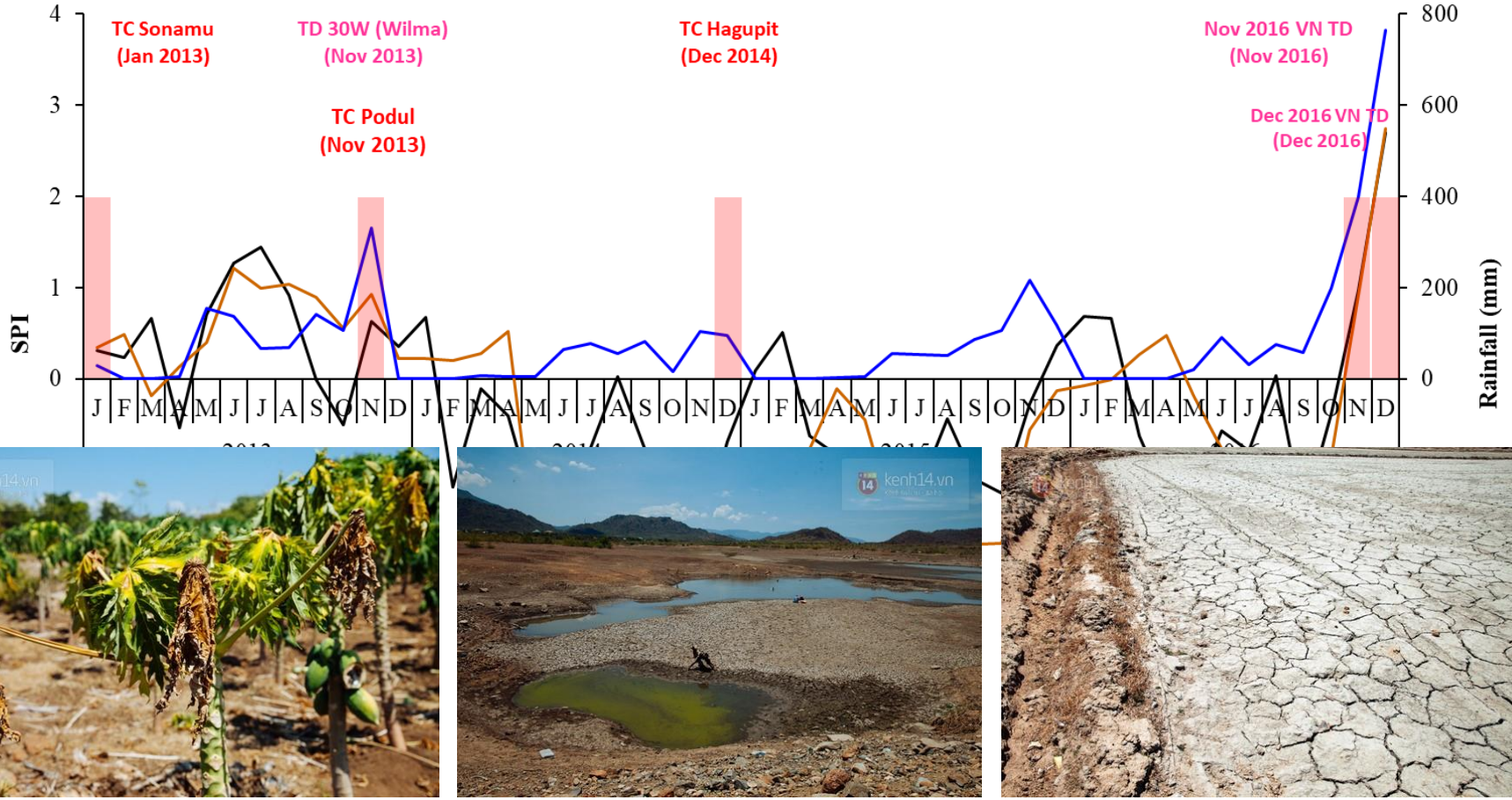
Dec 2016 VNTD

No	Type	Name	Duration	Daily Rainfall	Date	Total rainfall in month	Monthly Clima. rainfall
1	TC	Sonamu	1-10/Jan/2013	25.1	7/Jan/2013	29.0	6.6
2	TD	30W (Wilma)	1-21/Nov/2013	23.2; 27.8	6-7/Nov/2013	330.9	156.3
3	TC	Podul	11-15/Nov/2013	59.5	15/Nov/2013	330.9	156.3
4	TC	Hagupit	30/Nov-12/Dec/2014	17.9	12/Dec/2014	95.8	75.2
5	TD	Nov VNTD	2 - 6/Nov/2016	111.0; 76.0	4-5/Nov/2016	399.3	156.3
6	TD	Dec VNTD	10- 13/Dec/2016	148.0	13/Dec/2016	765.0	75.2

(https://www.wikipedia.org)

Benefits on drought condition

Trend of SPI3 and SPI6 related to rainfall in Phan Rang, Vietnam



(Trí Thức Trẻ/ Kênh 14, 2015)

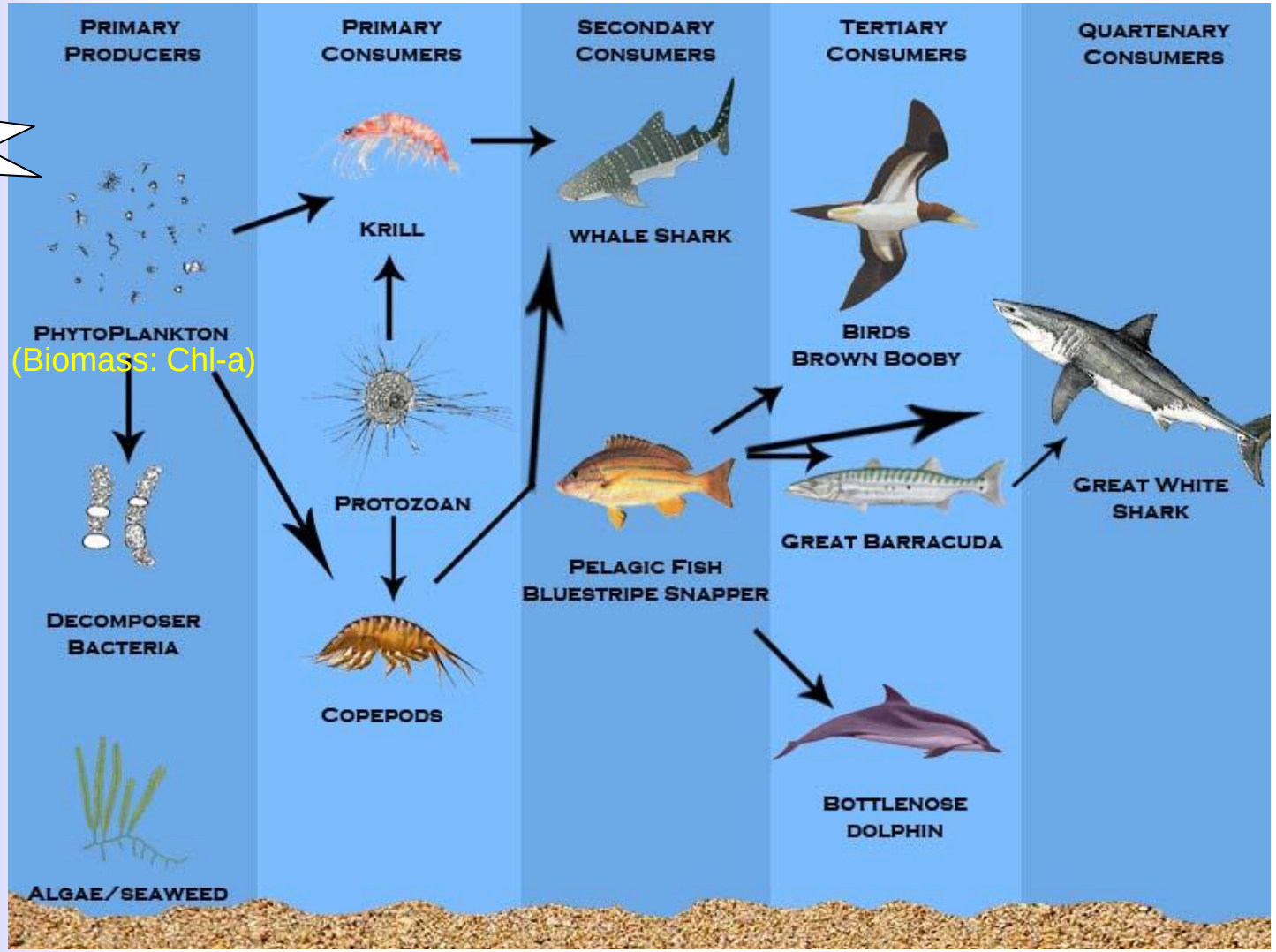
The pink rectangle indicates the month TC/TD operating

Light

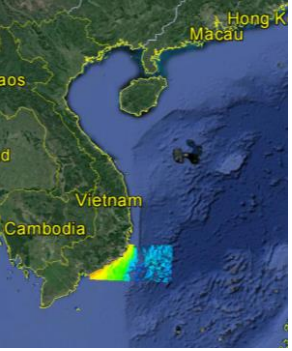
Nutrient

Trace element

Marine food chain

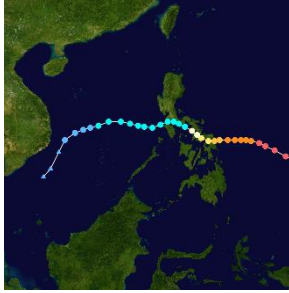


(https://www.thinglink.com)



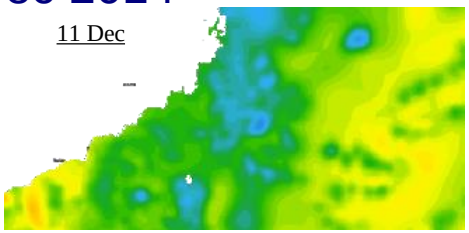
Benefits on marine ecosystem Hagupit 2014

effect to offshore marine regions of Ninh Thuan – Binh Thuan on 10-12 Dec 2014



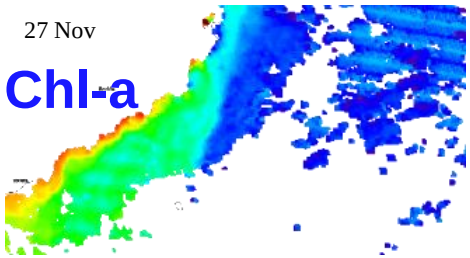
11 Dec

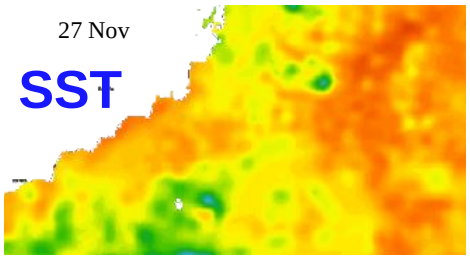
No data because of cloud (storm appearance)

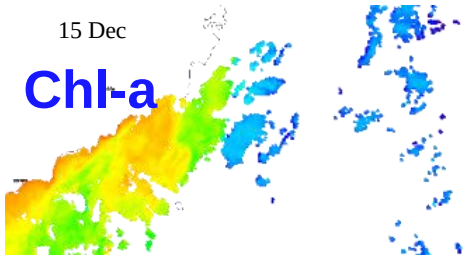


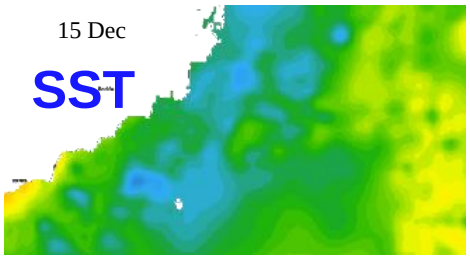
before the event (27 Nov – 08 Dec)

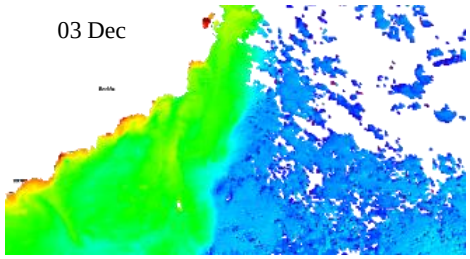
after the event (15 – 31 Dec)

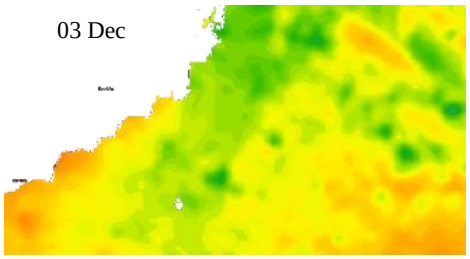


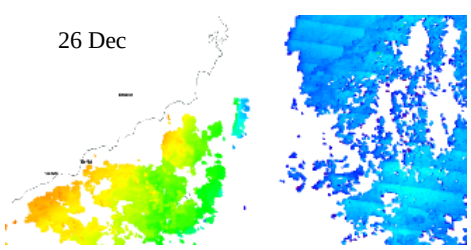


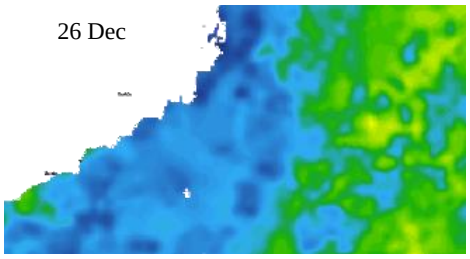


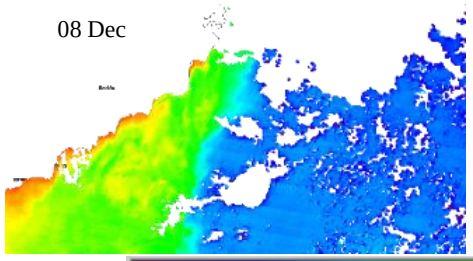


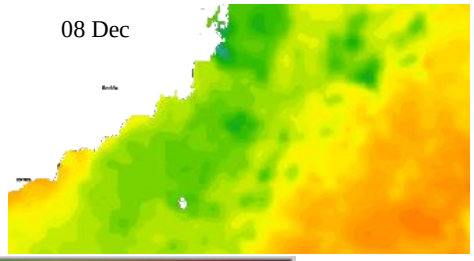


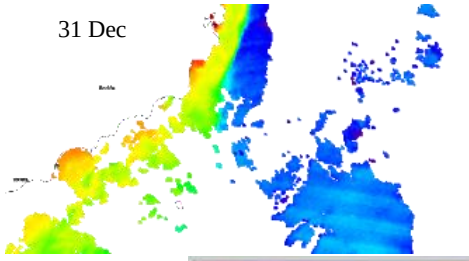


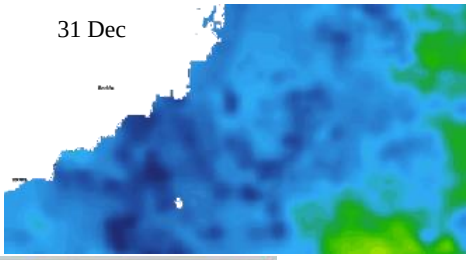


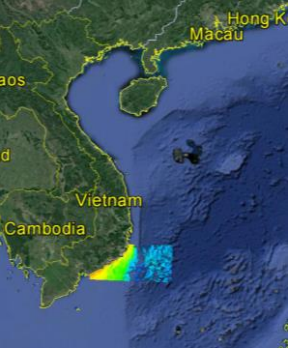






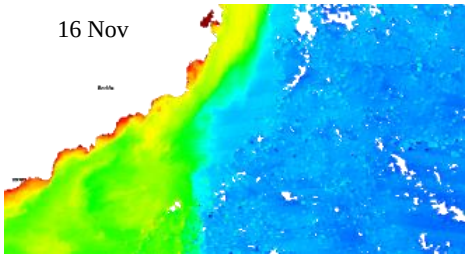


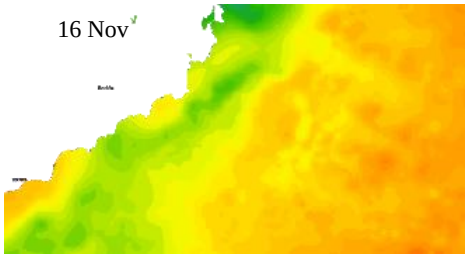




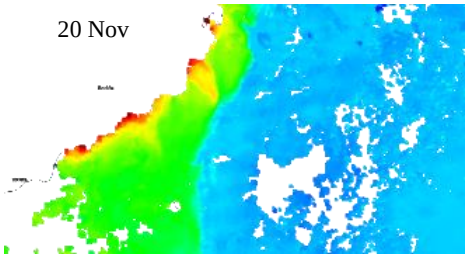
Benefits on marine ecosystem Kirogi in 2017

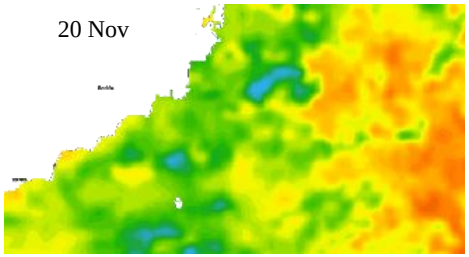
Before the event (16 Nov)



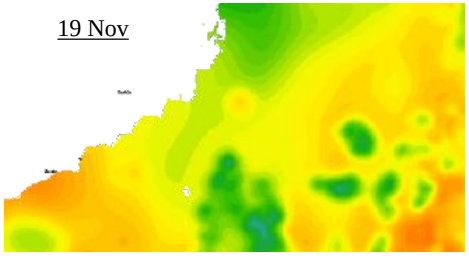


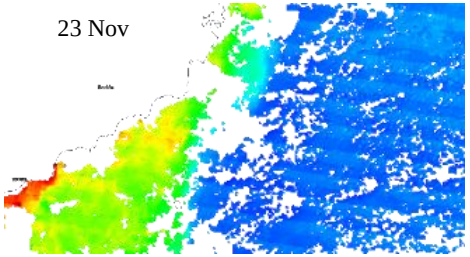
After the event (20 – 23 Nov)

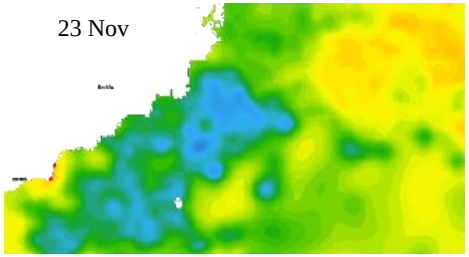




19 Nov
No data because of cloud (storm appearance)







Chl-a **SST** **Chl-a** **SST**

0.01 Chl-a ≥20 mg m^{-3}

18 SST ≥32°C

affecting to the marine region of Ninh Thuan – Binh Thuan on 18 – 19 Nov

CONCLUSIONS

- Although TC causes destructive and deadly damage to the places it passes, it also provides some economic and ecological advantages.

- Some of the possible benefits from TC.
  - increasing total rainfall and decreasing the drought condition in savanna area Ninh Thuan province, Vietnam
  - stimulating the phytoplankton growth in South Central Coast

OUTLOOKS

- Due to lacking fish catch data, the increase in fish stocks did not demonstrate to clarify the role of TC on marine resource.

→ it is necessary to conduct detailed field observations on issues related to fisheries.

After TC Talas on Jul 2017 in Nghe An

- The benefits of the storm only exist for a short time (often 5-15 days), so as soon as the storm passes
  - reconstructing and recovering
  - preparing and making the specific and concrete plans to exploit and take advantage of these benefits from storms, that can help to adapt and mitigate the effects of natural disasters and improve the quality of life.

ACKNOWLEDGMENTS

- We would like to thank to **South- Central Regional Hydrometeorological Center**, National Hydro-Meteorological Service, Khanh Hoa Province, Vietnam, which provide rainfall data to support this study


рахмат
ngiyabonga
danke
謝謝
teşekkür ederim
Баярлалаа
mersi
kia ora
barka
welalin
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spas
mahalo
tapadh leat
спасибо
faafetai lava
vinaka
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dank je
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matondo
paldies
grazzi
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nanni
nandri
dhanyavad
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