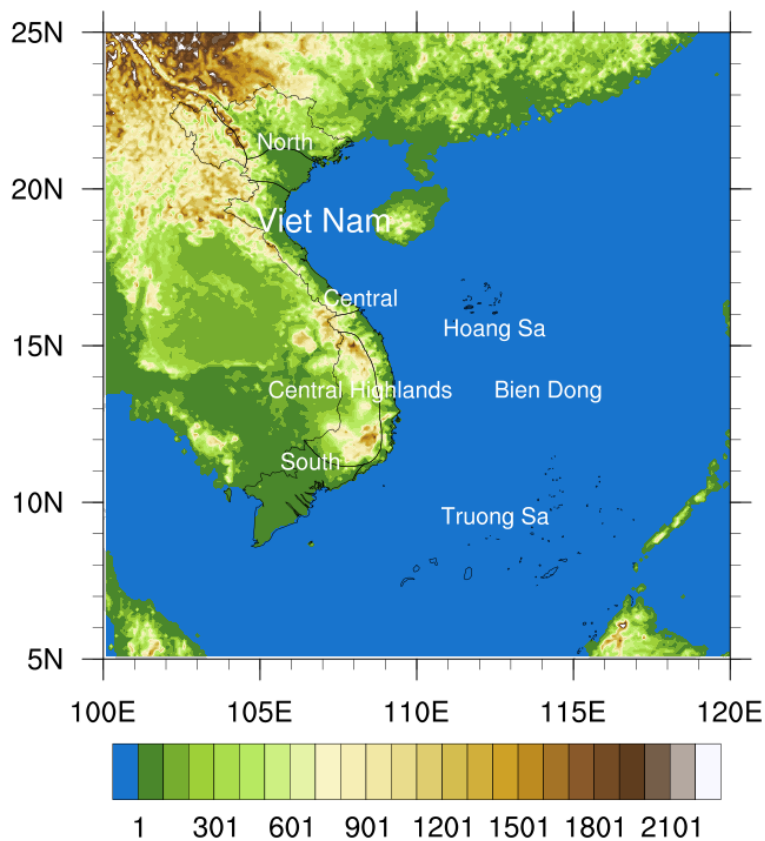
Referee #1

1.Specific Comments

1. In the manuscript, the authors examined the rainfall variation for different regions in Vietnam (i.e., North, Central, South, Central Highlands). It is better if the authors demarcate these regions in one figure. This will help the readers know where the authors want to mention.

   We agree with the reviewer's comment, we will incorporate below figure to demarcate the different regions (North, Central, South, Central Highlands) per the reviewer's recommendation).

2. The performance of CMORPH data in depicting the rainfall variation in Vietnam is not good. For example, May-July is rainy season in the central highlands but dry season in the north central Vietnam. However, CMORPH shows that the rainfall during May-July in the north central Vietnam is higher than that in the Central Highlands (Figs. 1a-f), which is because CMORPH significantly underestimates rainfall in the Central Highlands (Trinh-Tuan et al., 2019). Consequently, the rainfall variation in Vietnam observed by CMORPH may not be the true features. Thus, the authors should use other precipitation data which can capture better the true features of rainfall variation in Vietnam.

We agree that there is an underestimation of CMORPH data on Central Vietnam compared with different dataset like VnGP (Trinh-Tuan et al, 2019). Except these underestimation the other spatial variations are well represented by both datasets, which are also well documented in the book published by *(N.D Ngu and N.V.Hieu, 2013) [from a book on climate and climate resources of Vietnam, published by the Science and Technology publishing house in 2013]*.

Since the CMORPH satellite rain representation is relatively good for the research area, we believe that the results provided by this study are robust enough given using CMORPH data alone.

Additionally, we have provided extra details about the average monthly rainfall for the three months of May, June, and July (Figures 1, 2, 3) to demonstrate the similarity between CMORPH rain and VNGP.

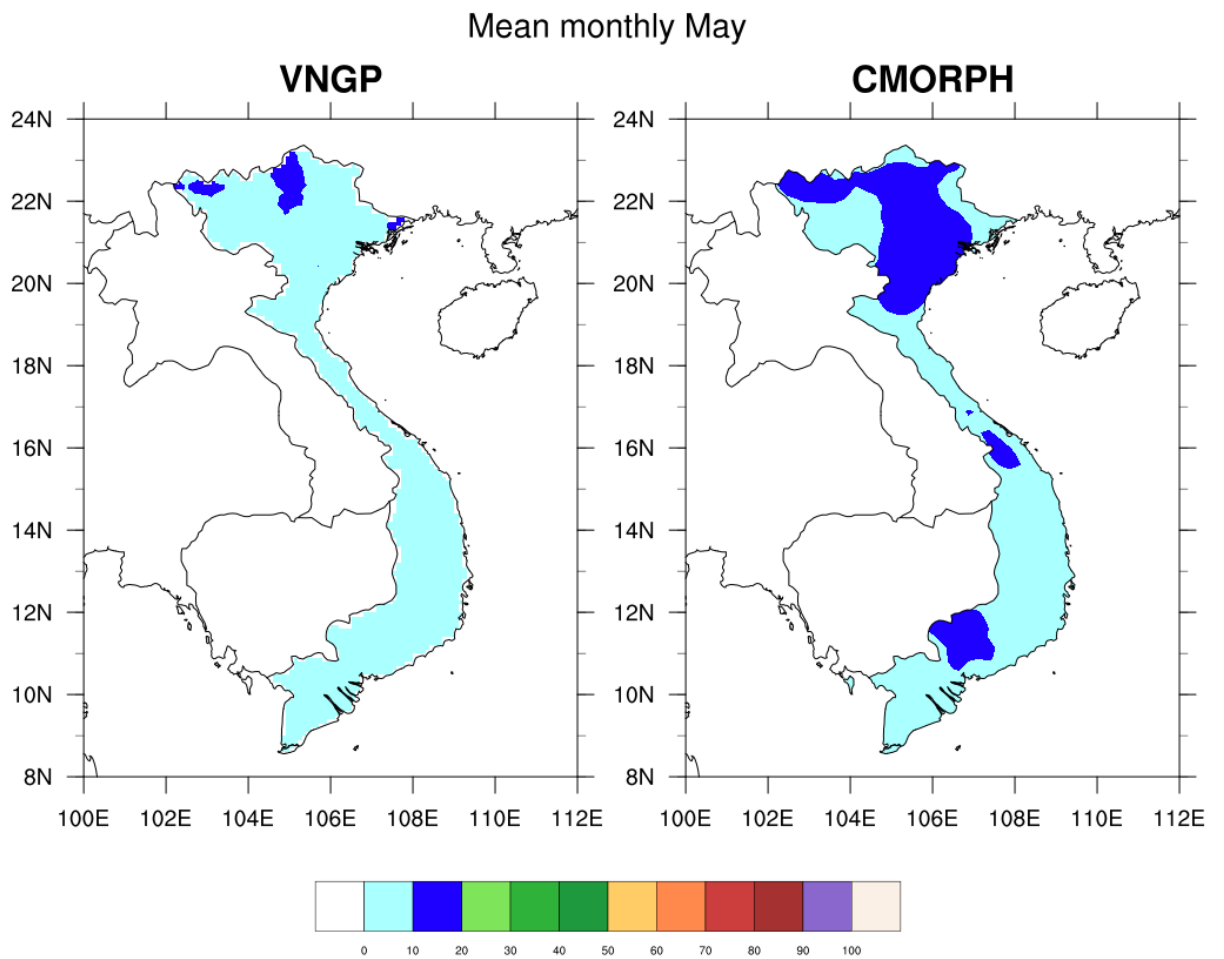



Figure 1: The average rainfall in Vietnam during May (from 2000 to 2020)

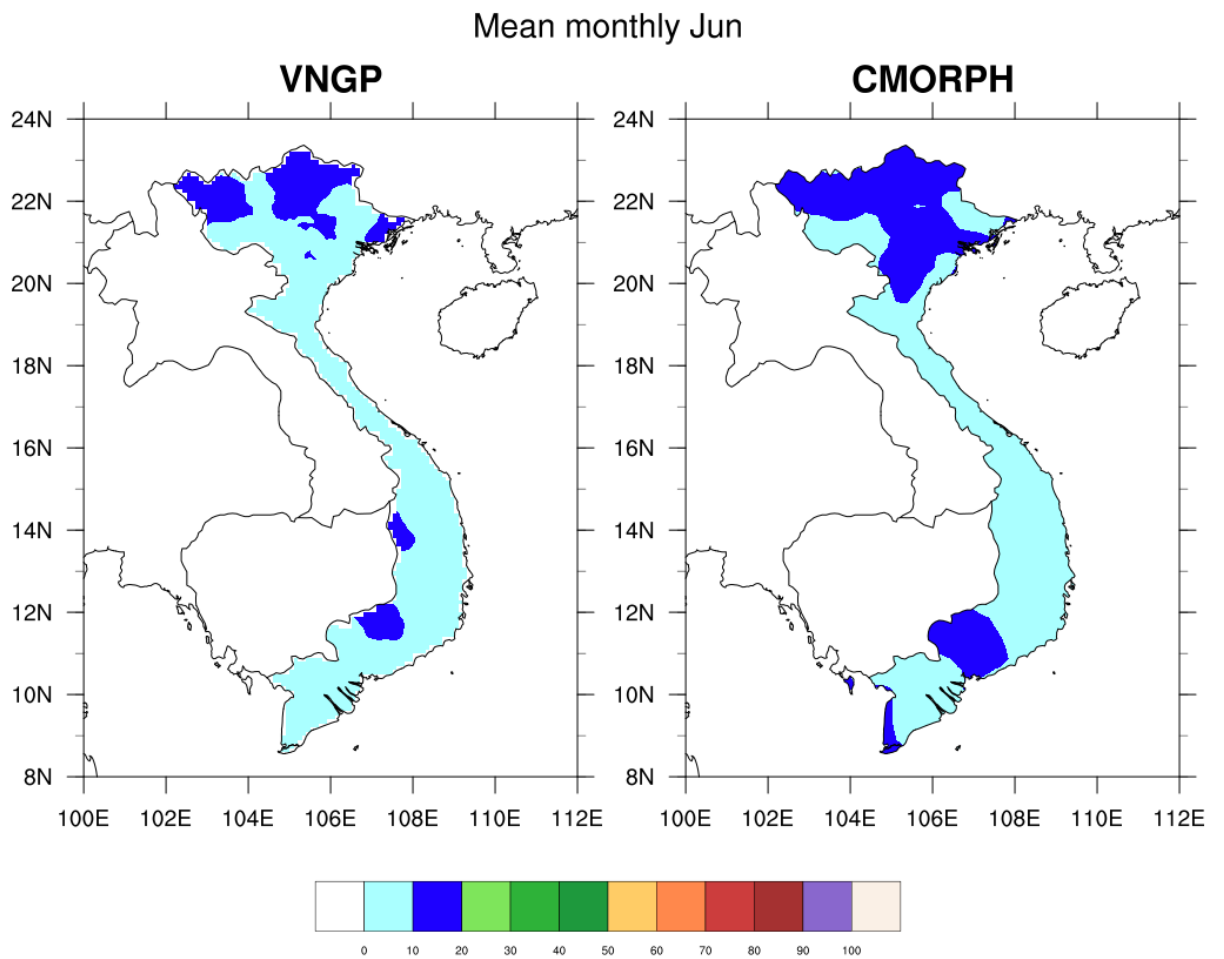



Figure 2: The average rainfall in Vietnam during June (from 2000 to 2020)

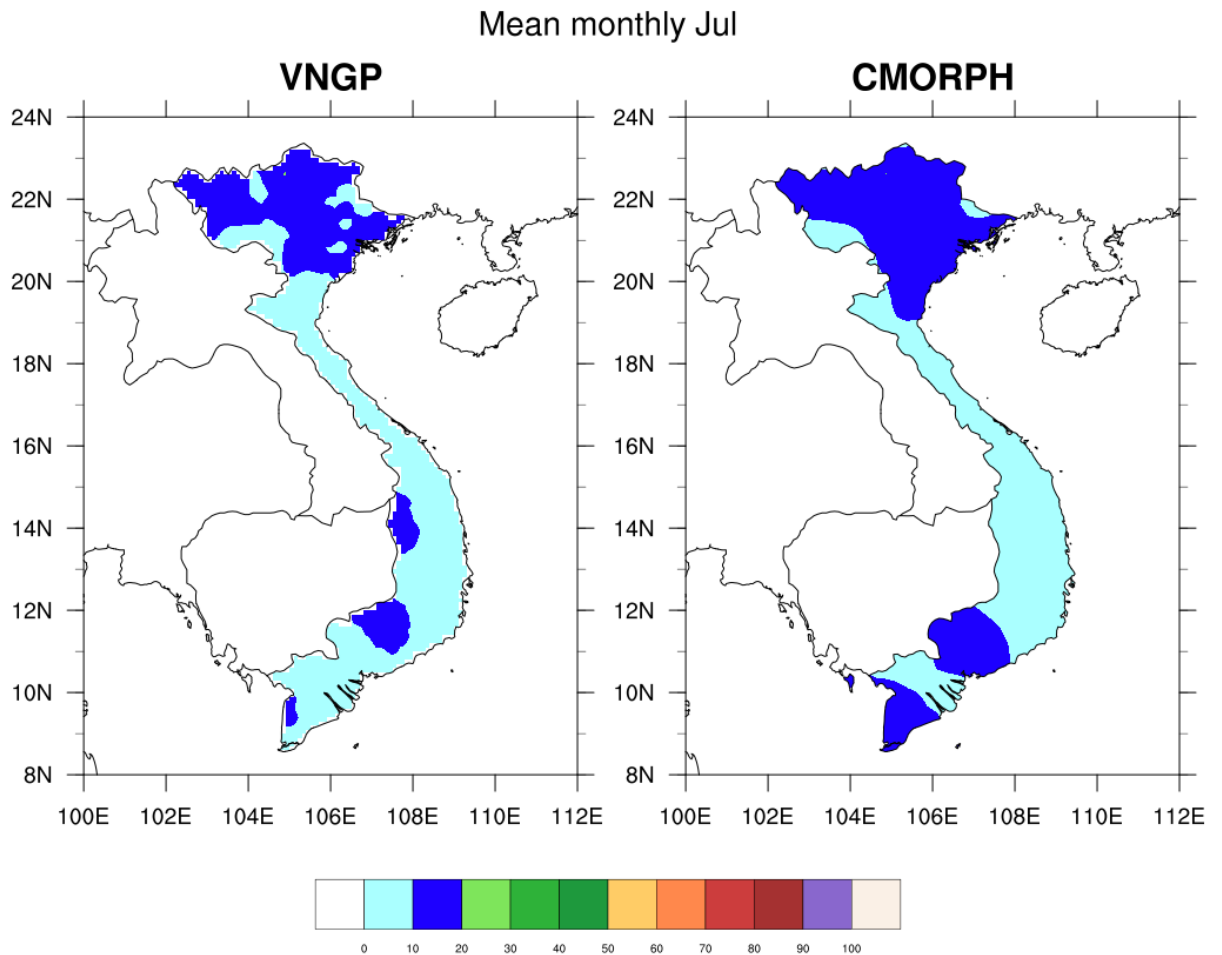



Figure 3: The average rainfall in Vietnam during July (from 2000 to 2020)

3. The authors calculated 90th percentile of rainfall across all grid points (Figs. 1g-l), then used this threshold to determine the number of extreme rainfall days (Figs. 1m-r). Accordingly, the number of extreme rainfall days should be about 3 days/ month for all grid points. However, the authors showed that the number of extreme rainfall days of each month vary significantly from 0 to 6 days (Figs. 1m-r). The authors should check their calculation because it affects to all the analysis and conclusion in the latter parts.

The 90th percentile threshold is determined on subset of rainnydays (defined as days with rainfall >= 0.3 mm for target 21-year period). This is the reason the number of detected days varies.

Figure 1 (m-r) shows the average number of significant rainy days across the months, with values predominantly ranging from 3 downwards.

The study utilized data spanning 21 years, calculating the average number of extreme rainfall days per month. This involved summing up all the significant rainy days for each month over the 21-year period and then dividing by 21. As a result, we observe values commonly falling between 0 and 3, although occasionally there may be 4 extreme rainfall days.

4. Line 83-85, The authors wrote "Van de Linden et al. (2016) demonstrated that the heavy rainfall in northern Vietnam in August 2015 was caused by a westward movement of a low-pressure system over the northern region combined with the strong activity of the southwest monsoon". Is this statement true? Van de Linden et al. (2016) studied about rainfall in the southern VN, they did nothing about heavy rainfall in Northern Vietnam.

    We apologize for the mistake. The correct reference is Van de Linden et al. (2017): "The Dynamics of an Extreme Precipitation Event in Northeastern Vietnam in 2015 and Its Predictability in the ECMWF Ensemble Prediction System"

5. 2g-l, Figs. 6g-l, and Figs. 7g-l are redundant. The main goal of this study is investigating the relationship between ISOs and heavy rainfall. The authors should focus on the phase which induces heavy rainfall events instead of the phase whose highest occurrence frequency.

    Figs 6g-l and 7g-l are not redundant. There was a typo in original caption of Fig 7g-l. Fig 6 shows the same with Fig 2 but for MJO, meanwhile Fig 7 shows the same with Fig 3 but for MJO.

6. In Fig. 3, why the anomalous rainfall over the central Highlands is very small at phase 4 but the probability of extreme rainfall is high? The authors should give detail about the time of this figure.

    In the Central Highlands (Tây Nguyên), there is a low amount of light rain during phase 4, but the likelihood of extreme rainfall is very high. This is due to a probability formula that takes into account heavy rain occurrences and the activity of the BSISO (Boreal Summer Intraseasonal Oscillation). Since heavy rain is scarce, any abnormality in light rain becomes more noticeable. The smaller the denominator in the probability formula, the higher the resulting probability

7. Line 129-132, the authors wrote "This identification of rainfall events is conducted across all grid points from May to November, which is considered the rainy season in North and South Vietnam. The period from December to April is considered dry season in Vietnam (Nguyen-Le et al. 2014); therefore, it is excluded from our analysis". However, in Fig. 6, Fig. 7, Fig. 9, and Fig. 10, the authors plotted and do analysis for December to April. Why they are inconsistent?

The BSISO impacts the summer months, while the MJO affects whole year including the winter and autumn months. Despite the typically low rainfall during these periods, we still analyze and assess the influence of MJO on precipitation in Vietnam during these months, as there are occasional heavy rains.

8. Line 155-159, "It is important to note that, although the timing of rainy season onset is similar between the North and South Vietnam, the rainfall amount in the former is significantly higher than that in the later. This difference in rainfall amount is primarily caused by the extratropical factors effecting the North Vietnam in summer (Tuan et al. 2019)". How is the role of tropical factors such as tropical cyclone, monsoon trough, and intertropical convergence zones which authors mentioned in Line 75-76?

We agree that the role of tropical factors such as tropical cyclone, monsoon trougt and UTCZ are assumed to contribute to the spactail variablity of rainfall onset. Investigating these factors' role is beyond this paper's scope as it qualifies as an independent paper. We will address this in the next paper.

9. Line 164-166: "In another hand, heavy rainfall only begins to appear in Central Vietnam in September which is related to the intensification of cold surge, activities of tropical disturbances and orographic effects (Yokoi and Matsumoto 2007)". In Yokoi et al. (2007), there is no information that the authors cited. The authors should double check this.

The correct reference is:

Yokoi, S., and Matsumoto, J. (2008). Collaborative effects of cold surge and tropical depression–type disturbance on heavy rainfall in central Vietnam. Monthly Weather Review, 136(9), 3275-3287.

10. Line 186-188: "Lastly, the number of extreme rainfall days in Central Vietnam reaches its peak in October-November, corresponding to the increase of rainfall in

the subregion in the period". How could the authors write that while Fig. 1 does not have November?

We will revise the text "October-Novermber" to "October" for consitency between evidence and statement.

11. In line 236-239, the authors wrote "While the probability of extreme rainfall tends to decrease over the North Vietnam, it is rapidly intensified significantly in the North Central and South Vietnam, consistent with the development of cold surge and activities of tropical disturbances during this period". If the heavy rainfall events are induced by development of cold surge and activities of tropical disturbances, what is the contribution of BSISOs to these heavy rainfall events?

BSISOs are active at this time, contributing to increased rainfall in the Central region with cold intrusion.BSISOs are active at this time, contributing to increased rainfall in the Central region with cold intrusion.

12. Line 266-270, the authors wrote "While anomalous rainfall displays ….. to early autumn". Figure 6 and 7 only show the rainfall in phase with highest occurrence frequency, which does not provide enough evidence to support the authors' statement.

We will revise the statement to make it consistent with evidence.

13. Figure 8: Why the authors chose October to plot instead of other months?

This is because the likelihood of extreme rainfall occurring in October varies across different phases, with the highest probability observed.

14. In Fig. 4, Fig. 5, Fig. 9, and Fig. 10: How did the authors use to determine which phase play the most important role in modulating the extreme rainfall?

The phases with the highest probability of extreme rainfall will significantly impact the adjustment of rainfall amounts

15. Conclusion: Line 343-345, this conclusion is not consistent with the result observed in Fig. 9 and Fig. 10 and what the authors wrote in Line 305-311.

We will remove this conclusion. **Technical corrections:**

1. Line 39: typo "heavey".

Thanh: We will address this in the upcoming version

2. Line 51: typo "theCentral".

Thanh: We will address this in the upcoming version

3. Line 55: There are no Nguyen et al. 2023 and Nguyen et al. 2022 in references.

The corrected reference should be (Thang et al. 2022; 2023):

Thang NV, Mau ND, Khiem MV, Duong TH, Kham DV, Thuy TT, Tuan VQ, Minh TTT (2022) Climatic factors associated with heavy rainfall in Northern Vietnam in Boreal Spring. Adv Meteorol. https:// doi. org/ 10. 1155/ 2022/ 59177 29

Thang NV, Mau ND, Van DQ, Tuan BM, Khiem MV, Kham DV, Thuy TT, Duong TH, Tam TT, Quyen NH, Thai LX, Hien TD (2023) Orographic effect and the opposite trend of rainfall in Central Vietnam. Adv Meteorol. https:// doi. org/ 10. 1155/ 2023/ 72566 34

4. Line 72-73: There are no (Khanh 1993; 1998a, 1998b, Lanh 2012) in references.

Thanh: We will add to the reference section.

Khanh T. G., 1993: Analysis and Forecast of the Storm Landfall Process in the Area from Quảng Ngãi - Đà Nẵng to Quảng Ngãi, Influenced by Cold Air from the North. Central Region Floods Project - Hydrometeorological Forecasting Department, September 1993. (*in Vietnamese*)

Khanh T. G., 1998a: Classification of Synoptic Patterns Causing Heavy Rain in the Area from Quảng Nam - Đà Nẵng to Khánh Hòa. (*in Vietnamese*)

Khanh T. G., 1998b: Professional Weather Forecasting Guide. Internal Circulation Document. (*in Vietnamese*)

Lanh N. V.,, 2012: Research to Identify Major Weather Systems and Patterns in Vietnam for Weather Forecasting, Especially Dangerous Weather Phenomena. Report on the Results of the Ministry-level Science and Technology Project, 134 pages. (*in Vietnamese*)

5. Line 80: Wu et al. (2011) should be Wu et al. (2012).

We agree. Wu et al. (2012) is correct

6. Line 96: There is no Wu et al. (2021) in the references.

The correct reference is Wu et al. (2012)

7. Line 97: There is no is Yen et al. 2011 in the references.

The correct reference is:

Yen, M.-C., and Coauthors, 2011: Interannual variation of the rainfall in central Vietnam. J. Meteor. Soc. Japan, 89, 193–204.

8. Line 115: The authors should provide full name of CMORPH before abbreviation

Thanh: We will address this in the upcoming version

9. Line 121: The authors need to provide reference for BSISO and MJO index.

10. Line 127-128: "In this study, a rainfall event is identified based on the 90th percentile of days with rainfall exceeding 0.3 mm in each respective month". The authors should revise this sentence to make it clearer.

Thanh: We will address this in the upcoming version

11. Line 157: "differrence" should be difference .

Thanh: We will address this in the upcoming version

12. Line 197-198: "In June and July, phase 5 and phase 3 of the BSISO-2 exhibit the highest frequencies, respectively". Phase 5 does not show the highest frequency of BISOS-2, the authors should check.

Thanh: We will address this in the upcoming version

13. Line 228: typo "of of ".

Thanh: We will address this in the upcoming version

14. Line 233: the sentence "From July to August, …. rainfall" need to revise.

Thanh: We will address this in the upcoming version

15. Line 318: The authors should indicate where is Bien Dong on the map.

Thanh: We've included a map to display the location