VIETNAM GRIDDED CLIMATE DATASET VERSION 2: PRELIMINARY RESULTS

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ABSTRACT

This presentation summarizes a published study on the Vietnam Gridded Precipitation dataset (VnGP) and our plan to generate an extended version for temperature and humidity variables and for a longer data period. First, we address the necessity of producing a standard gridded climate dataset for Vietnam and its potential applications. Then we describe the different interpolation methods and evaluate their performance in order to select the most optimal approach to build the VnGP. Next, we present some preliminary results of the extended data version with temperature and humidity.

Keywords: VnGP, gridded climate dataset, Vietnam, interpolation method.

1. INTRODUCTION

Nowadays, climate datasets become extremely important as they can be used as inputs for many sectors such as water management, electric consumption, or infectious disease prediction. In 2016, the first version of the Vietnam Gridded Precipitation dataset (VnGP) was published (Nguyen-Xuan et al. 2016). After that, there have been several studies and applications using the VnGP to evaluate satellite rainfall (Nodzu et al. 2019; Trinh-Tuan et al. 2019a) or model rainfall (Trinh-Tuan et al. 2019b, Tuyet et al. 2019). However, the VnGP still needs improvement such as an extension for a longer time period, or incorporating some other climate variables (e.g. temperature, humidity, etc.).

2. DATA AND METHODS

In the published version of the VnGP (Nguyen-Xuan et al. 2016), we initially collected daily-observed rainfall data from 614 stations of the Vietnam Meteorological and Hydrological Administration (VMHA). The data were checked with a 5-sigma rule. Finally, only 481 stations among the 614 ones were selected so that no stations have missing data for more than 3 years over the study period of 1980–2010. Recently, data from 157 stations during the period 1961–2014 have been collected and will be used to update the VnGP. The newly collected data include daily mean temperature (T2m), maximum and minimum daily temperature (Tx, Tn) and relative humidity (RH).

To interpolate station information to 0.25° and/or 0.1° gridded datasets, different methods are used including Cressman (Cressman 1959), Inverse Distance Weighted (IDW) (Shepard 1968), ordinary Kriging (Switzer 2014), and Spheremap (Willmott et al. 1985). The different products obtained with the different interpolation methods are named Cressman, IDW, Kriging, and Spheremap, respectively.

3. RESULTS AND DISCUSSION

In terms of interpolation technique, which was investigated to conduct the VnGP, we have made the cumulative frequency distribution (CDF) of the gridded datasets over 481 stations in comparison with that of APHRODITE and that of gauge-observations. There is a clear difference in the frequency of precipitation values from 50–500 mm per month. For example, one can recognize
a higher frequency in the low rainfall ranges of APHRODITE than that of the other gridded datasets, which could be due to the small number of rain gauges used in building APHRODITE. It is also noted that the CDF curves of four interpolation methods resemble well each other; and are closer to the observed CDF in the high rainfall ranges compared to APHRODITE. In other verifications, the IDW and Kriging methods tend to show smoother rainfall patterns compared to that of Cressman and Spheremap (could be found in Nguyen-Xuan et al. 2016), it is not always the best with the independent data. It is shown that the utilization of more rain gauges improves the accuracy of the gridded rainfall, explaining why APHRODITE has a statistically lower performance over Vietnam compared to the newly built datasets. As having a relatively better performance with the dependent validation, the Spheremap product is chosen as a final product, which is released to the community.

![Figure 1](image1.png)

**Figure 1.** Cumulative frequency distribution of monthly rainfall over Vietnam 481 stations for APHRODITE, the gridded datasets, and the station observations (Nguyen-Xuan et al. 2016).

![Figure 2](image2.png)

**Figure 2.** 1961–2014 annual average temperature for APHRODITE, CRU and the new gridded products without and with elevation correction (units in °C).

Figure 2 represents the mean temperature averaged over the period 1961-2014 for APHRODITE, CRU, and the new gridded products (VnGP2) without and with elevation correction. In general, the VnGP2 exhibits similar temperature patterns compared to these of APHRODITE but with less detailed features, particularly over the mountainous region and Central Highlands. It is worth noting that for VnGP2 for temperature, we used the Kriging interpolation technique. These differences may appear due to the inappropriate parameters and, number of station used in the
interpolation method. In the future, we will also investigate other approaches to find the best solution for the new gridded climate dataset for Vietnam.

4. CONCLUSIONS

The different interpolation methods were used to build the different daily gridded rainfall datasets over Vietnam. In general, the built products well represented the spatial patterns and the seasonal variations of rainfall. The IDW and Kriging methods tended to show smoother rainfall patterns compared to that of Cressman and Spheremap. Although Spheremap showed a relatively better performance compared to the other methods with the dependent verification, it was not always the best with the independent data.

In the published version of the VnGP, the daily-observed data from 481 rain gauges over the period 1980-2010 were interpolated to the 0.25º and 0.1º grids by using the Spheremap interpolation technique. The development of an extended version of the VnGP with more climate variables and for a longer period could be very beneficial for assessing specific climate characteristics and can help avoid misleading conclusions with respect to the performance of climate models over Vietnam.

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REFERENCES


