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SHORT COMMUNICATION

Trends Analysis of Wind in Srinagar Garhwal Valley, Uttarakhand, India

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ABSTRACT

Wind results from the air in motion. Air in motion arises from a pressure gradient. Wind direction and wind speed are two characteristics of the wind, whose inter-relationships may give us an insight into the prevailing weather condition at a particular place. This study examines the trend analysis of the wind direction and wind speed pattern of Srinagar Garhwal Valley, Uttarakhand. The average wind speed in Srinagar Valley is 2.923± 1.232 m/s. As it is seen the most frequent wind in Srinagar Garhwal has a speed from 0.50 to 2.10 m/s in the northwest direction.

***Keywords*:** AWS, Srinagar Garhwal, Wind Direction, Wind Speed

1. INTRODUCTION

Wind power is a renewable energy source that has developed rapidly since the end of the 1970s (Dauta *et al.*, 2012). Wind energy is an indirect form of solar energy. About 1percent of the total solar radiation that reaches the earth is converted in the atmosphere into the energy of the wind. Winds result from the differential heating of the earth and its atmosphere by the sun.

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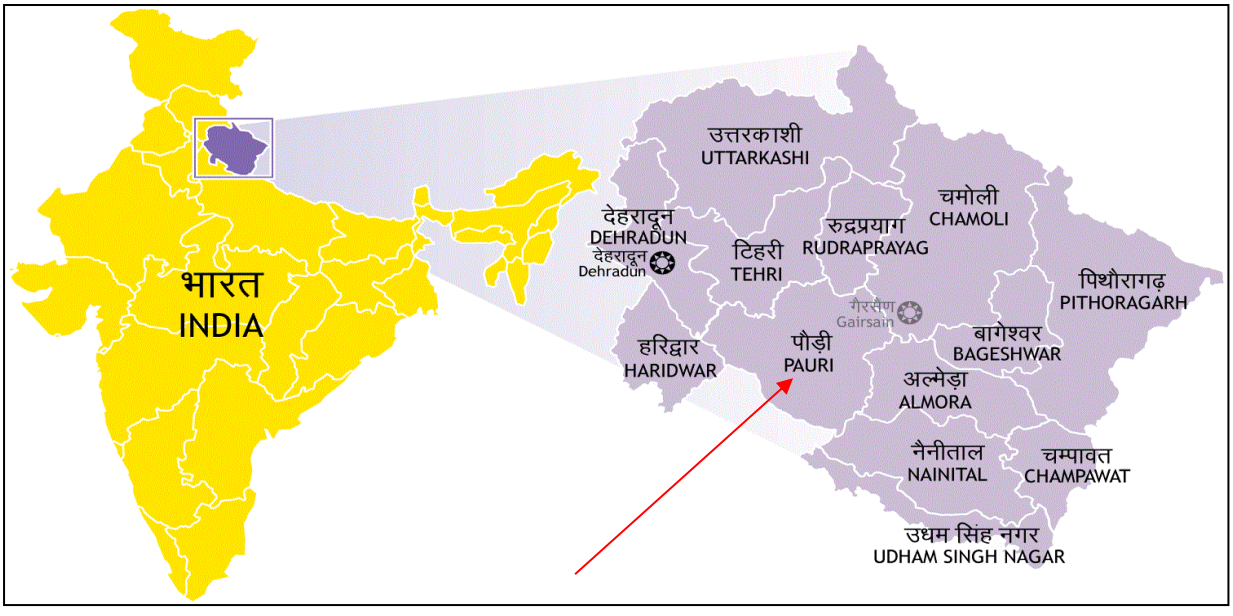
As the sun heats different parts of the earth at different rates air circulates from the cold to the warm areas production winds (Fujibe, 2009). A rapid advance in the wind turbine technology has caused the enhanced usage and dependence on wind power generation. Wind direction and wind speed are two characteristics of the wind the study of whose inter-relationships may give us an insight into the prevailing weather condition at a particular place (Milborrow, 2002; Pudasainee, 2017).

Wind speed describes the rate at which air is moving past a certain point. It is usually reported in knots, miles per hour or meters per second (Kaplya, 2014.). It deserves mention here that one mile per hour is equal to 0.45 meters per second or 0.87 knots. Wind speed is measured using either a cup or propeller anemometer. Wind direction describes the direction on the compass from which the wind emanates (Fujibe, 2003, 2011).

It is typically reported in degrees. Of the many impacts that wind speed and direction have on weather pattern, the most important remains that on surface water and rates of evaporation. This paper aims to carry out the trend analysis of the wind direction and wind speed pattern of Srinagar Garhwal Valley, Uttarakhand.

2. STUDY AREA

Srinagar Garhwal is 30°13'-13'30" North Latitude and 78° 45'-47'4" East Longitude is situated on the bank of river Alaknanda in the Lesser Himalaya, right in the heart of Garhwal region, enroot to the world famous Holy shrines of Badrinath and Kedarnath. It has an average elevation of 560 meters (1837ft) (Negi *et. al.*, 2018).



(A)

Figure 1(A). Location Map of Srinagar Garhwal Velley.

(B)

Figure 1(B). Location Map of Srinagar Garhwal Velley.

3. MATERIAL AND METHODS

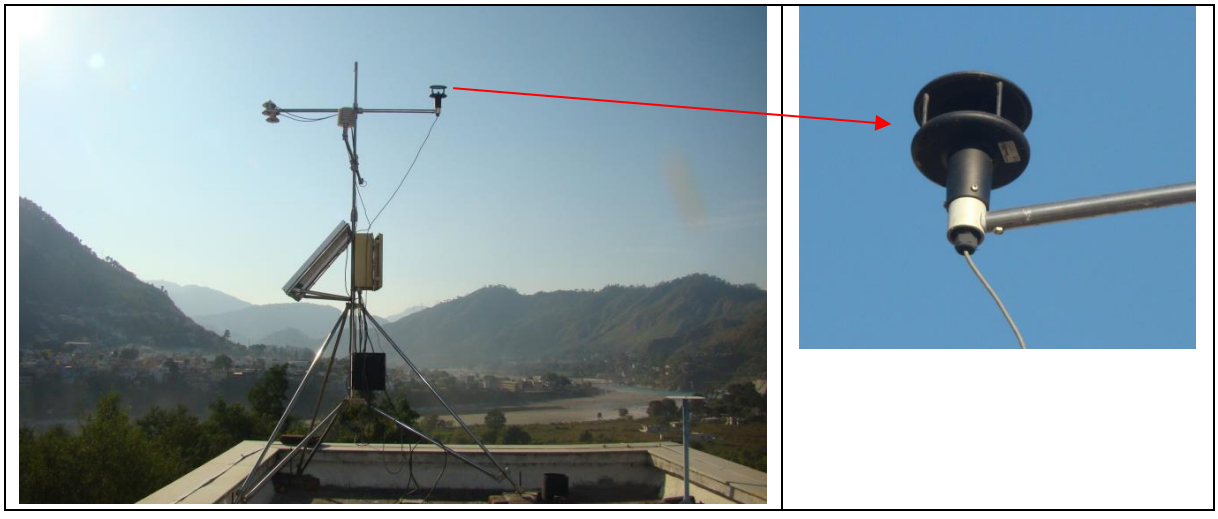


Figure 2. Observation Site at Alaknada Revier, Department of Rural Technology, HNBGU Chauras Campus

The Wind data were collected through Ethernet and data logger by the wind sensors installed on the Automatic Weather Station (AWS) Tower, Department of Rural Technology, Chauras Campus, H.N.B. Garhwal (A Central) University Srinagar Garhwal, Uttarakhand, India. For attaining the objectives of this study, two years daily hourly data (January 2016 to December 2017) of wind direction and speed are use for the study.

3. 1. Analysis of Collection Data

Data analysis was carried out in WRPLOT and MS Excel software. The wind data were analysed through WRPLOT for wind rose diagram creation and frequency analysis.

4. RESULT & DISCUSSION

4. 1. Distribution of Wind Speed

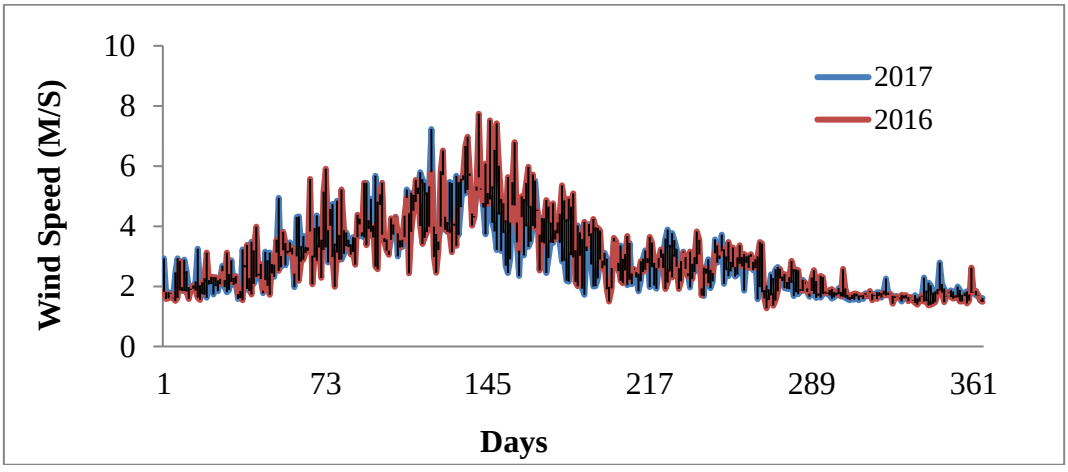


Figure 3. Tow year daily hourly wind speed data

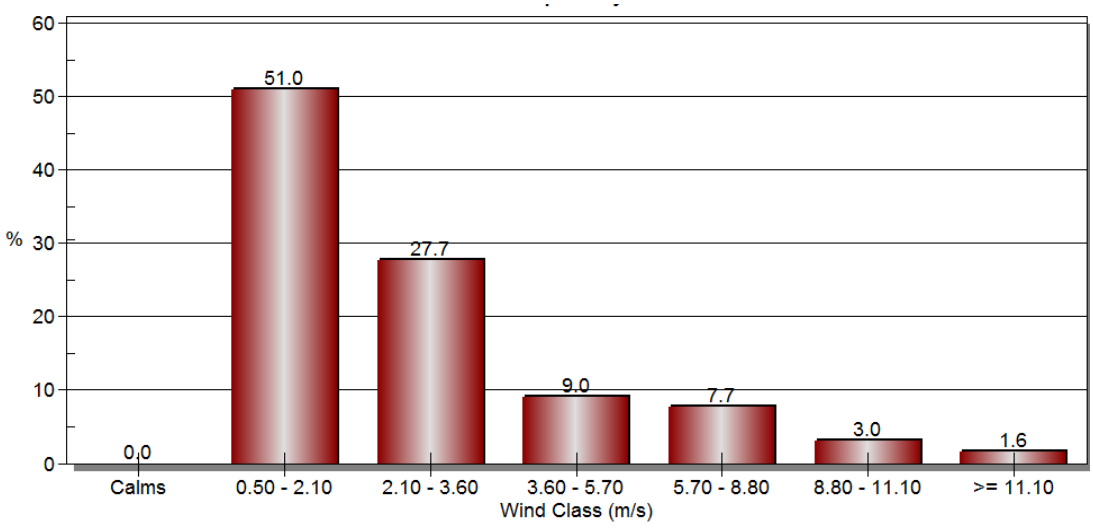


Figure 4. Wind Class Frequency Distribution

The daily wind speed data at Srinagar Garhwal of the year 2016 and 2017 is shown in Figure 3. The average wind speed in year 2016 is 2.982±1.321 m/s and year 2017 average wind speed is 2.868±1.136. The average wind speed over these 2 years period is 2.923± 1.232 m/s. As it is seen the most frequent wind in Srinagar Garhwal has a speed from 0.50 to 2.10 m/s which is 51 percent (Figure 4).

4. 2. Wind Direction

A wind rose gives a very concise but information laden view of how wind speed and direction are typically distributed at a particular location. Presented in a circular format, the wind rose shows the frequency of winds blowing from particular directions. The length of each spoke around the circle is related to the frequency of time that the wind blows from a particular direction. Each concentric circle represents a different frequency, emanating from zero at the centre to increasing frequencies at the outer circles.

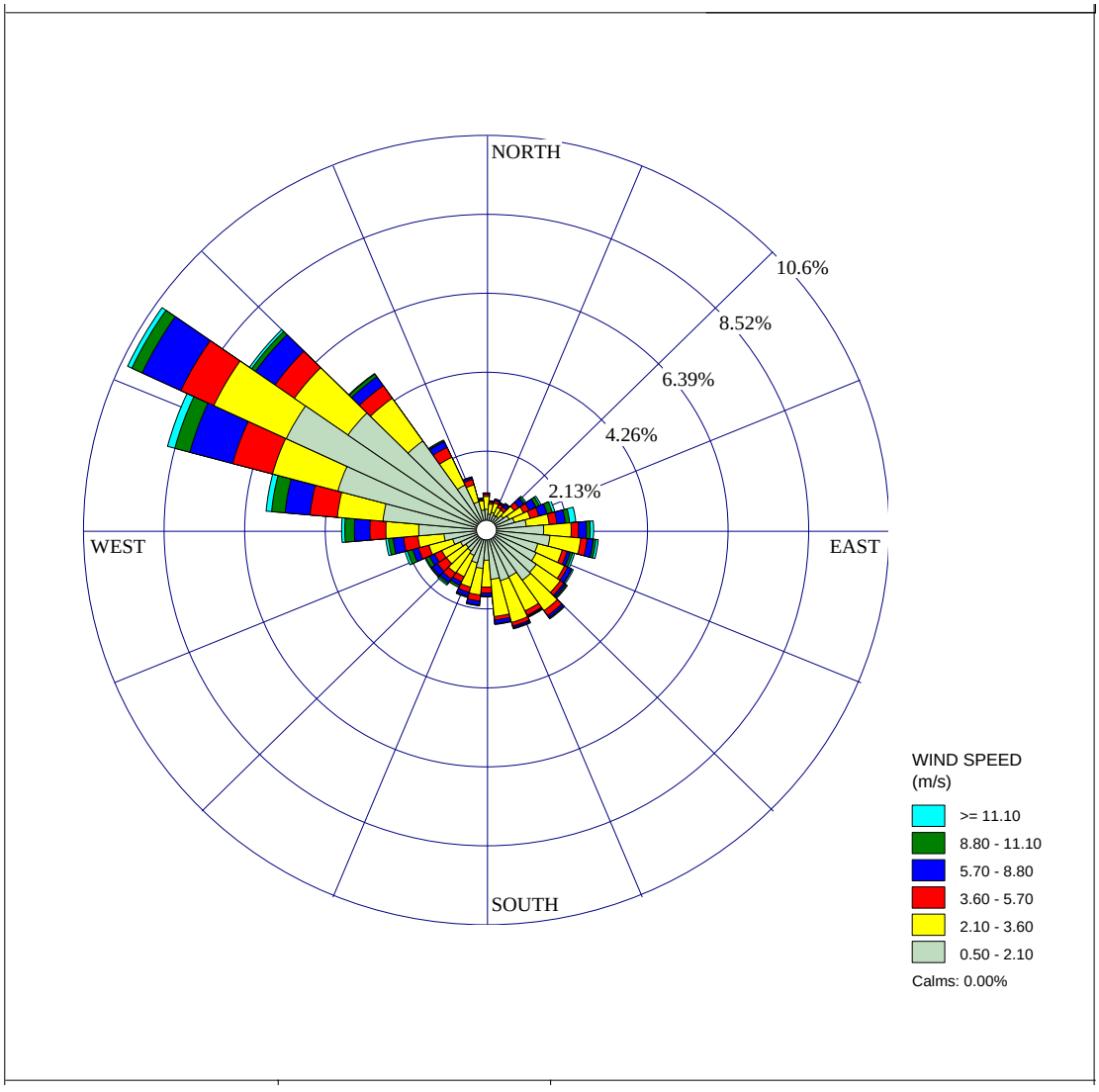


Figure 5. Wind Rose Plot for the data January 2016 to December 2017

The Figure 5 is shown wind rose for Srinagar Garhwal Valley on 2 year (January 2016 to December 2017) of hourly wind data. As it is seen the three spokes around the northwest direction (WNW, W, and NNW) comprise 24.82% of all hourly wind directions. This is quickly calculated by taking the sum of the frequencies of each of these directions (9+8.62+7.2=24.82 %). This also shows that the wind rarely blows from the northeast or the southwest. These wind roses also provide details on speeds from different directions. In the Figure 3, winds from the NW (the longest spoke) one can determine that approximately 5.26 % of the time in year at Srinagar Valley the wind blows from the northwest at speeds between 0.50 and 2.10 m/s. Similarly, on this spoke it can be calculated that winds blow from the northwest at speeds between 2.10 and 3.60 m/s about 7.1% of the time, at speeds between 3.60 and 5.70 m/sec about 8.62%, between 5.70 and 8.80 m/sec about 9.63%, between 8.80 and 11.10 m/sec about 10 percent and above 11.10 m/s speed is10.30 %.

5. CONCLUSION

The aim of this paper is to present an approximation to the trend analysis of the wind direction and wind speed pattern of Srinagar Garhwal Valley, Uttarakhand. The average wind speed in Srinagar Valley is 2.923± 1.232 m/s. As it is seen the most frequent wind in Srinagar Garhwal has a speed from 0.50 to 2.10 m/s in northwest direction.

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