Seasonal Groundwater Level Fluctuation analysis in Jagalur Taluk, Davanagere District, Karnataka State, India.

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Abstract

The present study has been conducted to assess the groundwater level fluctuation of Jagalur Taluk in Karnataka State, India. 30 Static water level locations and data were collected, sample locations were identified, and measured groundwater level during post-monsoon (May 2019) and pre-monsoon (December 2019) periods. To understand the spatial distribution of groundwater level fluctuation and its variation was assessed in GIS. From the result, it has been illustrated that the maximum depth of groundwater during the pre-monsoon was 40.87 mbgl and it was 39.76 mbgl during the post-monsoon. The minimum depth of groundwater during the pre-monsoon was 17.18 mbgl and it was 15.79 mbgl during the post-monsoon. The rise in water level in the range of minimum 0.04 mbgl to rising in the range of maximum 1.86 mbgl. From this, it is clear that during the post-monsoon water level was found to increase in the study area which may be caused due to rainfall infiltration during the monsoon season.

Keywords: - Groundwater, Fluctuation, Rainfall, Monsoon, Infiltration.

1. Introduction

Groundwater is an important natural resource of drinking water for a large number of people everywhere in the world (Silvia et al., 2015). In India, many backward pastoral zones are affected by the shortage of availability of potable groundwater. Human interventions greatly affect the sources of groundwater (Abhishek et al., 2018). Groundwater excellence has implications in domestic, public community, commercial and agricultural domains (Swetha et al., 2018). The application potential of GIS (Geographic Information System) is huge, particularly in the management of regular resources. Spatial statistics of groundwater system helps in the creation of spatial decision support systems (Bilgehan and Ali, 2009). The distribution of rainfall in time and space has a major role in the distribution of water resources. With the increased urbanization and dependence on minor irrigation for agricultural production, the need for scientific assessment and management of groundwater is very important. Accurate assessment of drought years helps the farmers in their crop management (Kamani et al., 2019). The droughts affect people more than any other natural hazards by causing serious economic, social, and environmental losses in both developing and developed countries (Gupta et al., 2011). The drought also leads to a reduction in stream-flow, depletion of soil moisture and groundwater (Shri Kant et al., 2014).

The erratic rainfall and repetitive droughts in the study area affected agricultural conditions in the Jagalur Taluk. Jagalur Taluk enjoys a semi-arid climate. Drought assessment studies at the micro-level contribute to a better understanding of the groundwater level management system.

2. Study Area

The current study was carried out in the Jagalur Taluk, Davanagere District of Karnataka State, covering an area of about 969.64 sq. Km (Figure 1). Jagalur Taluk of Davanagere District is located between north latitude 14°, 24'18.5" and 14°, 42', 16.0" & east longitude 76 °, 06', 34.7" and 76 °, 032', 02.2". Jagalur Taluk is bounded by KudligiTaluk on the north, Chitradurga District on the south, ChallakereTaluk on the east, and HarpanahalliTaluk on the western side. The granitic gneisses and schists are the main water-bearing formations in this area. Groundwater occurs within the weathered and fractured granitic gneisses and schist underwater table conditions and semi-confined conditions.

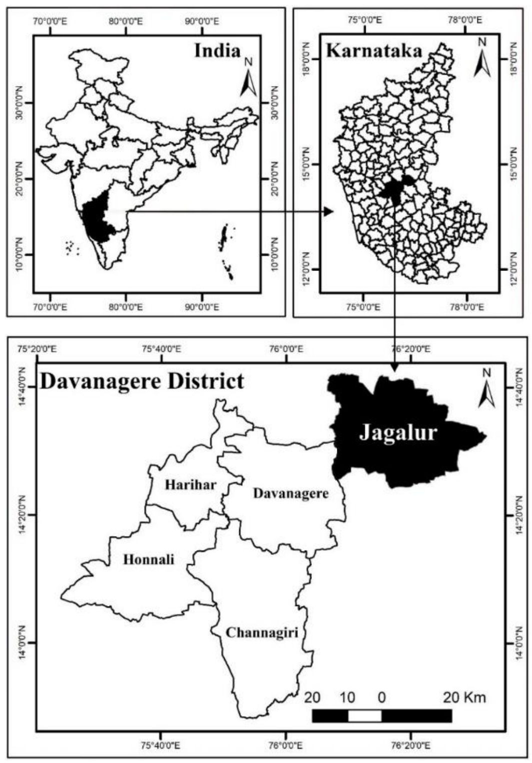
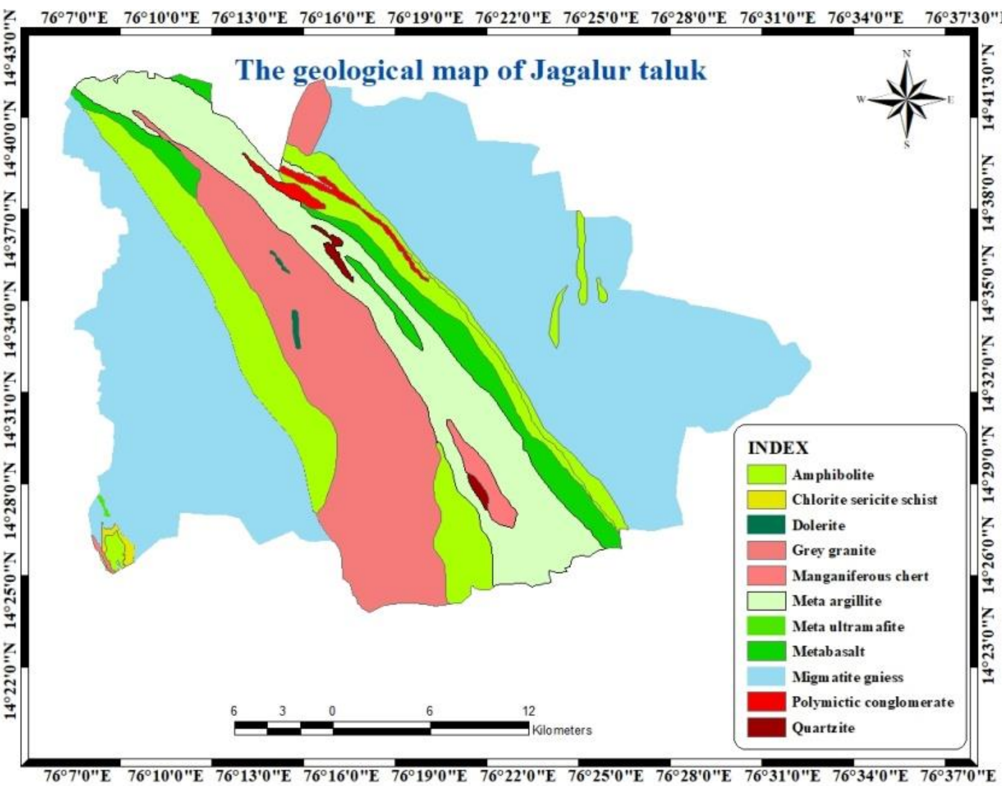


Figure1. Location map of Jagalur Taluk

3. Geology

Geologically, the area is composed dominantly of gneiss, which belongs to the PGC (Peninsular Gneissic Complex) and the litho units belong to the Chitradurga group. Lithounits of the Chitradurga group found to occur dominantly in the study area include amphibolite, chlorite sericite schist, meta argillite, and metabasalt. The occurrence of manganiferous chert, quartzite, and polymictic conglomerate is not ubiquitous. These were intruded by granites belongs to closepet, other younger granite, which is found in the central part of the study area. Granitic gneisses and partial schists were the important water-bearing formations. These inturns intruded by the later dolerite dyke. Lithounits of the study areas show the trend of the NNW-SSE direction, which coincides with the regional trend of Dharwarcraton. In the study area, groundwater was found to occur within the weathered and fractured granitic-gneisses and the schistose rocks belong to the Chitradurga group. (Figure 2).



4. Materials and Method

4.1 Groundwater Level Measurement

Groundwater level measurements were taken from 30 locations across the study area from different locations like agricultural land and other public places. Groundwater level measurements were taken at the same location during May 2019 and December 2019. To cover the study area evenly, a minimum of 3 km of distance was maintained between the sample locations. The geographical coordinates of the bore wells were taken using a GPS (Global Positioning System) and mapped in GIS.

From each groundwater level measurement were taken, respective two-season pre-monsoon (May – 2019) and post-monsoon (December – 2019) across the study area. During groundwater level measuring used economic water level meter, this instrument found exact groundwater level inside the Borewell. The water level meter sensor finds the level of water in some kind of groundwater level. It can then be sent that information into other devices that control what happens to the water after that. The water sensor dropped inside the borewell, we received a beep sound it means, sensor reached the water. Then take a reading for the respective value.

5. Result and Discussion

The groundwater level of the study area during pre-and post-monsoon seasons was measured through the used instrument economic water level meter from 30 locations. The collected groundwater level measurement locations were interpolated in GIS (Geographic Information System) to identify the overall groundwater level variation in the study area as shown in table 1.

S/N	Location	May-2019,Pre–Monsoon (mbgl)	December-2019,Post–Monsoon (mbgl)	Fluctuation (mbgl)
1	Kasavanahally	22.29	21.83	0.46
2	Siddyankote	26.94	26.47	0.47
3	Marikatte	20.43	19.97	0.46
4	Kysanahally	21.36	20.9	0.46
5	Dibdahally	19.5	19.04	0.46
6	Bilichodu	19.97	19.5	0.47
7	Mudlamachikere	17.65	17.18	0.47
8	Donnehally	19.04	18.57	0.47
9	Honnamardi	18.11	17.65	0.46
10	Thoranagatte	29.72	29.26	0.46
11	Kortikere	20.43	19.5	0.93
12	Rastemahakunte	23.22	22.29	0.93
13	Hirearikere	19.5	18.57	0.93
14	Tharehally	20.9	19.97	0.93
15	Katenahally	29.72	28.79	0.93
16	Malemachikere	40.87	39.76	1.11
17	Sokke	38.08	37.62	0.46
18	Kecchannahally	20.9	19.97	0.93
19	Jagalur	17.65	15.79	1.86
20	Bistavally	19.97	19.04	0.93
21	Thamalhally	22.76	21.83	0.93
22	Jyothipura	21.36	20.9	0.46
23	Magadi	21.36	20.9	0.46
24	Lakkumpura	25.08	23.96	1.12
25	Diddagi	32.51	31.58	0.93
26	Arsinagundi	22.29	21.83	0.46
27	Gowramanahlly	28.33	27.4	0.93
28	Kelogote	26.47	26.01	0.46
29	Linganahally	19.97	19.5	0.47
30	Byranyakanahally	17.18	17.14	0.04
	Maximum	**40.87**	**39.76**	**1.86**
	Minimum	**17.18**	**15.79**	**0.04**

Table 1. Measurement of Groundwater level Pre and Post monsoon from the bore wells of the study area.

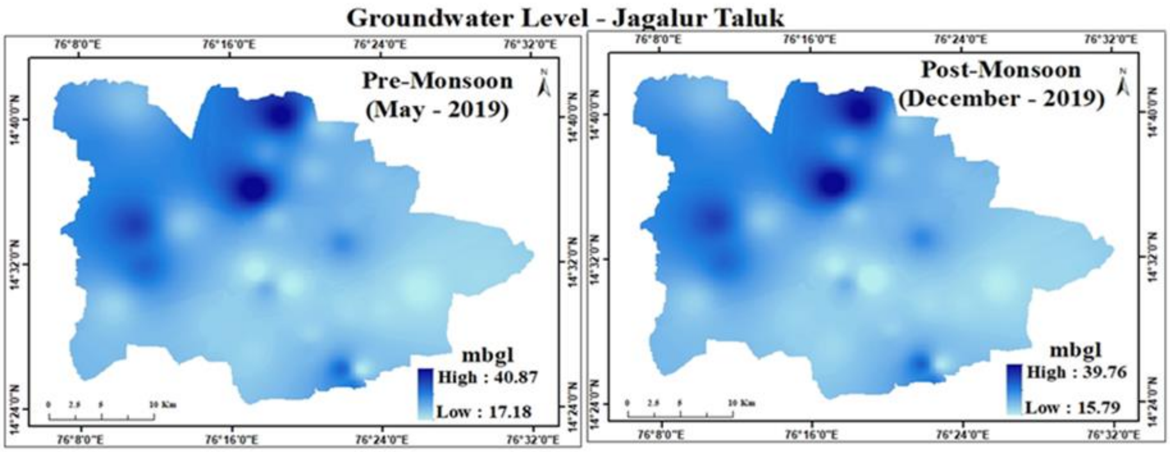


Figure 3. Groundwater level pre and post-monsoon

From the result, it has been illustrated that the maximum depth of groundwater during the pre-monsoon was 40.87 mbgl and it was 39.76 mbgl during the post-monsoon. The minimum depth of groundwater during the pre-monsoon was 17.18 mbgl and it was 15.79 mbgl during the post-monsoon. From this, it is clear that during the post-monsoon water level was found to increase in the study area which may be caused due to rainfall infiltration during the monsoon season.

6. Conclusion

The result of the groundwater level assessment depicts that, the water level was increased during the post-monsoon season comparing with the pre-monsoon season which may have been caused due to the infiltration of rainwater during the monsoon season. The assessment of seasonal variability illustrates that the higher variation is present in the southern part whereas the low variation is present in the north and northeast part of the study area. The result of groundwater level interpolation showed that the groundwater level was found increased compared to that of pre-monsoon.

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