

Summer Training Report
on
ANALYSIS OF SPATIAL AND
TEMPORAL VARIATION IN
RAINFALL TREND

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STUDENT'S DECLARATION

I hereby certify that the work embodied in this summer training entitled as "Analysis of Spatial and Temporal Variation in Rainfall Trend" by Sumit Kumar Vishwakarma, ID No E-7417/13 in the partial fulfillment of degree in Bachelor of Technology in Agricultural Engineering in Narendradeva University of Agriculture and Technology Kumarganj Faizabad. I successfully done my work during 10 June 2016 to 10th of July under the supervision of Dr. A. K. Lohani (Scientist-G), in National Institute of Hydrology, Roorkee, Uttarakhand. . The matter presented in this project report has not been submitted by me in any other university/ institute for the award of any other degree or diploma.



Signature of Student

This is to certify that the above statement made by the candidate is correct to the best of my knowledge and belief.



(Dr. A. K. Lohani)

Supervisor

Scientist-G

National Institute of Hydrology, Roorkee

Date:

Analysis of spatial and temporal variation in rainfall trend Of Uttar Pradesh, India (1901-2002)

Abstract:-

Monthly rainfall data from 1901 to 2002 for 6 Stations of Uttar Pradesh were used to analyse the changed rain fall trend of the region. Spatial distribution and tempo- ral variation of rainfall were observed in the seasonal and annual series. Mann–Kendall test and Sen’s slope were used in the study for the trend analysis. Standard normal homogeneity test and Mann–Whitney–Pettit Test were applied for detection of break point in the series. change percentage was calculated for seasonal and annual series for 102 years. Trend analysis was then done by dividing the entire series into two divisions before and after the break point. The impact of extreme events of rainfall on the trend was evaluated on the whole and partial series (Before and after the break point). Variation in the spatial distribution of annual, monsoon, pre monsoon and post monsoon rainfall was observed.

Keywords:-

Rainfall trend _ Mann–Kendall test _ Mann–Whitney–Pettit test _ Change percentage _
Extreme event

Introduction:-

The extremely dynamic nature of the climate is one of the primary causes of increasing concern in the present days. variability is the major feature of climate, and in the last few decades substantial increase in the temperature and changing rainfall pattern has drawn a lot of attention. The variable rainfall pattern associated with the climate change deserves systematic and instant attention as it affects the food production and available fresh water (Dore 2005). IPCC (Intergovernmental Panel for Climate Change) (2007) has reported spatial, interpersonal and internal variability in rainfall trend in Asia in the last few decades. It was found that changing rainfall pattern has considerable impact on the agricultural sector and water of the Asia–pacific region (Cruz et al. 2007). Changes in the rainfall and land use/land cover are also observed to have an effect on the sediment yield and runoff of the loess hilly catchment in China (Wei et al. 2014). Any fluctuations in the hydrological cycle will have an effect on the freshwater availability. According to the IPCC, there is about 0.74 _C rise in mean temperature in the 100 years of 1906–2005 which was observed together with a great variation in spatial

and temporal rainfall (Solomon et al. 2007). Continuous and increasing rate of events such as drought, flood and high-intensity rainfall have been observed all over the world (Mirza 2003; Kundzewicz et al. 2005; Kysely' 2008; dashtpagerdi et al. 2014). Some rising trend of precipitation is observed in the eastern north Europe, North and South America and central Asia, whereas a decrease is found in the Mediterranean and southern Africa and south Asia (IPCC (Intergovernmental Panel for Climate Change) 2007). Australia also shows an increasing rainfall trend (Suppiah and Hennessy 1998; Nicholls and Lavery 1992). reduction in the mean annual precipitation trend was noticed in north and north-east China (Hu et al. 2003; Zhai and Pan 2003), Russia (Savelieva et al. 2000; Peterson et al. 2002), in the arid plains and coastal areas of Pakistan (Farooq and Khan 2004), Italy (Buffoni et al. 1999), eastern Brazil (Silva 2004) and Kenya (Kipkorir 2002). A significant difference was observed in the rainfall trend in southern Spain from the historical data of 500 years (Rodrigo et al. 2000), in the Prairies of Canada and other places (Akinremi et al. 2001; Ati et al. 2008; Gonza'lez et al. 2008; Conway et al. 2009). Some extremes of rainfall are observed in China, where the increase is found in the west of 1008 E region, while a substantial decrease is observed in the Huaihe River basin, Haihe River basin and Yellow River basin with some moderate variation in the north-east (Zhang et al. 2012). Changed precipitation in the Haihe River basin of China is also observed in recent works (Lu et al. 2014), affecting the hydrological system of the basin. However, overall increasing annual precipitation is noticed in China from 1980 to 2012, though the numbers of wet days show decreases (Feng and Zhao 2014). The Asian landmass has a wide variety of climatic rainfall, which also includes monsoon rainfall. Many studies on the monsoon rainfall have been done which signify the effect of climate change. According to Gosain et al. (2006), the availability of freshwater will decrease in many river basins due to climate change. This reduction may affect India adversely together with the high growth of population by the 2050s (IPCC (Intergovernmental Panel for Climate Change) 2007). Some crops such as wheat, barley, mustard and chickpea may also show a decrease or stagnation in yield due to increasing temperature (Kalra et al. 2008). Numerous studies are available on the rainfall trend and summer monsoon of India (Parthasarathy and Dhar 1974, 1978; Kothyari and Singh 1996; Sarkar et al. 2004; Guhathakurta and Rajeevan 2008) where rising trend has been observed in Kashmir to the south through the Deccan Plateau (Sen Roy and Balling 2004). Kumar and Jain (2010) also observed an increase in the seasonal rainfall in Kashmir valley, but monsoon rainfall showed a decrease in Srinagar. Current work on rainfall trend has been done in Assam by Jhajharia et al. (2012) in north-east India, showing changes in the current trend. He has used the Mann–Kendall test for the study. The Indian climate is mainly

characterized by monsoon rainfall which generally occurs from June to September and feeds most of the agricultural sectors. Therefore, variation in the rainfall pattern may significantly influence the economy of the country. Allocation and management of water for irrigation purposes, in the present situation of climate change, is very important. With the growing stress on water due to climatic changes, analysis on a broad as well as regional scale is required, as India has vast climatic zones and variations. Major parts of India are facing decrease in precipitation during the monsoon time. A decreasing trend has been observed in north-east India, central north-east India and west-central India (Kumar et al. 2010). Agriculture being the main lifeline of people, it is extremely significant to study the distribution of rainfall. In the present study, the entire state of Uttar Pradesh which is situated in the central part of India is considered. Different researches have been carried out in central India regarding change in rainfall, but the analysis of extreme rainfall events has been lacking. The main objective of the present study is to analyse the trend along with the analysis of extreme events occurring in different years influencing the current rainfall trend. To support the analysis, results are taken before and after the break point year of 1978. The study was carried out with the following objectives: (1) to study the Annual and Seasonal (pre-monsoon, monsoon, post-monsoon and winter) rainfall trend from 1901 to 2002; (2) to analyse the changing trend before and after the break point (Annual and Monsoon); (3) to analyse extreme events of rainfall (yearly) and evaluate the impact of climate change. Various statistical techniques such as Mann–Kendall (MK) test, Sen's slope, Mann–Whitney–Pettit (MWP) tests, change percentage and break point analysis were applied in the study. Parametric linear regression test was carried out with the seasonal and Annual data to support the results obtained from the MK test. The rainfall trend analysis in 6 districts of whole UP will help the planners understand the recent scenario of climate change in this area.

Study area:-

The study area is Uttar Pradesh (Varanasi, Allahabad, Lucknow, Faizabad, Ambedkarnagar, Jaunpur) which is situated in the central part of India. It is surrounded by many states such as Madhya Pradesh, Rajasthan, Gujarat and Maharashtra from all sides. The state is agriculturally dependent where the majority of the people practice agriculture. It is also agriculturally quite diverse with crops such as rice, wheat, lower, soybean, cotton and sugarcane. Climatically, the

region is sub-tropical type with hot and dry summer and cool winter, and the monsoon season is very important as it gives maximum rainfall for agriculture. Spring or the pre-monsoon season commences from March up to May, monsoon season from June to September, Autumn or post-monsoon in October and November, and Winter from December to February. As the summer is hot and dry, the temperature starts rising during March and lowers during October. The temperature rises up to 40 °C or even more while the winter temperature varies from 10 °C to 25 °C as minimum and maximum, respectively. The landuse of UP is shows different classes and, noticeably, the higher elevated areas coincide with the forest areas. The rest of the region is mainly occupied by agricultural lands and the built-up area. Increasing settlement of the region has caused more occupancy of the agricultural lands.

Materials and methods:-

The monthly rainfall data of 102 years from 1901 to 2002 is used in the study, from the Indian Meteorological site (IMD) of India Water Portal (<http://www.indiawaterportal.org/etdata>). Seasonal and annual analysis was done of 6 stations of UP. Homogeneity test was applied to the data series by standard normal homogeneity test (SNHT) at the significance level of 5 % (Alexandersson 1986; Alexandersson and Moberg 1997). The series proved to be homogenous according to the test, as the critical value of T0 for 102 samples was 9.26 at the 95 % significance level for the heterogeneous series. It also indicates the break point in the series. The occurrence of any positive or negative correlation has an effect on trend detection). Therefore, serial correlation is applied to the series to observe the existence of any trend in the data, after which the data are pre-whitened to eliminate the correlation for applying Mann-Kendall (MK) test (Storch 1993; Yue et al. 2002; Cunderlik and Burn 2002, 2004). The MK test is applied to the pre-whitened data series to assess the monotonic trend of the data (Mann 1945; Kendall 1975). It is considered better than the parametric tests (Xu et al. 2003), although linear regression has been done to observe the trend. For analyzing the trend magnitude, Theil-Sen's estimator of slope is used (Theil 1950; Sen 1968). Mann-Whitney Pettitt (MWP) test is applied to detect break point in the series (Pettitt 1979) and then change percentage for 102 years is calculated (Yue and Hashino 2003). An extreme event of rainfall (yearly) is calculated for the whole series (1901–2002).

Results and analysis:-

Serial correlation and detection of change point in the series Lag-1 serial correlation is applied to check the presence of any existing trend in the series before applying the MK test and pre-whitening method is used to remove the correlation. The MK test is then applied to the pre-whitened data series at the 5 % significance level over 102 years. The break point in the data series is calculated by Mann–Whitney–Pettitt (MWP) test and SNHT test where considerable changes in climate are noticed.

Seasonal and annual rainfall trend analysis in 6 stations from 1901 to 2002.

- 1. Station 1 –Varanasi**
- 2. Station 2-Allahabad**
- 3. Station 3-Lucknow**
- 4. Station 4-Faizabad**
- 5. Station 5-Ambedkarnagar**
- 6. Station 6-Jaunpur**

Table 1- M K Test

Z-MK	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Pre-Monsoon	Monsoon	Post-Monsoon	Winter
Stn-1	2.769*	-1.212	-0.749	1.195	0.827	0.679	-1.995*	-2.753*	-0.156	0.327	0.235	0.789	-1.969*	0.280	-1.914	0.532	0.416
Stn-2	2.224*	-0.812	-0.848	1.338	1.099	1.486	-1.651	-2.009*	0.494	0.642	0.639	0.241	-1.200	0.526	-1.463	1.050	0.743
Stn-3	1.599	-0.448	0.353	0.980	1.394	0.824	-1.625	-2.423*	0.390	0.202	0.292	0.535	-1.376	1.165	-1.466	0.601	0.691
Stn-4	2.330*	-0.523	-0.052	0.928	0.627	-0.301	-2.654*	-2.880*	-0.176	-0.529	0.340	0.674	-2.527*	0.908	-2.550*	-0.029	0.818
Stn-5	2.466*	-0.575	-0.359	0.914	0.338	-0.396	-2.862*	-2.758*	-0.226	-0.567	0.540	0.904	-2.686*	0.570	-2.712*	-0.032	0.746
Stn-6	2.497*	-0.714	-0.593	1.206	0.590	0.679	-2.498*	-2.605*	-0.208	-0.090	0.703	1.167	-2.232*	0.477	-2.22*	0.552	0.882

*95% significance level

Table 2- Sens Estimator

Beta-MK	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Pre-Monsoon	Monsoon	Post-Monsoon	Winter
Stn-1	0.126	-0.054	-0.013	0.010	0.014	0.136	-0.796	-0.886	-0.039	0.024	0.000	0.000	-1.317	0.015	-1.385	0.052	0.044
Stn-2	0.119	-0.026	-0.008	0.008	0.013	0.316	-0.813	-0.834	0.137	0.024	0.000	0.000	-1.006	0.029	-1.014	0.093	0.070
Stn-3	0.062	-0.011	0.003	0.010	0.019	0.141	-0.619	-0.795	0.098	0.011	0.000	0.000	-0.925	0.048	-0.897	0.053	0.052
Stn-4	0.075	-0.015	0.000	0.009	0.013	-0.045	-0.969	-0.843	-0.041	-0.033	0.000	0.000	-1.823	0.040	-1.683	-0.002	0.052
Stn-5	0.085	-0.020	-0.005	0.010	0.005	-0.070	-1.097	-0.880	-0.045	-0.034	0.000	0.000	-1.942	0.023	-1.889	-0.003	0.050
Stn-6	0.103	-0.022	-0.008	0.010	0.009	0.126	-0.923	-0.899	-0.054	-0.005	0.000	0.000	-1.558	0.023	-1.563	0.050	0.067

Where (+ symbol shows increasing and Symbol shows decreasing)

In the seasonal results, mixed trend is noticed. (Fig. 1). The figure illustrates significant and non-significant increasing and decreasing trend with different symbols. Some significant trend is found in Varanasi in Annual period. And also some significant trend is found in Faizabad, Ambedkarnagar, and Jaunpur in Annual and Monsoon period. Other stations (Allahabad and Lucknow) have a non-significant trend in the period of Pre Monsoon, Post Monsoon and Winter season.

Varanasi shows a decreasing rainfall trend in Annual period and increasing rainfall trend in the Pre Monsoon period and decreasing rainfall trend in the Monsoon period and increasing rainfall trend in both the Post Monsoon and in Winter seasons.

Allahabad, Lucknow and Jaunpur have also a decreasing rainfall trend in Annual period and increasing rainfall trend in the Pre Monsoon period and decreasing rainfall trend in the Monsoon period and increasing rainfall trend in both the Post Monsoon and in Winter seasons.

Faizabad and Ambedkarnagar shows a decreasing rainfall trend in Annual period and increasing rainfall trend in the Pre Monsoon period and decreasing rainfall trend in both the Monsoon period and Post Monsoon period and increasing rainfall trend in the Winter seasons.

(1) Serial correlation and pre-whitening:- The serial correlation coefficient of q_k for a discrete time series for lag- k is given as (Yue et al. 2003)

$$P_k = \frac{\sum_{t=1}^{n-k} (x_t - \bar{x}_t)(x_{t+k} - \bar{x}_{t+k})}{\left[\sum_{t=1}^{n-k} (x_t - \bar{x}_t)^2 \sum_{t=1}^{n-k} (x_{t+k} - \bar{x}_{t+k})^2 \right]^{1/2}}$$

where $\bar{x}_t$ and $\text{Var}(x_t)$ stand for the sample mean and sample variance of the first $(n - k)$ terms, respectively, $\bar{x}_{t+k}$ and $\text{Var}(x_{t+k})$ are the sample mean and sample variance of the last $(n - k)$ terms, respectively no correlation hypothesis is checked by the lag-1 autocorrelation coefficient as $H_0: q_1 = 0$ against $H_1: |q_1| > 0$

$$t = |q_1| \sqrt{\frac{n-2}{1-p_1}}$$

Here, the t test represents the Student's t -distribution with $(n - 2)$ degrees of freedom (Cunderlik and Burn 2004). If $|t| < t_{\alpha/2}$, then the null hypothesis of no serial correlation is declined at the level of significance. The pre-whitening method removes the serial correlation effect on the MK test (Storch 1993) and it was applied on the data series with some modification in the technique (Yue et al. 2002).

$$Y_i = x_i - (\beta \times i)$$

where β is the Theil–Sen’s estimator. The r_1 (lag-1 serial correlation coefficient) is computed for the new series. In case the r_1 do not vary significantly from zero, the data are used without serial correlation and the MK test in that case will be applicable directly to the sample data. Otherwise, the method of pre-whitening will be used before trend analysis.

$$Y_i' = y_i - r_1 y_{i-1}$$

The $\beta \times i$ value is added to the residual data set of Eq. 4:

$$Y_i'' = y_i' + \beta \times i$$

i represents the final pre-whitened series.

(2) Mann–Kendall test and Theil–Sen’s estimator The MK test is given as:-

$$Z_c = \begin{cases} s-1/\sqrt{\text{var}(S)}, & \text{if } S > 0 \\ 0, & \text{if } S = 0 \\ s+1/\sqrt{\text{var}(s)}, & \text{if } s < 0 \end{cases}$$

where

$$s = \sum_{i=1}^{n-1} \sum_{j=i+1}^n \text{sgn}(x_i - x_j)$$

Here, x_j and x_i are the data values which are in sequence with n data, $\text{sgn}(h)$ is equivalent to 1, 0 and -1 if h is more than, equal to or less than 0, respectively. If Z_c appears to be greater than $Z_{\alpha/2}$ then the trend is considered as significant and α represents the level of significance (Xu et al. 2003).

The rainfall trend magnitude is calculated by Theil–Sen’s estimator (Theil 1950; Sen 1968).

$$\beta = \text{median}(x_i - x_j / i - j)$$

where $1 < j < i < n$ and β estimator is the median of the entire data set of all combinations of pairs and is resistant to the effect of extreme values (Xu et al. 2003).

(3) Change magnitude as percentage of mean:-

The change percentage is computed by approximating it with the linear trend. So, it is equivalent to the median slope multiplied by the length of the period and the whole is divided by the corresponding mean value that is given in percentage (Yue and Hashino 2003):

$$\text{Percentage change(\%)} = (\beta \times \text{data length} / \text{mean}) \times 100$$

(4) Mann–Whitney–Pettitt method (MWP) A time series $\{X_1, X_2, \dots, X_n\}$ with the length n is considered. Let t be considered as the time of the most expected change point. Two samples such as $\{X_1, X_2, \dots, X_t\}$ and $\{X_{t+1}, X_{t+2}, \dots, X_n\}$ can then be attained by dividing the time series at t time. The U_t index is developed in the following way:

$$U_t = \sum_{i=1}^t \sum_{j=1}^n \text{sgn}(x_i - x_j)$$

where

$$\text{sgn}(x_j - x_i) = \begin{cases} 1, & \text{if } (x_j - x_i) > 0 \\ 0, & \text{if } (x_j - x_i) = 0 \\ -1, & \text{if } (x_j - x_i) < 0 \end{cases}$$

(5) There will be constantly increasing value of $|U_t|$ if it is plotted against t in a time series with no change point. But, if there is presence of a change point (even a local change point) then $|U_t|$ will rise up to the level of change point and then start decreasing. The major significant change point t is considered as the point where the value of $|U_t|$ remains highest:

$$k_t = \max_{1 \leq t \leq T} |U_t|$$

The estimated significant probability $p(t)$ for a change point (Pettitt 1979) is:

$$p = \exp[-6Kt^2/n^3 + n^2]$$

When probability $p(t)$ surpasses $(1-\alpha)$, then the change point becomes statistically significant at t time with the α significance level.

Appendix(2)

Data values of Varanasi

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Pre-Monsoon	Monsoon	Post-Monsoon	Winter
1901	85.4	32.3	8.7	2.4	4.0	27.6	171.9	308.0	244.2	5.2	2.0	0.0	891.6	15.1	751.6	7.2	117.7
1902	13.0	4.0	0.6	2.2	6.4	35.7	402.4	204.5	288.1	3.4	1.8	0.0	962.1	9.3	930.6	5.2	17.0
1903	3.4	3.0	1.6	1.2	8.9	57.6	110.3	358.8	154.2	67.7	0.0	0.0	766.8	11.7	680.9	67.7	6.5
1904	6.2	2.3	23.6	0.2	37.2	43.4	304.7	502.2	72.7	92.0	13.2	12.2	1109.9	61.0	923.0	105.2	20.8
1905	16.0	12.7	28.0	3.2	1.9	15.3	337.0	281.1	276.2	2.0	0.0	0.6	974.1	33.1	909.6	2.0	29.3
1906	7.8	37.7	15.0	0.1	7.4	85.5	357.7	246.7	193.0	21.5	0.4	0.6	973.5	22.5	883.0	21.9	46.1
1907	0.3	86.5	19.0	17.1	4.0	118.0	190.8	357.7	66.8	1.7	0.0	0.6	862.5	40.1	733.2	1.7	87.4
1908	15.4	33.2	3.1	0.0	1.0	17.5	313.6	406.2	63.7	33.3	0.0	0.6	887.6	4.1	801.0	33.3	49.2
1909	4.3	6.3	0.0	21.9	1.2	249.1	496.1	181.2	164.5	0.7	0.0	13.3	1138.4	23.0	1090.8	0.7	23.8
1910	11.3	3.3	10.2	1.7	10.1	106.7	184.5	292.3	222.8	38.0	81.9	0.0	962.8	22.1	806.2	119.9	14.6
1911	20.3	0.2	43.7	2.6	2.6	175.0	89.3	278.4	300.6	99.2	68.9	0.0	1080.8	48.9	843.3	168.1	20.5
1912	2.6	4.0	5.7	3.2	8.7	50.0	284.5	298.5	91.2	1.9	39.4	0.4	790.0	17.6	724.3	41.3	6.9
1913	0.2	60.8	35.8	0.1	21.3	180.4	208.4	287.2	99.9	24.6	2.6	13.2	934.5	57.3	775.9	27.2	74.2
1914	5.7	12.5	21.2	11.7	32.8	47.0	403.6	330.1	136.6	2.5	0.0	1.3	1004.8	65.6	917.2	2.5	19.5
1915	16.2	61.3	46.4	3.9	3.1	67.6	312.6	286.1	271.6	74.0	22.2	1.8	1166.9	53.3	938.0	96.2	79.3
1916	0.2	26.1	0.0	0.9	2.2	160.0	322.2	423.5	161.0	77.0	9.7	0.0	1182.8	3.1	1066.6	86.7	26.3
1917	5.0	53.9	18.4	1.1	38.1	173.0	268.5	401.9	194.6	79.3	0.0	5.1	1238.9	57.6	1038.0	79.3	64.0
1918	0.2	0.2	3.7	1.4	3.3	243.8	80.2	393.4	120.6	0.5	1.1	0.0	848.4	8.3	838.1	1.6	0.4
1919	64.3	15.3	9.9	4.8	12.1	85.7	298.8	427.1	168.3	56.9	0.4	0.6	1144.1	26.8	979.8	57.3	80.2
1920	0.2	20.0	28.6	0.0	8.2	36.8	627.6	243.4	76.7	2.8	0.0	0.0	1044.4	36.9	984.5	2.8	20.2
1921	56.5	6.8	0.1	0.5	0.0	152.8	223.2	387.4	126.0	4.4	0.0	0.0	957.8	0.6	889.4	4.4	63.3
1922	29.6	5.6	0.0	3.5	0.1	102.5	420.1	398.2	319.3	19.9	6.7	8.9	1314.3	3.6	1240.2	26.5	44.0
1923	0.6	38.1	0.0	0.2	0.7	41.3	304.7	502.1	201.9	31.1	5.0	2.5	1128.4	1.0	1050.0	36.2	41.3
1924	17.8	9.2	0.7	5.1	3.0	37.8	385.6	295.1	232.2	45.9	33.4	1.8	1067.5	8.7	950.7	79.3	28.8

1925	3.2	1.8	2.9	0.4	23.7	94.0	588.2	382.8	318.3	3.5	36.6	0.0	1455.3	27.0	1383.3	40.0	5.0
1926	9.6	1.0	65.3	6.0	20.3	15.3	283.0	273.2	238.4	27.7	3.7	4.1	947.6	91.6	809.9	31.4	14.7
1927	17.3	36.6	37.5	0.4	4.3	35.2	443.1	330.4	153.6	46.2	62.8	0.4	1167.8	42.2	962.4	109.0	54.2
1928	24.5	25.2	0.6	10.9	6.3	53.8	322.2	114.9	80.1	80.7	0.0	9.0	728.1	17.8	571.0	80.7	58.7
1929	68.1	4.4	1.9	1.5	2.9	67.7	497.1	360.6	82.3	98.8	0.0	18.9	1204.2	6.3	1007.6	98.8	91.4
1930	9.8	18.7	3.5	3.8	2.0	54.4	408.8	224.1	176.6	14.4	34.2	12.3	962.8	9.4	864.0	48.6	40.8
1931	0.9	41.7	10.0	0.1	2.1	66.5	315.6	306.4	262.9	81.2	10.4	1.0	1098.8	12.2	951.4	91.6	43.5
1932	0.2	11.7	0.7	0.4	9.5	49.7	255.5	380.9	118.1	22.6	23.4	1.6	874.2	10.6	804.2	46.0	13.4
1933	13.7	29.8	6.5	20.7	25.9	123.7	209.5	337.0	115.9	46.8	0.2	0.1	930.0	53.2	786.1	47.0	43.7
1934	27.8	4.8	15.5	1.8	0.3	98.6	233.0	336.8	201.3	15.0	21.0	1.4	957.1	17.5	869.6	36.0	34.0
1935	9.2	21.0	1.3	5.0	0.8	127.6	323.0	474.6	204.9	1.7	0.0	5.1	1174.4	7.1	1130.2	1.7	35.4
1936	5.1	49.1	11.8	1.0	12.5	174.7	429.4	318.4	290.2	42.4	2.5	15.5	1352.7	25.3	1212.7	44.9	69.7
1937	0.2	53.0	7.1	7.2	6.5	66.0	341.9	311.5	192.8	67.0	0.0	0.0	1053.2	20.8	912.2	67.0	53.2
1938	46.5	15.8	0.5	3.8	12.0	222.8	313.5	315.0	256.7	33.5	0.0	0.0	1220.1	16.4	1108.0	33.5	62.3
1939	17.7	19.2	7.1	4.7	0.7	158.0	353.6	330.9	261.8	18.8	0.0	0.0	1172.3	12.4	1104.2	18.8	36.9
1940	1.2	29.5	58.8	4.7	7.8	62.0	218.4	396.7	161.2	3.9	0.0	4.5	948.7	71.2	838.4	3.9	35.1
1941	29.9	5.8	6.0	0.1	8.9	105.6	199.1	299.6	165.5	18.4	1.5	0.0	840.3	15.0	769.8	19.8	35.7
1942	68.8	50.1	9.1	4.7	0.7	89.3	272.4	372.5	258.3	1.6	0.0	6.7	1134.1	14.4	992.6	1.6	125.5
1943	18.3	7.4	1.0	15.0	8.2	24.5	287.1	608.9	241.8	17.1	0.0	0.0	1229.2	24.1	1162.3	17.1	25.7
1944	24.5	47.9	60.7	4.2	2.8	44.6	360.3	532.8	75.8	32.8	0.0	1.5	1187.8	67.8	1013.5	32.8	73.8
1945	46.8	12.5	0.3	5.7	5.9	79.5	202.7	231.0	184.8	56.7	0.0	13.6	839.6	12.0	698.0	56.7	72.9
1946	0.2	35.1	8.4	5.6	6.2	153.2	370.3	440.0	182.9	38.4	38.3	3.6	1282.1	20.2	1146.4	76.6	38.9
1947	19.0	12.7	16.5	1.3	1.8	55.7	388.2	267.5	232.5	26.2	5.7	1.1	1028.3	19.7	943.9	31.9	32.8
1948	16.4	14.1	3.4	0.4	6.1	221.0	407.6	414.0	242.4	30.9	55.0	0.4	1411.7	9.9	1285.0	85.9	31.0
1949	1.8	40.0	6.6	1.8	14.2	44.5	327.0	494.3	123.2	85.2	0.4	0.0	1138.9	22.5	988.9	85.6	41.8
1950	18.7	12.4	54.4	0.2	0.8	106.3	312.1	445.1	94.4	4.6	0.4	11.6	1061.1	55.4	958.0	5.0	42.7
1951	14.5	15.1	41.5	9.9	1.6	152.3	229.4	393.3	185.1	19.8	5.0	0.0	1067.6	53.0	960.2	24.8	29.6
1952	0.9	19.9	37.2	1.1	5.4	189.3	180.0	299.6	164.0	12.3	0.0	0.9	910.6	43.7	832.9	12.3	21.7
1953	39.4	25.4	0.1	2.8	0.5	150.0	364.1	363.6	204.3	1.6	0.0	3.5	1155.2	3.4	1081.9	1.6	68.2

1954	18.1	18.8	5.0	0.3	2.2	89.3	224.8	298.4	227.9	13.9	0.0	0.2	899.0	7.5	840.4	13.9	37.1
1955	39.5	27.9	2.4	0.7	1.4	86.0	440.3	208.0	102.5	88.3	0.4	0.9	998.3	4.5	836.8	88.7	68.3
1956	36.0	23.8	12.1	0.7	14.4	222.2	245.9	372.7	369.1	81.1	77.5	5.9	1461.4	27.1	1209.9	158.6	65.7
1957	21.9	1.5	38.4	1.0	0.8	86.1	332.8	323.1	130.7	0.3	0.0	1.0	937.6	40.2	872.7	0.3	24.4
1958	32.0	8.6	43.1	3.5	0.0	59.1	294.1	278.5	165.2	53.8	0.0	1.5	939.4	46.6	796.9	53.8	42.0
1959	73.5	5.6	0.0	0.0	27.1	27.3	223.1	351.4	116.8	138.2	0.0	0.0	963.0	27.1	718.6	138.2	79.1
1960	11.6	0.2	19.4	2.3	0.5	59.5	412.5	491.5	109.0	37.9	0.0	0.0	1144.4	22.2	1072.5	37.9	11.7
1961	31.8	25.6	0.0	0.0	3.1	105.5	259.5	425.6	208.8	56.6	4.4	4.7	1125.8	3.1	999.4	61.0	62.2
1962	22.0	13.0	7.8	9.5	2.4	55.0	303.2	301.2	325.3	5.4	0.0	3.4	1048.3	19.7	984.7	5.4	38.4
1963	19.8	10.7	23.4	5.9	24.3	95.6	477.4	394.9	188.6	21.1	11.6	1.5	1274.7	53.6	1156.5	32.7	32.0
1964	0.2	8.4	5.4	5.4	7.6	88.0	333.4	358.6	223.9	21.4	16.0	0.0	1068.2	18.4	1003.8	37.4	8.6
1965	3.7	0.7	24.1	18.1	3.1	19.2	240.0	162.1	153.4	28.5	1.4	3.0	657.2	45.3	574.6	29.9	7.4
1966	21.0	11.1	0.0	0.0	0.0	266.7	105.3	146.2	34.5	1.2	67.6	11.5	665.0	0.0	552.7	68.8	43.5
1967	9.8	0.2	40.6	4.0	2.6	53.0	286.2	556.0	213.6	3.7	0.0	18.7	1188.3	47.2	1108.7	3.7	28.7
1968	33.0	8.0	3.9	0.3	0.4	79.8	201.1	198.3	54.2	19.9	0.0	4.6	603.7	4.6	533.5	19.9	45.6
1969	3.7	8.6	0.3	2.0	29.6	55.5	488.5	253.5	158.2	1.2	25.5	0.0	1026.7	31.9	955.8	26.7	12.3
1970	33.2	55.3	4.8	0.1	31.2	135.5	320.2	244.4	567.6	35.2	0.0	0.0	1427.4	36.1	1267.6	35.2	88.4
1971	24.3	12.7	4.3	19.4	46.3	287.3	279.6	495.3	176.8	82.3	0.0	0.0	1428.3	70.1	1239.0	82.3	37.0
1972	24.1	57.7	1.1	6.4	0.6	10.3	152.6	330.6	135.8	111.2	37.5	0.4	868.5	8.1	629.4	148.7	82.2
1973	31.0	1.6	0.9	0.2	1.2	58.0	361.9	438.9	185.3	94.9	1.7	0.0	1175.5	2.3	1044.1	96.6	32.6
1974	3.5	2.1	0.3	0.1	4.9	56.2	446.7	224.9	87.1	26.4	3.3	0.5	856.1	5.4	814.9	29.8	6.1
1975	32.3	8.9	25.6	3.0	3.2	141.7	362.1	185.5	144.5	39.7	1.8	0.0	948.4	31.8	833.8	41.5	41.3
1976	29.1	7.2	0.3	7.2	4.6	34.8	248.3	155.3	409.9	0.4	2.1	0.0	899.2	12.1	848.3	2.5	36.3
1977	19.6	17.3	0.1	11.7	28.1	107.2	413.1	252.3	173.7	63.3	23.0	7.9	1117.4	40.0	946.3	86.3	44.8
1978	28.8	74.0	25.0	9.8	0.9	207.1	165.1	280.6	346.8	25.8	0.1	9.3	1173.4	35.7	999.6	26.0	112.1
1979	29.7	12.3	0.3	5.3	0.8	134.4	290.3	157.3	90.9	2.6	88.8	4.4	817.1	6.5	672.9	91.4	46.4
1980	10.2	5.5	7.9	0.0	4.0	196.3	450.5	506.6	155.5	10.7	0.0	9.2	1356.4	11.9	1309.0	10.7	24.8
1981	20.1	4.8	16.1	1.4	9.6	106.2	416.2	352.6	161.7	0.3	23.0	3.2	1115.4	27.2	1036.7	23.4	28.1
1982	65.8	15.2	46.4	4.4	27.9	91.7	207.5	358.1	407.4	5.4	52.4	4.0	1286.2	78.7	1064.7	57.8	85.0

1983	11.5	3.7	3.0	11.5	32.3	96.1	287.5	179.8	132.4	51.0	0.0	2.7	811.5	46.8	695.8	51.0	17.9
1984	45.1	37.1	0.8	9.2	1.5	174.9	211.7	220.0	238.2	27.3	0.0	0.0	965.8	11.6	844.8	27.3	82.1
1985	27.4	1.5	0.1	7.6	2.0	63.1	300.0	286.9	204.5	79.6	0.0	2.5	975.1	9.6	854.5	79.6	31.4
1986	20.9	38.5	1.3	2.2	40.4	70.3	260.3	375.1	183.3	6.0	3.7	13.7	1015.6	43.9	889.0	9.7	73.0
1987	16.9	15.1	13.3	0.8	7.7	31.7	163.3	296.4	234.1	70.6	9.7	3.0	862.6	21.7	725.6	80.3	34.9
1988	13.5	10.5	26.4	1.3	13.2	159.3	245.7	246.7	105.8	18.1	0.0	11.5	852.0	40.9	757.5	18.1	35.5
1989	4.7	3.2	7.6	0.7	12.0	121.4	314.3	185.8	150.3	30.5	20.4	20.1	870.9	20.3	771.7	50.9	27.9
1990	0.2	31.1	7.5	6.5	21.9	208.4	384.5	287.1	229.6	17.0	0.0	1.5	1195.4	35.9	1109.7	17.0	32.8
1991	18.1	11.3	18.8	7.1	7.0	109.3	131.0	235.3	142.2	1.9	1.0	21.3	704.3	32.9	617.8	3.0	50.7
1992	34.5	7.6	0.3	3.3	9.6	21.5	114.2	137.8	150.8	59.4	19.4	0.0	558.3	13.2	424.3	78.7	42.1
1993	10.5	0.4	12.2	0.9	18.7	25.1	92.2	170.5	278.7	38.9	0.2	0.0	648.3	31.8	566.5	39.1	10.9
1994	69.2	21.7	32.0	6.6	1.8	212.3	295.9	319.8	123.8	35.4	0.0	0.0	1118.4	40.4	951.7	35.4	90.9
1995	27.9	23.7	17.1	5.0	4.8	26.3	219.2	253.0	176.0	2.6	30.7	9.9	796.3	26.9	674.6	33.3	61.5
1996	44.7	20.3	0.8	0.8	1.9	197.7	231.4	327.5	122.9	91.7	0.0	0.0	1039.8	3.5	879.6	91.7	65.0
1997	20.9	0.5	2.5	6.2	23.6	85.1	111.5	275.9	185.0	18.1	37.8	13.6	780.7	32.3	657.5	56.0	34.9
1998	5.7	6.0	12.9	5.7	35.1	56.5	251.3	327.6	164.3	43.2	17.7	0.0	926.1	53.7	799.8	60.9	11.8
1999	45.2	35.8	0.0	0.0	16.2	32.8	337.3	221.2	170.3	25.2	0.0	0.7	884.7	16.2	761.6	25.2	81.7
2000	11.2	15.2	0.4	3.1	7.6	98.6	162.4	138.1	269.9	0.3	0.0	0.0	707.0	11.2	669.1	0.3	26.4
2001	3.6	1.8	20.6	5.7	5.2	80.8	214.0	245.3	71.9	64.6	5.9	0.0	719.4	31.5	612.0	70.5	5.5
2002	30.9	17.3	4.4	1.7	1.8	26.2	117.6	276.9	176.9	77.7	21.9	1.5	754.7	7.9	597.5	99.5	49.8

Data values of Allahabad

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Pre-Monsoon	Monsoon	Post-Monsoon	Winter
1901	95.4	32.3	13.6	1.2	2.8	11.5	188.3	348.2	247.4	2.0	0.5	0.1	943.2	17.6	795.4	2.5	127.7
1902	17.5	3.4	0.2	0.9	10.2	35.5	460.6	253.4	244.1	1.5	2.0	0.1	1029.5	11.3	993.6	3.5	21.1
1903	1.7	2.3	0.6	1.2	4.7	40.5	121.3	478.7	156.6	61.0	0.0	0.0	868.6	6.5	797.1	61.0	4.0
1904	8.9	1.6	18.3	0.3	14.1	40.4	321.4	526.1	71.1	100.4	13.7	23.9	1140.2	32.7	959.0	114.1	34.4
1905	21.6	8.3	26.5	3.7	1.5	19.2	323.5	301.8	180.3	0.6	0.0	0.5	887.4	31.7	824.7	0.6	30.4

1906	8.6	23.1	8.0	0.1	8.1	87.4	319.4	261.7	153.6	7.0	0.1	0.7	877.8	16.2	822.1	7.1	32.4
1907	0.4	90.2	12.6	16.2	2.2	69.5	207.3	414.5	24.8	0.7	0.6	0.5	839.6	31.0	716.1	1.3	91.1
1908	17.6	20.9	1.7	0.2	0.3	13.3	342.0	477.4	62.3	15.9	0.0	1.1	952.6	2.2	894.9	15.9	39.6
1909	5.8	6.6	0.2	25.0	2.3	314.4	539.5	159.0	167.8	0.4	0.0	24.6	1245.6	27.4	1180.7	0.4	37.1
1910	14.3	2.3	3.9	0.8	11.4	108.7	173.8	282.1	228.3	41.1	91.2	0.0	958.0	16.1	793.0	132.3	16.5
1911	26.6	0.2	59.8	3.7	0.9	124.5	77.3	288.8	324.3	103.1	59.7	0.0	1068.9	64.4	814.9	162.9	26.8
1912	2.3	3.0	7.8	1.3	4.5	50.1	287.9	294.1	114.5	0.6	42.4	0.9	809.4	13.6	746.6	43.0	6.2
1913	0.2	55.2	37.5	0.1	21.1	155.9	201.5	278.8	81.5	7.8	1.3	19.8	860.7	58.7	717.7	9.1	75.2
1914	8.6	8.3	22.1	9.0	35.1	55.6	515.0	297.2	106.2	2.3	0.0	1.2	1060.7	66.2	974.1	2.3	18.1
1915	23.9	57.5	63.9	6.9	1.5	75.5	348.1	335.7	272.4	83.4	9.5	3.6	1281.8	72.4	1031.6	92.9	84.9
1916	0.2	24.5	0.0	0.4	1.9	155.9	325.2	504.4	176.5	60.4	12.4	0.0	1261.9	2.3	1162.1	72.7	24.8
1917	6.7	59.2	30.0	0.5	43.2	208.2	281.9	336.4	236.9	49.9	0.0	9.7	1262.5	73.6	1063.4	49.9	75.6
1918	0.5	0.4	1.4	1.0	3.9	274.3	48.8	401.3	83.3	0.4	2.1	0.4	817.7	6.3	807.6	2.5	1.3
1919	75.6	18.5	4.3	3.9	6.4	70.3	304.9	421.2	152.3	40.9	2.1	1.5	1101.7	14.5	948.7	42.9	95.5
1920	0.3	13.8	27.4	0.0	7.3	37.4	646.8	197.3	63.5	1.8	0.0	0.0	995.5	34.7	945.0	1.8	14.1
1921	68.5	3.7	0.0	0.1	0.0	142.1	206.2	359.4	153.2	4.8	0.0	0.0	938.1	0.2	861.0	4.8	72.1
1922	37.8	4.9	0.0	3.6	0.0	54.2	425.0	443.2	286.4	6.4	5.3	14.3	1281.1	3.6	1208.8	11.7	57.0
1923	1.0	24.2	1.1	0.3	0.2	25.3	295.2	495.3	184.9	35.5	3.1	5.0	1071.1	1.7	1000.7	38.6	30.1
1924	23.4	4.8	0.8	2.0	1.1	26.3	398.3	397.1	183.9	26.1	16.9	3.9	1084.5	4.0	1005.6	43.0	32.0
1925	1.0	0.8	1.1	0.1	28.0	105.3	722.6	277.3	389.5	1.2	39.1	0.0	1566.1	29.2	1494.8	40.3	1.8
1926	5.7	1.1	74.9	8.4	12.5	12.2	245.5	270.0	289.2	27.6	2.0	3.3	952.2	95.8	816.8	29.5	10.0
1927	16.0	31.2	36.8	0.4	2.9	43.9	506.7	232.5	171.9	42.4	63.6	1.0	1149.3	40.1	955.0	105.9	48.2
1928	26.2	31.0	0.4	13.8	3.1	38.4	298.8	88.9	57.7	73.0	0.3	19.6	651.3	17.4	483.9	73.3	76.8
1929	94.3	4.3	0.7	1.3	1.1	60.4	577.3	403.5	86.7	54.5	0.0	30.4	1314.5	3.1	1127.9	54.5	129.0
1930	7.8	22.7	3.9	2.3	2.5	66.4	481.3	243.8	146.7	15.0	24.7	18.3	1035.3	8.7	938.1	39.7	48.8
1931	0.5	32.0	4.4	0.2	2.0	79.5	260.8	273.1	289.2	91.5	4.8	0.7	1038.7	6.5	902.7	96.3	33.1
1932	0.2	9.0	0.7	0.1	6.3	41.5	207.0	429.8	107.3	23.7	12.0	0.7	838.1	7.0	785.5	35.7	9.9
1933	5.9	26.9	11.2	29.5	33.9	133.2	180.8	312.5	102.4	41.2	0.3	0.4	878.0	74.5	729.0	41.5	33.1
1934	28.3	1.2	28.7	0.8	0.1	101.6	212.6	301.1	199.9	6.6	13.8	2.8	897.6	29.6	815.1	20.5	32.4

1935	13.2	22.1	0.5	4.1	0.4	145.3	340.5	440.1	205.9	0.7	0.2	10.1	1183.3	5.0	1131.8	1.0	45.4
1936	5.6	59.7	8.8	0.5	5.3	175.0	453.6	339.0	295.4	16.6	3.1	23.3	1386.0	14.7	1263.0	19.7	88.7
1937	0.2	50.0	11.1	3.9	4.1	82.1	359.6	320.1	183.4	54.8	0.0	0.1	1069.4	19.1	945.3	54.8	50.3
1938	66.0	11.7	0.1	5.2	4.8	243.8	344.2	335.9	333.1	38.0	0.0	0.0	1382.9	10.2	1257.0	38.0	77.7
1939	24.5	14.9	4.6	6.9	0.2	167.0	337.9	416.3	298.1	14.9	0.0	0.0	1285.3	11.7	1219.3	14.9	39.4
1940	1.9	19.3	58.3	5.6	8.5	72.2	182.4	409.3	162.7	5.1	0.7	6.0	931.8	72.4	826.5	5.8	27.1
1941	38.3	5.1	2.7	0.1	7.7	93.8	187.1	231.5	147.2	5.8	0.7	0.1	719.9	10.5	659.5	6.4	43.4
1942	86.9	43.5	3.9	5.6	0.2	85.8	273.6	360.2	214.9	1.2	0.0	12.9	1088.6	9.6	934.5	1.2	143.2
1943	18.2	4.0	0.4	14.6	3.9	12.5	267.7	630.0	251.5	11.5	0.1	0.0	1214.4	18.9	1161.8	11.6	22.2
1944	23.0	42.1	63.1	5.3	1.0	25.0	396.3	603.6	37.2	20.9	0.0	2.9	1220.4	69.4	1062.2	20.9	68.0
1945	41.0	5.3	0.1	10.2	2.6	62.3	207.3	339.9	142.7	33.2	0.0	25.2	869.8	12.9	752.2	33.2	71.5
1946	0.2	37.6	3.2	3.2	2.9	162.2	367.3	451.3	67.9	28.9	32.0	6.5	1163.3	9.4	1048.7	60.9	44.4
1947	12.6	13.2	14.8	2.6	0.6	53.3	417.8	313.3	140.7	12.4	7.1	0.8	989.3	18.0	925.2	19.6	26.5
1948	19.2	13.3	2.1	0.3	2.2	271.7	431.2	535.8	203.9	22.8	54.4	0.3	1557.2	4.6	1442.5	77.2	32.8
1949	0.5	36.0	2.5	0.8	6.8	24.2	340.1	512.8	95.2	79.1	0.5	0.0	1098.3	10.1	972.1	79.5	36.6
1950	27.0	11.3	63.6	0.4	0.5	98.8	333.1	471.7	71.3	1.5	0.2	19.4	1098.8	64.4	975.0	1.7	57.7
1951	20.1	18.6	45.6	8.2	1.3	189.5	214.9	471.2	165.4	10.3	1.5	0.0	1146.8	55.2	1041.0	11.8	38.8
1952	1.3	20.9	46.9	0.5	5.1	186.9	206.0	360.6	132.5	4.1	0.3	0.6	965.7	52.6	885.9	4.4	22.9
1953	28.2	32.1	0.0	3.3	0.2	176.0	375.7	358.0	189.7	1.5	0.0	6.7	1171.6	3.5	1099.4	1.5	67.1
1954	22.3	17.6	6.3	0.1	0.9	93.5	255.5	329.5	225.5	11.8	0.0	0.1	963.1	7.2	904.1	11.8	40.0
1955	57.4	30.5	3.2	0.4	2.1	98.2	473.1	281.2	118.0	88.7	0.1	1.0	1153.9	5.7	970.5	88.9	88.9
1956	45.8	26.3	15.1	0.2	7.5	243.2	274.1	383.4	343.6	85.6	88.3	7.6	1520.7	22.8	1244.2	174.0	79.7
1957	19.9	1.1	50.0	2.3	1.0	94.8	306.6	381.8	125.2	0.4	0.1	1.4	984.7	53.3	908.5	0.5	22.4
1958	33.3	7.8	53.3	2.1	0.0	45.8	265.7	313.3	132.5	33.3	1.7	3.0	891.9	55.5	757.3	35.0	44.1
1959	69.2	7.3	0.0	0.5	34.0	14.3	213.2	406.0	72.2	133.1	0.4	0.0	950.1	34.5	705.6	133.5	76.5
1960	17.6	0.2	16.4	2.3	1.4	62.4	467.0	551.1	85.3	39.0	0.0	0.0	1242.6	20.1	1165.8	39.0	17.7
1961	40.6	16.6	0.2	0.0	3.7	84.5	282.8	488.3	208.1	52.1	4.3	6.1	1187.1	3.9	1063.6	56.3	63.3
1962	23.4	14.3	10.1	13.5	3.4	41.7	330.7	346.7	329.4	2.0	0.9	5.9	1121.9	26.9	1048.5	2.9	43.6
1963	27.3	13.0	20.1	8.6	19.0	100.3	552.9	424.2	185.1	7.8	5.5	2.9	1366.9	47.7	1262.6	13.4	43.2

1964	0.2	9.3	5.5	5.1	7.0	74.7	339.9	337.7	220.8	14.8	6.9	0.1	1022.0	17.6	973.1	21.7	9.6
1965	4.5	1.1	31.9	20.6	2.8	16.8	212.9	179.4	149.2	26.7	0.3	4.6	650.7	55.3	558.2	27.0	10.2
1966	11.8	9.3	0.5	0.1	1.5	341.2	118.1	149.4	27.2	1.7	74.1	14.6	749.6	2.1	635.9	75.8	35.7
1967	8.0	0.2	45.5	5.0	1.5	55.6	292.8	627.0	236.0	1.8	0.2	35.7	1309.1	52.0	1211.3	1.9	43.9
1968	33.0	8.9	6.3	0.5	0.1	76.7	193.0	148.9	58.7	14.4	0.0	6.5	546.9	6.9	477.2	14.4	48.4
1969	3.3	5.4	0.3	0.8	30.1	32.8	551.4	238.8	135.8	0.4	20.3	0.0	1019.5	31.3	958.7	20.7	8.7
1970	46.6	64.6	2.7	0.0	37.9	122.8	326.8	263.6	650.9	33.8	0.0	0.0	1549.7	40.7	1364.1	33.8	111.2
1971	20.9	13.6	5.2	24.3	46.4	285.1	232.3	521.3	205.1	82.3	0.1	0.0	1436.6	75.9	1243.9	82.4	34.4
1972	33.3	46.7	0.3	3.1	0.2	7.7	133.5	338.4	146.4	95.1	33.4	0.3	838.5	3.6	626.0	128.5	80.3
1973	13.8	0.7	0.3	0.2	0.3	34.2	441.1	526.0	159.6	77.4	0.6	0.0	1254.1	0.8	1160.9	77.9	14.5
1974	1.1	1.0	0.1	0.1	3.9	52.3	421.8	247.9	67.5	15.2	2.1	0.1	813.1	4.1	789.5	17.3	2.3
1975	11.4	9.1	27.6	4.4	1.2	190.7	342.3	221.4	130.6	36.1	1.1	0.0	975.9	33.2	885.0	37.2	20.5
1976	40.8	1.5	0.4	6.1	5.7	22.7	236.0	154.0	366.4	0.3	4.4	0.0	838.3	12.2	779.0	4.7	42.3
1977	29.5	20.7	0.4	8.4	12.1	127.0	423.9	248.9	141.5	66.6	12.6	9.2	1100.8	20.8	941.3	79.2	59.4
1978	37.6	71.2	25.7	5.6	0.7	214.2	144.0	284.0	314.9	15.4	0.4	9.0	1122.6	31.9	957.2	15.8	117.7
1979	35.5	10.0	0.1	4.4	0.3	161.3	249.1	167.0	71.5	1.7	87.4	2.5	790.8	4.8	648.9	89.1	48.0
1980	6.7	4.9	4.0	0.1	1.2	214.6	504.7	644.5	186.4	8.5	0.0	18.1	1593.7	5.2	1550.2	8.5	29.7
1981	22.2	2.4	11.8	0.8	6.9	147.2	450.9	456.9	151.0	0.4	24.8	4.8	1280.0	19.4	1206.0	25.2	29.4
1982	86.1	13.0	42.1	3.7	29.7	102.2	220.4	422.7	434.1	2.9	55.8	6.7	1419.2	75.4	1179.3	58.7	105.8
1983	8.4	2.3	1.7	13.7	32.1	99.1	265.8	190.3	136.4	44.6	0.0	2.7	797.1	47.6	691.6	44.6	13.4
1984	49.1	38.0	0.2	10.3	1.0	168.4	197.5	232.8	191.5	25.3	0.0	0.1	914.1	11.5	790.1	25.3	87.2
1985	28.9	0.6	0.0	11.0	1.0	62.6	275.6	303.8	214.9	79.2	0.0	1.5	979.1	12.0	856.9	79.2	31.0
1986	27.3	40.9	0.5	0.9	50.1	58.8	228.8	419.4	180.7	7.0	2.0	21.6	1037.9	51.4	887.7	9.0	89.8
1987	25.3	14.4	17.4	0.2	6.4	8.0	123.3	233.8	87.4	72.1	5.7	5.4	599.3	24.0	452.5	77.8	45.0
1988	15.0	4.9	25.6	0.9	10.0	172.8	248.8	293.3	96.7	12.7	0.8	20.5	902.1	36.5	811.6	13.5	40.5
1989	2.5	0.7	9.6	0.7	4.4	118.1	348.4	151.1	139.1	22.0	17.0	24.6	838.3	14.7	756.7	39.0	27.9
1990	0.2	26.3	5.5	9.6	18.6	232.9	380.1	328.8	234.4	7.0	0.1	3.3	1246.8	33.7	1176.3	7.0	29.8
1991	15.3	12.5	12.9	8.6	8.7	102.9	118.4	102.1	128.8	0.6	0.7	32.5	544.1	30.2	452.2	1.4	60.3
1992	40.9	8.5	0.1	2.4	11.7	24.5	105.0	165.5	177.1	58.2	20.6	0.0	614.5	14.2	472.2	78.8	49.3

1993	10.6	2.0	12.6	1.1	19.4	30.3	112.0	174.9	260.7	29.4	0.1	0.0	653.0	33.1	577.9	29.5	12.6
1994	66.2	25.4	37.2	6.8	0.7	219.8	334.7	336.8	168.3	16.8	0.1	0.0	1212.9	44.8	1059.6	17.0	91.6
1995	36.9	24.8	18.0	7.8	2.3	38.5	237.4	274.5	159.7	1.3	32.6	19.7	853.6	28.1	710.1	33.9	81.5
1996	54.4	22.3	0.4	1.0	1.1	229.5	240.7	348.8	118.2	80.0	0.6	0.0	1096.9	2.5	937.2	80.6	76.7
1997	20.4	0.3	3.0	8.6	14.3	111.1	54.2	249.9	224.2	17.0	31.1	21.4	755.5	26.0	639.4	48.1	42.0
1998	3.1	3.4	18.8	6.1	32.3	107.4	326.5	424.5	181.7	18.6	8.2	0.0	1130.7	57.3	1040.1	26.8	6.5
1999	56.2	44.4	0.0	0.0	18.3	15.3	433.3	228.6	218.2	30.0	0.0	1.0	1045.2	18.3	895.4	30.0	101.6
2000	11.9	10.9	0.1	1.2	10.4	104.7	231.5	167.4	305.6	0.4	0.0	0.0	844.0	11.7	809.1	0.4	22.8
2001	4.2	2.3	14.4	6.4	5.9	120.2	222.5	245.2	107.6	63.1	10.4	0.0	802.2	26.7	695.4	73.5	6.6
2002	36.4	19.3	1.5	0.7	1.3	38.8	111.0	294.0	169.6	72.6	17.5	4.2	766.9	3.5	613.5	90.0	59.9

Data values of Lucknow

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Pre-Monsoon	Monsoon	Post-Monsoon	Winter
1901	57.6	16.9	7.2	0.6	5.9	12.0	195.3	365.5	205.0	2.3	0.2	3.0	871.3	13.6	777.8	2.5	77.5
1902	8.0	2.0	0.6	3.2	9.8	36.8	412.4	246.3	188.0	10.3	0.4	0.0	917.8	13.6	883.5	10.8	10.0
1903	5.7	1.5	2.1	1.5	3.1	31.7	118.1	412.2	119.9	89.9	0.0	0.4	786.2	6.8	682.0	89.9	7.6
1904	6.9	0.3	8.7	0.6	8.7	47.6	277.7	457.6	107.3	108.7	7.9	29.6	1061.6	18.0	890.2	116.6	36.8
1905	28.3	10.4	11.8	3.7	2.8	17.8	258.5	250.0	120.8	0.5	0.0	2.4	707.1	18.4	647.1	0.5	41.1
1906	7.7	17.5	3.4	0.6	7.0	79.5	225.6	273.9	152.4	6.9	0.0	0.7	775.0	11.0	731.4	6.9	25.8
1907	3.0	47.9	9.4	14.2	3.8	29.9	220.6	319.8	11.6	1.0	0.0	0.0	661.3	27.5	582.0	1.0	50.9
1908	15.0	10.1	0.3	0.4	2.5	19.4	286.3	385.9	58.5	8.9	0.2	1.5	789.3	3.3	750.2	9.1	26.7
1909	10.7	4.9	0.0	21.9	2.2	251.8	485.7	182.1	128.5	2.8	0.0	33.9	1124.5	24.0	1048.1	2.8	49.5
1910	9.2	3.0	1.0	0.7	12.6	105.4	217.7	249.4	207.9	50.0	27.2	0.6	884.5	14.3	780.3	77.2	12.8
1911	26.0	0.0	32.1	4.6	0.3	69.3	73.8	262.6	287.6	108.8	23.7	0.4	889.3	37.1	693.4	132.5	26.4
1912	6.9	2.5	4.9	2.8	5.8	50.3	249.6	261.1	158.4	1.3	19.8	2.2	765.5	13.4	719.4	21.0	11.6
1913	0.7	30.4	17.5	0.9	19.1	142.3	164.7	206.0	55.0	5.3	2.4	24.6	668.9	37.5	567.9	7.8	55.7
1914	4.4	9.2	12.3	7.7	29.2	61.3	474.2	238.2	218.0	7.9	0.0	0.0	1062.4	49.2	991.6	7.9	13.6

1915	13.8	35.6	34.1	7.1	2.4	71.0	292.0	379.9	205.8	88.0	0.2	5.2	1135.2	43.6	948.7	88.2	54.6
1916	0.1	12.7	0.0	1.2	5.6	141.3	326.6	408.9	184.2	70.7	3.8	0.0	1155.0	6.8	1061.0	74.5	12.8
1917	5.3	32.3	16.5	3.9	37.9	176.0	266.4	252.2	258.0	62.8	0.0	13.0	1124.1	58.3	952.5	62.8	50.5
1918	1.7	0.0	1.6	4.1	2.2	183.2	51.5	295.8	52.6	2.1	7.2	0.7	602.6	7.9	583.1	9.3	2.4
1919	37.9	9.8	2.1	6.0	4.4	49.9	267.0	326.7	147.2	43.0	0.8	2.3	897.1	12.5	790.8	43.8	50.0
1920	1.0	8.5	12.9	0.3	9.3	84.1	493.8	137.1	50.8	4.1	0.0	0.3	802.1	22.4	765.8	4.1	9.8
1921	40.9	0.9	0.3	0.3	0.2	76.9	183.9	320.1	160.7	29.2	0.0	0.0	813.4	0.8	741.6	29.2	41.8
1922	26.1	5.3	0.0	3.2	0.5	32.2	383.7	428.8	245.9	10.6	1.4	27.3	1165.1	3.7	1090.6	12.1	58.7
1923	2.7	16.5	0.0	0.0	2.5	17.5	225.4	363.7	183.5	68.3	6.0	9.6	895.6	2.5	790.1	74.3	28.8
1924	13.6	4.0	0.7	1.3	3.2	23.7	317.6	347.4	263.5	62.9	4.4	10.0	1052.2	5.3	952.2	67.3	27.6
1925	4.8	0.1	0.7	1.4	25.0	125.5	619.1	261.5	308.6	3.4	15.4	0.0	1365.5	27.1	1314.7	18.8	4.9
1926	4.5	1.6	37.5	9.6	8.9	10.9	244.3	251.2	206.4	26.2	3.4	2.0	806.6	56.1	712.8	29.5	8.1
1927	8.4	18.7	15.2	1.4	8.2	39.8	372.9	284.7	143.6	95.5	23.4	2.0	1013.7	24.8	841.0	118.9	29.0
1928	21.7	21.6	1.0	13.1	1.3	33.2	258.1	87.9	36.2	67.2	3.8	28.9	574.0	15.4	415.4	71.0	72.2
1929	60.3	1.5	1.0	2.7	1.6	67.4	432.1	358.5	66.6	63.8	0.0	40.6	1096.2	5.3	924.6	63.8	102.4
1930	7.9	14.4	2.7	2.3	3.4	66.5	410.5	236.0	108.0	31.5	9.2	22.6	914.9	8.4	821.0	40.7	44.9
1931	0.5	17.2	2.2	0.2	3.4	56.1	219.0	209.9	313.0	137.7	0.6	0.1	959.8	5.7	798.0	138.3	17.8
1932	0.1	3.9	1.9	0.5	4.7	38.3	132.8	354.1	160.7	26.5	3.3	4.0	730.6	7.1	685.8	29.8	8.0
1933	5.2	17.1	5.3	24.1	28.9	117.4	212.9	269.9	121.8	91.2	0.0	0.4	894.2	58.3	722.0	91.2	22.7
1934	19.2	1.0	14.8	0.3	1.8	83.7	191.5	297.1	149.7	3.5	1.5	9.1	773.2	16.8	722.1	5.0	29.3
1935	16.8	13.5	0.8	4.7	0.7	90.4	296.4	316.2	170.2	1.1	3.4	15.2	929.4	6.2	873.2	4.5	45.6
1936	3.2	33.7	5.2	2.6	4.0	248.7	481.5	336.2	248.3	6.0	2.2	35.3	1406.8	11.8	1314.7	8.2	72.1
1937	0.5	32.4	4.5	4.4	5.8	74.2	304.5	258.5	174.0	55.4	0.3	5.0	919.5	14.7	811.1	55.8	37.9
1938	43.2	8.5	0.2	4.4	2.2	200.6	322.9	300.3	237.6	39.0	0.5	0.0	1159.6	6.9	1061.5	39.5	51.8
1939	15.0	10.4	2.1	7.0	1.2	131.8	262.1	309.2	220.0	25.1	0.0	0.0	983.7	10.2	923.1	25.1	25.4
1940	6.2	15.8	25.6	5.7	8.0	60.6	169.6	326.1	125.1	5.6	0.1	6.9	755.3	39.3	681.4	5.7	29.0
1941	22.7	3.4	0.9	0.1	8.9	61.7	140.5	192.7	132.3	6.8	0.5	3.2	573.8	10.0	527.2	7.3	29.4
1942	53.5	21.8	0.5	6.3	2.4	76.0	296.5	272.5	171.5	0.4	0.0	20.6	922.2	9.2	816.6	0.4	95.9
1943	12.7	2.3	1.1	14.6	2.0	39.9	189.3	529.0	184.4	5.4	0.0	0.0	980.7	17.7	942.6	5.4	15.0

1944	16.1	22.2	30.5	6.0	0.4	48.5	293.3	410.0	46.4	14.3	0.2	3.3	891.4	37.0	798.3	14.5	41.6
1945	26.6	1.1	0.9	10.6	1.6	31.3	224.4	287.7	189.4	58.5	0.0	27.8	860.0	13.1	732.9	58.5	55.5
1946	0.2	21.8	1.2	5.0	6.1	107.8	325.3	325.8	38.8	38.1	12.6	10.2	893.0	12.3	797.8	50.8	32.2
1947	8.2	9.5	8.1	2.3	1.7	40.3	348.1	298.6	147.7	11.8	2.8	1.1	880.3	12.1	834.7	14.6	18.8
1948	10.4	10.2	3.7	0.4	2.5	167.8	343.8	505.6	156.0	34.4	14.0	0.6	1249.3	6.5	1173.1	48.4	21.2
1949	0.4	24.0	1.3	2.9	4.7	26.7	347.9	395.0	131.0	86.8	0.3	0.5	1021.7	8.9	900.7	87.2	24.9
1950	19.8	6.1	29.0	0.4	3.0	101.9	297.8	384.8	86.4	1.1	0.2	20.1	950.6	32.4	870.8	1.3	46.0
1951	14.2	12.2	20.7	6.6	2.9	135.5	174.5	393.5	159.0	12.4	8.8	0.0	940.2	30.2	862.5	21.1	26.4
1952	3.3	13.2	22.4	1.5	8.2	141.4	194.1	347.1	85.4	0.9	3.6	1.4	822.4	32.1	768.0	4.5	17.8
1953	22.8	17.5	0.3	3.5	0.8	129.7	363.0	296.4	131.1	0.8	0.0	7.8	973.7	4.5	920.2	0.8	48.1
1954	19.0	17.3	3.9	0.2	0.5	63.0	275.1	288.8	181.4	41.4	0.0	0.4	891.1	4.6	808.4	41.4	36.7
1955	36.9	16.2	2.7	2.6	2.7	89.1	416.1	269.4	126.7	131.6	0.0	1.5	1095.3	8.0	901.3	131.6	54.5
1956	25.6	14.2	9.1	0.4	7.2	163.4	245.8	290.9	234.8	145.5	27.9	9.7	1174.5	16.7	934.9	173.5	49.5
1957	19.2	0.7	25.8	3.1	2.5	74.3	248.0	310.5	163.6	7.4	1.5	10.4	866.9	31.4	796.4	8.9	30.2
1958	18.5	4.4	26.0	2.0	0.4	48.6	215.2	319.7	128.9	70.3	0.9	8.6	843.6	28.5	712.3	71.2	31.5
1959	38.4	5.5	1.3	1.4	30.0	14.7	228.0	325.0	69.6	152.1	5.2	0.0	871.1	32.6	637.3	157.3	43.9
1960	14.1	0.0	8.3	2.2	1.6	47.7	380.1	444.1	98.1	81.8	0.0	0.9	1079.0	12.1	970.0	81.8	15.1
1961	29.5	12.4	0.0	1.3	4.3	66.3	269.4	428.1	164.6	86.8	1.5	9.1	1073.4	5.6	928.5	88.3	51.0
1962	20.3	9.0	6.7	12.4	4.6	49.7	288.4	309.2	298.8	0.6	2.1	6.9	1008.7	23.6	946.1	2.7	36.2
1963	16.9	7.2	11.4	9.0	14.8	85.0	437.2	360.1	210.3	9.1	6.0	5.8	1172.8	35.2	1092.6	15.2	29.9
1964	1.8	4.5	3.5	3.8	9.4	42.9	345.8	230.5	212.9	10.6	0.0	3.3	868.9	16.6	832.1	10.6	9.5
1965	3.7	5.2	16.5	17.8	3.1	13.0	188.7	181.8	104.7	33.8	0.4	4.3	573.1	37.3	488.3	34.2	13.3
1966	3.1	8.6	0.3	0.0	3.8	229.4	166.3	219.7	49.5	10.6	26.7	13.2	731.0	4.1	664.9	37.3	24.8
1967	1.5	0.8	23.9	4.3	0.6	45.1	259.2	540.1	178.5	2.8	1.0	43.4	1101.0	28.8	1022.9	3.8	45.6
1968	27.5	7.4	4.0	1.3	0.5	76.9	178.9	116.3	59.9	21.8	0.0	7.5	502.0	5.8	432.0	21.8	42.4
1969	7.2	3.9	1.3	2.6	23.9	27.3	440.4	226.9	209.1	1.7	5.8	0.0	950.1	27.8	903.6	7.5	11.1
1970	30.7	35.5	0.7	0.1	34.9	95.2	259.4	241.4	468.6	51.6	0.0	0.0	1218.2	35.7	1064.6	51.6	66.2
1971	13.0	9.7	3.6	20.8	38.6	195.0	226.1	417.1	217.9	128.4	4.2	0.0	1274.4	63.0	1056.2	132.5	22.7
1972	18.8	24.3	0.9	2.8	0.6	17.3	164.6	268.1	192.8	100.7	10.4	0.6	801.7	4.3	642.7	111.0	43.6

1973	9.8	3.1	2.0	0.1	3.0	60.7	342.3	446.4	131.3	105.6	0.1	0.0	1104.3	5.1	980.7	105.7	12.9
1974	3.0	1.5	0.6	0.4	4.2	48.0	318.1	199.6	50.0	11.6	0.3	5.1	642.3	5.1	615.6	11.9	9.6
1975	14.1	6.7	13.1	4.3	1.1	150.7	277.7	229.1	159.8	39.2	0.0	0.0	895.7	18.4	817.3	39.2	20.8
1976	21.9	6.1	0.9	5.2	5.6	32.3	190.5	229.2	238.3	2.5	1.3	0.2	734.0	11.7	690.3	3.7	28.1
1977	20.7	11.6	0.2	7.2	8.0	94.7	348.3	193.8	114.6	73.1	0.7	11.6	884.4	15.4	751.4	73.8	43.8
1978	20.2	34.2	21.9	2.1	0.7	139.8	130.3	259.8	249.0	16.9	1.5	6.6	883.0	24.6	779.0	18.3	61.1
1979	21.7	9.1	2.2	4.0	5.2	109.4	197.6	148.1	44.9	0.6	32.2	3.3	578.4	11.5	500.0	32.8	34.1
1980	1.3	3.9	4.5	0.7	0.8	164.2	499.0	556.9	227.8	22.1	0.5	22.6	1504.2	6.0	1447.9	22.6	27.8
1981	16.9	2.2	7.7	0.4	8.9	124.7	417.3	359.6	118.8	0.4	11.0	3.5	1071.3	17.0	1020.4	11.3	22.6
1982	49.8	7.6	24.9	4.9	25.8	66.8	189.1	394.1	306.9	8.3	17.9	10.0	1105.9	55.5	956.8	26.2	67.4
1983	15.0	1.5	1.9	17.4	28.3	90.9	227.4	163.6	205.4	55.4	0.0	4.6	811.4	47.5	687.3	55.4	21.1
1984	25.1	27.6	0.6	10.6	0.8	123.4	163.8	192.4	137.2	24.4	0.0	1.8	707.7	12.0	616.8	24.4	54.6
1985	13.3	0.3	0.2	10.9	4.0	60.6	238.4	265.0	203.4	108.9	0.0	10.9	915.9	15.2	767.4	108.9	24.4
1986	13.2	22.5	1.4	2.8	45.2	44.0	243.6	316.1	172.1	18.2	2.7	35.3	917.2	49.5	775.8	20.9	71.0
1987	16.3	10.3	8.3	0.8	11.3	2.1	77.7	174.0	27.4	78.7	0.0	6.9	413.9	20.4	281.3	78.7	33.4
1988	9.0	4.9	11.5	2.9	8.4	121.4	283.5	304.2	87.2	12.1	0.4	27.2	872.7	22.8	796.3	12.5	41.1
1989	10.5	1.9	5.4	0.8	3.3	91.4	300.5	147.8	149.4	23.2	7.2	22.4	763.8	9.5	689.1	30.4	34.8
1990	0.1	16.8	3.9	8.9	16.9	124.1	333.9	289.8	192.2	8.4	3.4	12.3	1010.8	29.7	940.0	11.8	29.2
1991	8.3	9.2	5.4	8.8	16.8	32.0	52.4	65.0	100.3	0.4	1.2	34.0	333.8	31.1	249.7	1.6	51.5
1992	25.9	7.3	1.4	2.3	11.9	32.1	111.1	183.9	147.2	64.5	15.5	0.0	603.2	15.7	474.4	80.0	33.2
1993	10.6	0.0	9.5	2.6	17.4	62.7	198.4	169.7	285.1	24.9	0.0	0.0	780.9	29.5	715.9	24.9	10.6
1994	42.3	12.9	19.0	6.8	3.6	121.6	300.4	292.1	137.0	5.0	0.0	0.2	940.7	29.3	851.0	5.0	55.3
1995	26.2	16.8	8.5	8.2	1.3	27.2	210.1	288.3	174.0	0.4	16.1	24.2	801.5	18.0	699.7	16.5	67.3
1996	35.4	15.3	1.1	1.8	3.5	163.7	208.5	295.4	134.5	82.3	0.0	0.0	941.3	6.3	802.0	82.3	50.7
1997	11.5	0.8	3.1	7.0	12.5	108.4	42.6	206.5	179.6	29.7	13.7	23.9	639.4	22.6	537.1	43.5	36.2
1998	1.9	3.2	13.9	8.8	24.3	69.5	297.8	394.7	137.0	16.1	1.6	0.0	969.0	47.0	899.1	17.7	5.1
1999	30.9	24.6	0.0	0.0	14.6	32.1	311.8	163.6	202.3	43.4	0.0	3.2	826.6	14.6	709.8	43.4	58.7
2000	12.4	9.2	0.9	1.1	11.2	64.2	198.5	185.3	223.8	0.4	0.0	0.0	706.9	13.2	671.7	0.4	21.7
2001	4.0	2.7	5.2	7.8	11.2	97.3	186.2	168.0	86.4	60.7	3.2	0.6	633.3	24.2	537.9	63.9	7.3

2002	20.6	15.1	4.2	1.6	0.8	27.4	98.3	227.6	197.2	72.5	4.8	4.7	674.9	6.6	550.5	77.3	40.5
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Data values of Faizabad

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Pre-Monsoon	Monsoon	Post-Monsoon	Winter
1901	57.0	14.3	3.6	2.3	11.7	36.7	197.8	340.0	250.8	7.2	0.9	1.9	924.2	17.6	825.3	8.1	73.3
1902	5.6	1.7	0.8	5.1	6.2	50.1	431.2	242.2	239.2	15.8	0.3	0.0	998.2	12.1	962.8	16.1	7.3
1903	5.7	1.5	1.0	1.9	12.3	74.7	130.0	431.5	158.0	92.2	0.0	0.2	909.0	15.2	794.2	92.2	7.4
1904	5.1	0.2	11.9	0.5	47.1	44.8	281.8	444.1	120.8	130.7	7.1	18.3	1112.3	59.5	891.5	137.8	23.5
1905	22.0	13.5	11.5	3.7	4.4	17.7	337.6	255.5	267.3	2.1	0.0	1.7	937.1	19.6	878.1	2.1	37.2
1906	6.8	24.3	8.0	0.7	11.6	82.7	286.9	291.0	223.4	27.4	0.0	0.2	963.1	20.3	884.0	27.4	31.4
1907	2.1	44.0	13.1	12.0	8.0	56.4	231.6	330.5	66.3	6.5	0.0	0.0	770.6	33.2	684.8	6.5	46.1
1908	12.0	15.1	1.0	0.5	4.7	30.4	296.2	332.5	73.6	14.5	0.2	1.3	782.2	6.3	732.7	14.7	28.5
1909	8.0	4.9	0.0	20.0	2.5	201.4	492.9	231.5	172.9	4.1	0.0	22.1	1160.2	22.5	1098.7	4.1	35.0
1910	6.6	2.7	5.1	1.2	17.4	121.7	278.5	246.9	236.5	55.5	19.5	0.4	992.0	23.6	883.6	75.0	9.7
1911	20.9	0.0	18.5	4.4	2.2	98.6	127.1	280.6	287.2	130.6	17.6	0.0	987.6	25.1	793.5	148.2	20.9
1912	5.4	3.7	2.8	5.4	14.6	62.4	286.2	297.0	138.0	3.3	15.3	1.5	835.5	22.8	783.5	18.6	10.6
1913	0.6	32.6	15.1	1.1	25.2	183.5	186.8	226.6	89.7	28.1	2.0	20.5	811.8	41.4	686.6	30.1	53.7
1914	3.1	13.3	10.6	11.7	44.7	57.8	454.1	255.1	313.6	7.8	0.0	0.0	1171.8	67.1	1080.5	7.8	16.4
1915	9.7	39.9	32.1	3.3	3.1	88.8	314.6	307.1	252.5	97.7	1.2	3.4	1153.4	38.5	963.1	98.9	53.0
1916	0.0	13.3	0.0	1.9	10.0	172.2	362.5	433.3	201.4	74.8	2.6	0.0	1272.0	11.9	1169.3	77.4	13.3
1917	4.2	29.5	7.1	1.7	40.7	173.4	281.6	276.2	272.2	57.9	0.0	8.2	1152.7	49.5	1003.4	57.9	41.9
1918	0.7	0.0	3.0	5.0	4.4	173.9	107.3	311.5	84.0	3.1	5.8	0.5	699.2	12.4	676.6	8.9	1.2
1919	32.4	8.1	6.1	4.1	6.7	52.4	294.7	365.0	194.5	60.6	0.6	1.3	1026.5	16.9	906.7	61.2	41.8
1920	0.5	13.9	11.8	0.4	10.4	84.6	470.5	158.2	76.8	9.1	0.0	0.2	836.4	22.6	790.1	9.1	14.6
1921	32.7	0.8	0.3	0.7	0.4	82.6	217.7	307.6	175.7	13.0	0.0	0.0	831.5	1.5	783.6	13.0	33.5
1922	21.4	7.1	0.0	3.0	0.9	90.6	425.8	416.3	317.7	9.9	1.2	22.4	1316.2	3.8	1250.4	11.0	51.0
1923	2.1	24.3	0.0	0.1	4.6	31.6	240.2	383.3	188.2	60.8	4.9	6.1	946.2	4.8	843.3	65.7	32.5
1924	9.3	4.0	0.9	5.1	7.8	44.6	342.9	254.5	374.2	95.9	8.7	5.9	1154.0	13.9	1016.2	104.6	19.3
1925	5.8	0.0	1.9	1.8	34.9	111.7	572.7	423.9	400.9	7.9	11.0	0.0	1572.5	38.6	1509.2	18.9	5.8

1926	7.4	1.3	35.3	8.2	26.2	16.2	332.0	234.8	161.5	25.7	2.8	2.4	853.8	69.8	744.5	28.5	11.1
1927	11.0	19.9	15.5	1.3	9.3	46.6	358.8	432.7	131.8	107.9	21.1	0.9	1156.8	26.1	969.9	129.0	31.7
1928	21.5	20.4	0.8	9.0	3.2	54.2	324.2	108.0	67.3	61.5	3.0	11.5	684.6	13.1	553.7	64.5	53.3
1929	47.6	1.3	1.8	3.2	2.7	90.2	441.4	354.1	79.6	119.7	0.0	30.3	1172.0	7.7	965.4	119.7	79.2
1930	9.2	12.8	2.9	4.8	5.8	70.1	387.3	232.5	157.1	30.0	7.8	18.9	939.3	13.4	847.0	37.9	40.9
1931	0.6	18.6	6.2	0.7	4.6	56.6	321.7	219.5	327.1	116.0	0.9	0.4	1073.0	11.5	924.9	117.0	19.6
1932	0.0	4.6	2.0	0.8	8.0	62.4	130.0	318.1	161.9	20.4	8.5	6.5	723.1	10.8	672.4	28.8	11.1
1933	9.7	17.3	2.1	13.2	24.8	109.2	318.9	329.2	134.7	75.9	0.0	0.2	1035.2	40.1	892.0	75.9	27.2
1934	20.5	5.3	4.1	1.0	2.2	97.9	250.1	273.7	171.4	15.2	1.2	5.2	847.8	7.3	793.2	16.4	30.9
1935	12.5	15.3	0.9	3.5	2.9	97.6	289.3	382.4	190.4	6.5	2.8	9.6	1013.8	7.4	959.8	9.3	37.3
1936	2.9	27.7	7.0	3.6	3.8	231.8	532.7	316.7	272.0	9.0	1.4	28.8	1437.5	14.4	1353.2	10.4	59.5
1937	0.4	35.0	1.9	10.1	11.5	73.6	293.5	275.7	199.5	65.4	0.2	2.8	969.5	23.5	842.3	65.6	38.1
1938	32.5	12.0	0.9	4.7	14.8	235.5	342.9	297.7	156.9	29.1	0.4	0.0	1127.5	20.5	1033.0	29.5	44.5
1939	10.5	15.8	4.7	4.5	3.2	134.4	290.5	246.5	183.0	24.3	0.0	0.0	917.4	12.3	854.4	24.3	26.3
1940	4.4	22.5	22.9	4.7	8.9	67.3	273.5	328.6	176.1	5.9	0.0	6.2	921.0	36.5	845.6	5.9	33.0
1941	17.2	4.3	3.3	0.7	11.9	69.6	173.9	297.0	158.4	24.5	0.4	2.3	763.4	15.9	698.8	24.9	23.8
1942	46.3	28.0	1.1	5.5	4.4	88.1	287.7	281.4	198.7	1.7	0.0	13.7	956.5	10.9	855.8	1.7	88.0
1943	12.0	5.0	1.0	14.3	10.1	51.7	208.2	512.2	241.3	16.8	0.0	0.0	1072.5	25.4	1013.4	16.8	17.0
1944	16.6	23.9	22.6	3.9	3.4	83.4	274.1	359.1	112.9	19.8	0.2	2.1	922.0	29.8	829.6	20.0	42.6
1945	24.2	4.9	0.8	5.1	3.2	42.9	250.7	176.2	162.8	93.7	0.0	18.1	782.6	9.1	632.7	93.7	47.1
1946	0.1	22.9	4.5	8.6	6.6	100.2	383.3	332.9	192.1	39.8	11.4	6.5	1109.0	19.7	1008.6	51.2	29.5
1947	12.2	9.6	9.4	0.6	4.4	43.0	402.6	276.0	291.4	26.3	2.0	0.6	1078.1	14.5	1013.0	28.3	22.4
1948	7.5	10.8	2.7	1.0	9.4	149.4	380.2	410.1	221.0	43.9	10.3	0.4	1246.7	13.0	1160.8	54.2	18.7
1949	1.5	32.6	3.9	4.5	20.7	76.6	389.5	406.1	200.6	90.4	0.3	0.3	1226.9	29.1	1072.8	90.7	34.4
1950	15.1	6.9	20.2	0.2	5.0	124.1	300.7	375.0	132.4	5.6	0.2	12.5	998.0	25.4	932.2	5.8	34.5
1951	10.9	10.1	15.8	8.7	6.0	124.3	265.5	411.4	179.3	14.6	9.8	0.0	1056.2	30.4	980.4	24.4	21.0
1952	2.6	13.0	13.8	1.5	12.3	177.4	216.3	296.0	123.2	5.5	3.0	0.0	864.5	27.5	812.9	8.5	15.6
1953	30.0	14.4	0.4	3.2	1.8	136.1	406.8	328.4	165.2	1.4	0.0	4.9	1092.8	5.4	1036.6	1.4	49.4
1954	16.4	16.2	3.8	0.9	2.8	72.6	312.0	291.2	207.4	23.4	0.0	0.2	946.9	7.5	883.3	23.4	32.7

1955	26.7	16.0	2.1	3.4	2.7	100.2	503.1	216.9	140.9	121.9	0.0	2.1	1135.9	8.2	961.1	121.9	44.7
1956	22.4	11.8	7.3	2.1	6.6	173.7	231.0	292.2	286.2	135.5	25.6	9.1	1203.6	16.1	983.2	161.1	43.3
1957	13.4	1.0	22.4	2.1	2.5	87.7	286.7	304.2	150.9	4.6	1.2	8.6	885.2	27.0	829.4	5.8	22.9
1958	19.1	4.2	24.0	2.4	0.8	81.9	220.7	300.5	135.1	54.9	0.8	5.7	850.1	27.1	738.2	55.7	29.0
1959	47.6	4.7	0.7	0.9	38.5	37.0	231.3	337.8	151.3	155.4	4.1	0.0	1009.3	40.0	757.4	159.5	52.3
1960	10.4	0.0	6.8	1.7	1.5	54.6	375.2	435.2	131.4	68.1	0.0	0.4	1085.2	10.0	996.4	68.1	10.8
1961	22.6	15.0	0.0	0.8	5.2	82.9	290.3	394.8	206.1	76.5	2.3	6.2	1102.7	6.0	974.2	78.8	43.7
1962	19.4	9.8	5.7	12.1	5.2	62.2	294.8	317.5	349.1	0.4	1.8	6.4	1084.3	23.0	1023.6	2.2	35.5
1963	13.0	6.0	13.1	7.5	21.7	97.4	455.7	347.7	212.2	19.0	7.1	3.5	1203.9	42.3	1113.0	26.1	22.4
1964	1.4	3.7	2.7	3.5	10.2	52.2	387.3	258.4	216.8	11.1	0.0	2.2	949.4	16.3	914.7	11.1	7.3
1965	2.8	4.6	13.8	16.4	3.9	20.6	234.4	176.4	112.2	32.4	1.2	2.7	621.4	34.1	543.6	33.6	10.1
1966	8.0	12.2	0.2	0.0	2.9	185.4	170.6	191.8	54.0	7.1	22.1	10.4	664.6	3.0	601.8	29.2	30.6
1967	1.3	0.6	19.7	4.2	2.4	44.5	269.8	511.1	202.4	3.3	1.3	31.6	1092.3	26.4	1027.8	4.6	33.4
1968	22.7	6.6	3.2	1.5	1.7	76.4	219.9	143.7	76.1	37.2	0.0	5.7	594.8	6.4	516.2	37.2	35.0
1969	9.3	3.6	1.3	2.7	31.9	32.3	493.6	223.0	199.0	1.8	6.0	0.0	1004.4	35.8	947.9	7.8	12.8
1970	25.2	39.4	1.2	0.5	43.5	116.5	303.2	241.2	510.8	47.3	0.1	0.0	1328.8	45.1	1171.7	47.4	64.6
1971	10.2	9.8	3.4	18.4	50.6	193.4	230.4	397.6	222.0	119.3	2.2	0.0	1257.2	72.5	1043.3	121.5	20.0
1972	17.1	25.3	1.8	2.7	2.6	20.9	172.9	269.7	206.9	117.1	10.5	0.1	847.7	7.1	670.4	127.6	42.5
1973	8.7	5.5	2.0	0.7	5.4	58.1	354.3	446.3	174.8	105.1	0.7	0.0	1161.7	8.1	1033.6	105.8	14.2
1974	5.2	1.9	0.7	0.8	5.9	52.6	358.4	202.1	98.5	8.3	0.5	3.1	738.1	7.4	711.6	8.8	10.3
1975	13.5	8.3	11.7	4.2	3.2	160.2	322.2	256.5	200.7	38.0	0.0	0.0	1018.6	19.1	939.6	38.0	21.9
1976	24.6	5.4	0.9	4.6	9.2	33.3	199.6	190.1	305.3	2.1	0.8	0.0	776.0	14.7	728.3	2.9	30.0
1977	17.9	13.2	0.5	7.1	10.0	104.3	374.2	183.8	117.8	76.0	2.6	10.0	917.6	17.6	780.2	78.6	41.2
1978	19.1	36.3	16.6	2.5	1.9	133.0	143.6	250.9	269.6	33.7	1.1	5.0	913.5	21.0	797.2	34.9	60.4
1979	18.4	8.5	1.6	5.3	4.7	108.7	246.6	172.5	73.1	3.1	28.2	3.8	674.7	11.7	601.0	31.2	30.8
1980	0.9	4.8	4.4	0.9	2.1	191.7	538.9	542.7	239.0	15.9	0.3	16.4	1558.1	7.4	1512.2	16.3	22.2
1981	19.1	2.5	5.7	1.4	10.1	121.5	436.8	401.8	179.5	1.0	12.8	4.1	1196.5	17.2	1139.7	13.9	25.7
1982	46.4	9.4	23.7	3.9	36.5	81.0	203.8	392.4	379.9	8.5	15.7	7.1	1208.3	64.0	1057.2	24.1	62.9
1983	11.4	2.5	2.9	14.1	37.9	92.5	271.3	183.6	221.6	64.6	0.0	4.4	906.6	54.9	768.9	64.6	18.2

1984	25.0	26.0	0.6	8.4	1.9	115.6	193.2	231.0	182.3	28.8	0.0	2.3	814.9	10.8	722.0	28.8	53.3
1985	14.3	0.9	0.3	9.4	5.5	60.4	250.7	245.0	271.4	112.5	0.1	9.8	980.3	15.2	827.4	112.6	25.0
1986	11.0	22.5	1.8	2.8	60.1	55.5	279.7	323.7	235.6	15.1	1.6	26.6	1036.1	64.7	894.6	16.8	60.1
1987	14.9	11.4	7.3	2.2	15.1	10.7	138.2	196.9	55.8	100.2	0.0	4.1	556.9	24.6	401.5	100.2	30.5
1988	8.9	5.9	10.8	1.9	15.5	140.8	299.4	310.3	104.0	14.6	1.3	29.1	942.5	28.2	854.6	15.9	43.9
1989	10.4	4.9	4.6	1.5	11.6	94.5	326.2	150.9	176.1	24.3	5.0	13.2	823.1	17.6	747.6	29.4	28.5
1990	0.0	15.5	3.1	8.0	20.4	103.2	362.9	258.6	233.9	8.0	1.7	7.0	1022.4	31.5	958.6	9.8	22.5
1991	10.2	9.0	4.7	7.6	19.0	28.5	65.9	76.6	120.1	0.5	0.6	25.9	368.6	31.3	291.2	1.1	45.1
1992	22.3	6.7	0.9	1.9	17.5	36.1	147.6	168.7	171.1	62.2	11.4	0.0	646.5	20.3	523.6	73.6	29.1
1993	10.4	0.0	7.7	2.7	23.9	45.5	182.3	182.5	319.4	27.1	0.0	0.0	801.4	34.3	729.7	27.1	10.4
1994	46.3	16.2	16.1	6.4	4.8	95.5	303.9	280.6	166.5	5.1	0.6	0.1	942.1	27.3	846.6	5.7	62.6
1995	26.9	17.6	12.6	7.1	3.9	26.2	208.5	303.0	195.9	0.9	16.5	20.1	839.2	23.6	733.5	17.4	64.6
1996	30.9	15.9	1.4	1.9	3.5	129.7	210.0	300.7	119.7	88.6	0.0	0.0	902.5	6.9	760.2	88.6	46.8
1997	11.2	1.5	2.9	8.0	29.9	106.5	125.8	214.5	224.1	29.2	9.4	17.2	780.2	40.7	670.9	38.7	29.8
1998	1.7	3.5	10.5	7.2	38.9	16.1	239.8	320.9	133.3	11.3	1.1	0.0	784.0	56.5	710.0	12.3	5.1
1999	33.6	29.5	0.0	0.0	15.5	22.0	215.8	171.1	167.6	32.3	0.0	2.5	689.9	15.5	576.5	32.3	65.6
2000	12.0	15.4	1.1	3.3	11.5	83.7	139.2	171.0	195.4	0.4	0.0	0.0	633.0	15.9	589.3	0.4	27.4
2001	4.2	2.2	9.0	6.4	12.7	108.0	224.0	182.4	50.6	69.5	0.5	0.8	670.4	28.1	565.1	70.0	7.2
2002	17.6	14.9	6.1	3.0	2.5	21.2	121.1	232.1	240.6	90.3	5.2	0.7	755.4	11.6	615.0	95.6	33.2