



## ANNUAL RAINFALL VARIABILITY ANALYSIS IN NANDURBAR DISTRICT OF MAHARASHTRA STATE

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**Abstract:** The average annual rainfall was 885.8 mm. It varied from 686.9 mm at Shahada to 1133 mm at Navapur. The average annual rainfall of Nandurbar district was received in 47 days with the highest of 68 days during the year 2013 and the lowest of 26 days during the year 2000. Out of total annual rainfall, South-West monsoon alone contributed 79.86 per cent, while remaining seasons contributed to North-East (9.37 per cent), summer (7.11 per cent) and winter (3.84 per cent) seasons.

**Key words:** Annual, Rainfall, Variability, Analysis, Maharashtra state.

### Introduction

Nandurbar district is bounded by 21° 00' to 22° 03' North and longitude 73° 31' to 74° 32' East longitude. Nandurbar district comprises six tahsils namely Akkalkuva, Nandurbar, Navapur, Shahada, Taloda, and Akrani. The district has total area of 5034.23 sq. km. In Nandurbar district the average of rainfall is 885.8 mm. The rainfall in the eastern part of the district is minimum and Shahada comes under this category. The rainfall increases in the westwards of the district. Akkalkwa and Navapur comes under the major rainfall area in the district.

The climate of Nandurbar District is generally hot and dry. As the rest of India, Nandurbar District has three distinct seasons; Summer, Monsoon /Rainy and the Winter season. Summer is from March to mid of June. Summers are usually hot and dry. During the month of May the summer is at its peak. Temperatures can be as high as 45° C during the peak of Summer. The Monsoon sets in during the mid or end of June. During this season the weather is usually humid and hot. The northern and western regions receive more rainfall than the rest of the region. The average rainfall is 885.8 mm, the district Winter is from the month of November to February. Winters are mildly cold but dry. In the study area tropical monsoon climate with four distinct seasons during the year was considered.

The distribution of precipitation throughout the seasonal cycle is as important as the total annual amount of monthly or annual precipitation when evaluating its impact on hydrology, ecology, agriculture or in water use. The seasonal distribution of precipitation is the results of revolution of earth resulting the unequal heating of the earth's surface over the year and resulted the atmospheric general circulation. The time and duration of the seasons of high precipitation at a place or watershed is most important for the planning and design of agriculture or water managements.

The Nandurbar district formed after bifurcation of Dhule District in 1998. The total geographical area reported is 503 thousand ha, out of the total net sown area is 297 thousand ha, gross cropped area is 397 thousand ha. The Cropping Intensity is 133.6%. The Net irrigated area is 66.0 Thousand ha. Gross irrigated area is 91.0 thousand ha and majority of area is under rained crops (231.0 thousand ha.) The major *kharif* crops cultivated in the district are Cotton, Kharif Sorghum, Paddy, Pearl millet, Maize and soybean while, in *Rabi*, *Rabi* sorghum, Wheat, Groundnut and chickpea are cultivated. However, fruit crops *viz.* Mango, Ber, Guava, Custard apple and Sapota are cultivated. The important vegetables grown in the district are Onion, Tomato, Brinjal and Chilli

Farmers have to adjust cropping system and crop management practices to the limitations imposed by the environment. The farming systems which they practice have been developed by experience of generations without proper knowledge of agro climatic conditions, effective cropping pattern and schedule of supplemental irrigation. Due to the increased number of disasters and their high impact on economical and human life, it is necessary for the district administration to have district rainfall climatology and information about temporal variability of rainfall in the district levels for better disaster and water management and planning. However, so far there is no in-depth study for districts rainfall climatology, its variability and the changing pattern of rainfall using a long period of data. The reason is the absence of long period district rainfall series.

Hence, it was necessary to undertake the characterization of Annual rainfall for agricultural crop planning to the farmers of district.

### Materials and Methods

The important aspects like annual rainfall variability in Nandurbar district of Maharashtra state is studied.

The historical daily data of rainfall at each tahsil of Nandurbar district was collected from (1) India Meteorological Department, Pune (2) College of Agriculture, Pune and (3) Zonal Agricultural Research Station, Solapur.

### Processing of Data:

The daily data collected for each tahsil were summed up on meteorological annual basis. For calculation of meteorological annual basis, the year was partitioned as per meteorological calendar starting from 1<sup>st</sup> January of each year and ending on 31<sup>st</sup> December of the same year. Calendar month wise data were processed and tabulated for further analyses.

The Weather Cock software developed by CRIDA, Hyderabad was used for analysis.

### Collection of data and computerization

Daily rainfall data was recorded at each tahsil headquarter were collected and used for Nandurbar district study. The daily rainfall data of 06 tahsils were available for last 56 years (1961-2016) and The data collected were subjected to statistical analysis such as standard deviation, coefficient of variation, extreme lowest and the highest tahsil wise annual variable rainfall estimated by forward and backward accumulation from the computerized programme named Weather Cock developed by CRIDA, Hyderabad.

### Annual rainfall variability (A):

$$\text{Annual mean } (\bar{A}) = \frac{\sum_{i=1}^n A_i}{n}$$

Standard deviation (mm) :

$$\delta = \sqrt{\frac{\sum (A_i - \bar{A})^2}{n-1}}$$

Annual Coefficient of variation (C.V.%)  
Standard deviation

$$\text{C.V.} = \frac{\text{Standard deviation}}{\text{Mean}} \times 100$$

Where,

$$\begin{aligned} A_i &= \text{Annual rainfall of } i^{\text{th}} \text{ year} \\ \frac{\sum}{n} &= \text{Number of years} \\ \bar{A} &= \text{Annual mean} \end{aligned}$$

### Result and Discussion

#### Annual rainfall variation:

The daily rainfall data recorded at each tahsil headquarter for the periods of fifty six years (1961-2016) were summed up for annual rainfall. The analysis of the annual rainfall and its variability at six tahsil are presented in Table 1.

The data indicated that average annual rainfall for fifty six years of Nandurbar district was 885.8 mm. It varied from 686.9 mm at Shahada to 1133 mm at Navapur. Further average annual rainfall recorded in various tahsils in their descending order was 1133 mm at Navapur, 1025 mm at Akkalkuva,

876.5 mm at Akarni, 832.4 mm at Taloda, 760.7 mm at Nandurbar, 686.9 mm at Shahada.

The data revealed large variation in annual rainfall pattern with respect to all the tahsils. The highest annual rainfall recorded was 2244 mm at Navapur during 1976 followed by 2166 mm at Shahada during 1981, 2097.9 mm at Akkalkuva during 2013, 2003 mm at Akarni during 2006, 1653 mm at Taloda during 2006, 1386 mm at Nandurbar during 2006. The annual rainfall varied from western ghat to the scarcity zone of Nandurbar district.

The lowest rainfall of 287.3 mm was observed at Shahada during 2000, followed by Akarni recorded 306.3 mm rainfall during, 2000 Nandurbar recorded 306.3 mm rainfall during 1987, Akkalkuva recorded 355.1 mm rainfall during 1968, Taloda recorded 415.2 mm rainfall during 1986, Navapur recorded 648.2 mm rainfall during 2000. Lowest rainfall was mostly observed in scarcity zone of Nandurbar district.

The average highest rainfall surplus for the district was 78.46 per cent in the year 2006 and deficit was 46.60 per cent in the year 2000 for the period under study. This is because the year 2006 recorded highest rainfall of 1580.8 mm and the year 2000 noted lowest rainfall of 473mm.

In the similar manner, surplus rainfall for all the 6 tahsils for fifty six years were noted in their descending order. Navapur noted surplus rainfall of 2244 mm with 98.05 per cent contribution in the year 1976 and 24 years of surplus rainfall, followed by Shahada of 2166 mm with 215.33 per cent contribution in the year 1981 and 22 years of surplus rainfall. Akkalkuva recorded 2097.9 mm surplus rainfall with 104.59 per cent contribution in the year 2013 and 27 years of surplus rainfall. Akarni recorded 2003 mm surplus with 128.52 per cent

contribution in 2006 and 25 years of surplus rainfall. Taloda recorded 1653 mm with 98.57 per cent contribution in 2006 and 25 years surplus rainfall. Nandurbar recorded 1386 mm with 80.88 per cent contribution in the year 2006 and 20 years of surplus rainfall. The surplus values showed the increased amount of rainfall over the normal rainfall.

The deficit rainfall was 65.37 per cent at Akkalkuva during 1968, 65.05 per cent at Akarni during 2000, 61.05 per cent at Nandurbar during 1987, 58.17 per cent at Shahada during 2000, 50.12 per cent at Taloda during 1986, 42.79 per cent at Navapur during 2000. The deficit values indicated that the annual rainfall was less than the normal rainfall.

Halikatti *et al.* (2010) studied annual rainfall variability at Dharwad in Karnataka by rainfall data for 36 years. Hanumanthappa *et al.* (2010) studied annual rainfall variability in coastal districts of Karnataka by using rainfall data of 25 years (1985-2009). The result revealed that the rainfall pattern and seasonal distribution not changed over time.

Jain and Kumar (2012) observed that most of the basins had the same direction of trend in rainfall and rainy days at the annual and seasonal scale. Trend analysis of rainfall data of 135 years (1871-2005) indicated no significant trend for annual rainfall on all India basis.

Guhathakurta and Saji (2013) reported that, Vidharbha region was recognized as low rainfall area due to climate change. The trend of receiving total annual rainfall in short period (i.e. length of monsoon decreased) was observed in Marathwada region. It means the decreasing trend of rainy days was observed regionally and mixed trend (i.e. decreasing and increasing) was observed intra distinctly.

**Table 1: Tahasilwise annual rainfall (mm) variation in Nandurbar district (1961-2016)**

Year	Akarni			Akkalkuva		
	RF (mm)	RF = +/- (mm)	Sur/Def (%)	RF (mm)	RF = +/- (mm)	Sur/Def (%)
1961	982.3	105.8	12.07	1228.1	202.7	19.77
1962	727.2	-149.3	-17.03	1061.7	36.3	3.54
1963	771.3	-105.2	-12.00	741.9	-283.5	-27.65
1964	685.9	-190.6	-21.75	715.3	-310.1	-30.24

1965	625.6	-250.9	-28.63	624.6	-400.8	-39.09
1966	587.8	-288.7	-32.94	499.2	-526.2	-51.32
1967	516.8	-359.7	-41.04	383.4	-642.0	-62.61
1968	569.9	-306.6	-34.98	<b>355.1</b>	-670.3	-65.37
1969	1248.4	371.9	42.43	1938.2	912.8	89.02
1970	1206.3	329.8	37.63	1670.8	645.4	62.94
1971	628.4	-248.1	-28.31	719.3	-306.1	-29.85
1972	500.4	-376.1	-42.91	682.2	-343.2	-33.47
1973	1030	153.5	17.51	1353.1	327.7	31.96
1974	699.4	-177.1	-20.21	835	-190.4	-18.57
1975	849.7	-26.8	-3.06	1080	54.6	5.33
1976	1401.4	524.9	59.89	2038.2	1012.8	98.78
1977	1093	216.5	24.70	1495	469.6	45.80
1978	862.5	-14.0	-1.60	1124	98.6	9.62
1979	921.5	45.0	5.13	1177.2	151.8	14.81
1980	701.8	-174.7	-19.93	799	-226.4	-22.08
1981	1328.9	452.4	51.61	1341	315.6	30.78
1982	638.2	-238.3	-27.19	711.6	-313.8	-30.60
1983	1113.2	236.7	27.01	1244	218.6	21.32
1984	763.3	-113.2	-12.92	896	-129.4	-12.62
1985	488.7	-387.8	-44.24	629	-396.4	-38.66
1986	453.9	-422.6	-48.21	542.2	-483.2	-47.12
1987	497.1	-379.4	-43.29	434.6	-590.8	-57.62
1988	1077.9	201.4	22.98	1104.6	79.2	7.73
1989	976.1	99.6	11.36	1171	145.6	14.20
1990	1048	171.5	19.57	1208	182.6	17.81
1991	714	-162.5	-18.54	865	-160.4	-15.64
1992	699.4	-177.1	-20.21	861.3	-164.1	-16.00
1993	770	-106.5	-12.15	1080.5	55.1	5.38
1994	1086	209.5	23.90	1413	387.6	37.80
1995	843	-33.5	-3.82	872	-153.4	-14.96
1996	985	108.5	12.38	755	-270.4	-26.37
1997	1350	473.5	54.02	1106	80.6	7.86
1998	946	69.5	7.93	1224.2	198.8	19.39
1999	592	-284.5	-32.46	503.5	-521.9	-50.90
2000	<b>306.3</b>	-570.2	-65.05	516.5	-508.9	-49.63
2001	878	1.5	0.17	884	-141.4	-13.79
2002	943	66.5	7.59	666.8	-358.6	-34.97
2003	1128.5	252.0	28.75	1035	9.6	0.94
2004	1353.5	477.0	54.42	1035	9.6	0.94
2005	924	47.5	5.42	1170.1	144.7	14.11
2006	<b>2003</b>	1126.5	128.52	1764	738.6	72.03
2007	1131	254.5	29.04	1693.5	668.1	65.16
2008	924	47.5	5.42	1512	486.6	47.46
2009	611	-265.5	-30.29	905	-120.4	-11.74
2010	705	-171.5	-19.57	915	-110.4	-10.76
2011	797	-79.5	-9.07	1128	102.6	10.01
2012	713.1	-163.4	-18.64	852.6	-172.8	-16.85
2013	1455.4	578.9	66.05	<b>2097.9</b>	1072.5	104.60
2014	651.7	-224.8	-25.65	907.6	-117.8	-11.49
2015	814.3	-62.2	-7.10	935.4	-90.0	-8.78
2016	766	-110.5	-12.61	919.3	-106.1	-10.35
Mean	876.5			1025.384		

Max	2003	2097.9
Year	2006	2013
Min	306.3	355.1
Year	2000	1968

Table 4.1 contd...

Table1: Tahasilwise annual rainfall (mm) variation in Nandurbar district (1961-2016)

Year	Nandurbar			Navapur		
	RF (mm)	RF = +/- (mm)	Sur/Def (%)	RF (mm)	RF = +/- (mm)	Sur/Def (%)
1961	797.5	26.8	3.52	666.9	-466.1	-41.14
1962	632.8	-137.9	-18.13	783.8	-349.2	-30.82
1963	601.9	-168.8	-22.19	1385	252	22.24
1964	535.7	-235	-30.89	1295	162	14.29
1965	608.8	-161.9	-21.28	1318	185	16.32
1966	474.9	-295.8	-38.89	1010.5	-122.5	-10.81
1967	933	162.3	21.33	1165	32	2.82
1968	711.1	-59.6	-7.84	1344	211	18.62
1969	781.9	11.2	1.47	1973	840	74.13
1970	753.2	-17.5	-2.3	1863	730	64.43
1971	465.8	-304.9	-40.08	1194	61	5.38
1972	455.5	-315.2	-41.44	931.2	-201.8	-17.81
1973	848.1	77.4	10.17	856.1	-276.9	-24.44
1974	590.4	-180.3	-23.7	721	-412	-36.37
1975	502	-268.7	-35.32	1214.8	81.8	7.22
1976	1350	579.3	76.15	<b>2244</b>	1111	98.05
1977	1105.7	335	44.04	1746	613	54.1
1978	724.3	-46.4	-6.1	709	-424	-37.42
1979	683.8	-86.9	-11.42	1074.4	-58.6	-5.18
1980	613.7	-157	-20.64	722	-411	-36.28
1981	708.4	-62.3	-8.19	936.7	-196.3	-17.33
1982	704.6	-66.1	-8.69	925.4	-207.6	-18.33
1983	703.6	-67.1	-8.82	1303.8	170.8	15.07
1984	666.7	-104	-13.67	871.3	-261.7	-23.1
1985	383.2	-387.5	-50.94	808.3	-324.7	-28.66
1986	558.5	-212.2	-27.9	782.3	-350.7	-30.96
1987	<b>306.3</b>	-464.4	-61.05	718.1	-414.9	-36.62
1988	1044.5	273.8	35.99	1128.9	-4.1	-0.37
1989	707.5	-63.2	-8.31	1043.5	-89.5	-7.9
1990	967.4	196.7	25.86	1093.5	-39.5	-3.49
1991	537.4	-233.3	-30.67	792.4	-340.6	-30.06
1992	652.8	-117.9	-15.5	1137.2	4.2	0.37
1993	891.2	120.5	15.84	1350.1	217.1	19.16
1994	976.6	205.9	27.07	1428.3	295.3	26.06
1995	601	-169.7	-22.31	900	-233	-20.57
1996	683	-87.7	-11.53	1207.4	74.4	6.56
1997	1292	521.3	68.53	1329	196	17.3
1998	1158	387.3	50.91	1506.7	373.7	32.98
1999	572	-198.7	-26.12	1077	-56	-4.95
2000	607	-163.7	-21.52	<b>648.2</b>	-484.8	-42.79
2001	905.5	134.8	17.72	789	-344	-30.36
2002	968.9	198.2	26.05	764.2	-368.8	-32.55

2003	1267	496.3	65.24	1255	122	10.76
2004	956	185.3	24.36	1720	587	51.8
2005	1284	513.3	67.47	2103	970	85.61
2006	<b>1386</b>	615.3	80.88	1456	323	28.5
2007	1034	263.3	34.61	1529	396	34.95
2008	759	-11.7	-1.54	1269	136	12
2009	721	-49.7	-6.53	828	-305	-26.92
2010	753	-17.7	-2.33	1043	-90	-7.95
2011	619	-151.7	-19.94	860	-273	-24.1
2012	536	-234.7	-30.85	860	-273	-24.1
2013	849.8	79.1	10.4	1526.6	393.6	34.74
2014	445.8	-324.9	-42.71	656.6	-476.4	-42.05
2015	659.5	-111.2	-14.62	727.3	-405.7	-35.81
2016	563.9	-206.8	-27.19	858.6	-274.4	-24.22
Mean	760.7			1133.0		
Max		1386			2244	
Year		2006			1976	
Min		306.3			648.2	
Year		1987			2000	

Table 4.1 contd...

Table 1: Tahasilwise annual rainfall (mm) variation in Nandurbar district (1961-2016)

Year	Shahada			Taloda		
	RF (mm)	RF = +/- (mm)	Sur/Def (%)	RF (mm)	RF = +/- (mm)	Sur/Def (%)
1961	819.2	132.3	19.26	899.6	67.2	8.07
1962	423.2	-263.7	-38.39	696.6	-135.8	-16.32
1963	731.4	44.5	6.48	840.7	8.3	0.99
1964	624.7	-62.2	-9.05	717.8	-114.6	-13.77
1965	529.9	-157	-22.86	722.2	-110.2	-13.24
1966	597.1	-89.8	-13.07	667.1	-165.3	-19.86
1967	734.9	48	6.99	432	-400.4	-48.1
1968	598.6	-88.3	-12.85	756	-76.4	-9.18
1969	750.9	64	9.32	1056.1	223.7	26.87
1970	776.5	89.6	13.05	1171.6	339.2	40.74
1971	601	-85.9	-12.5	564.8	-267.6	-32.15
1972	343.9	-343	-49.93	475.1	-357.3	-42.93
1973	924	237.1	34.52	813	-19.4	-2.34
1974	662	-24.9	-3.62	601.1	-231.3	-27.79
1975	720	33.1	4.82	749.2	-83.2	-10
1976	857.4	170.5	24.82	1308.5	476.1	57.19
1977	793	106.1	15.45	991.1	158.7	19.06
1978	665	-21.9	-3.19	798.4	-34	-4.09
1979	729.4	42.5	6.19	857.9	25.5	3.06
1980	598	-88.9	-12.94	708.5	-123.9	-14.89
1981	<b>2166</b>	1479.1	215.33	479.7	-352.7	-42.37
1982	635.6	-51.3	-7.47	567.5	-264.9	-31.83
1983	1123.9	437	63.62	971.7	139.3	16.73
1984	650.6	-36.3	-5.28	743.2	-89.2	-10.72
1985	352	-334.9	-48.75	485.1	-347.3	-41.73
1986	404.2	-282.7	-41.15	<b>415.2</b>	-417.2	-50.12
1987	571.9	-115	-16.74	484.8	-347.6	-41.76
1988	930.7	243.8	35.49	1198.3	365.9	43.95

1989	977.6	290.7	42.32	779.6	-52.8	-6.35
1990	835.1	148.2	21.58	1100.9	268.5	32.25
1991	397.1	-289.8	-42.19	738.1	-94.3	-11.33
1992	601	-85.9	-12.5	947.2	114.8	13.79
1993	653	-33.9	-4.93	997	164.6	19.77
1994	906.4	219.5	31.96	1192.6	360.2	43.27
1995	439.1	-247.8	-36.07	674.4	-158	-18.99
1996	616.1	-70.8	-10.31	843.1	10.7	1.28
1997	548.9	-138	-20.09	984.1	151.7	18.22
1998	773	86.1	12.54	1060.6	228.2	27.41
1999	324.1	-362.8	-52.82	419.5	-412.9	-49.61
2000	<b>287.3</b>	-399.6	-58.17	472.6	-359.8	-43.23
2001	537.3	-149.6	-21.78	797	-35.4	-4.26
2002	404.9	-282	-41.05	572	-260.4	-31.29
2003	887	200.1	29.13	1065	232.6	27.94
2004	604	-82.9	-12.07	880	47.6	5.71
2005	571	-115.9	-16.87	1099.3	266.9	32.06
2006	1223	536.1	78.05	<b>1653</b>	820.6	98.57
2007	851.4	164.5	23.95	1215	382.6	45.96
2008	724	37.1	5.4	945	112.6	13.52
2009	627	-59.9	-8.72	783	-49.4	-5.94
2010	623	-63.9	-9.3	900	67.6	8.12
2011	573	-113.9	-16.58	827	-5.4	-0.65
2012	608	-78.9	-11.49	795.4	-37	-4.45
2013	1040.5	353.6	51.48	1578	745.6	89.56
2014	507.8	-179.1	-26.07	528.3	-304.1	-36.54
2015	553.6	-133.3	-19.4	866.3	33.9	4.07
2016	456.8	-230.1	-33.5	729.7	-102.7	-12.34
<b>Mean</b>	<b>686.9</b>			<b>832.4</b>		
<b>Max</b>		2166			1653	
<b>Year</b>		1981			2006	
<b>Min</b>		287.3			415.2	
<b>Year</b>		2000			1986	

Table 4.1 contd...

Table 2: Average annual rainfall (mm) variation in Nandurbar district (1961-2016)

Year	District Average		
	RF (mm)	RF = +/- (mm)	Sur/Def (%)
1961	898.9	13.1	1.48
1962	720.9	-164.9	-18.62
1963	845.4	-40.4	-4.56
1964	762.4	-123.4	-13.93
1965	738.2	-147.6	-16.66
1966	639.4	-246.4	-27.81
1967	694.2	-191.6	-21.63
1968	722.5	-163.4	-18.44
1969	1291.4	405.6	45.79
1970	1240.2	354.4	40.01
1971	695.6	-190.3	-21.48
1972	564.7	-321.1	-36.25
1973	970.7	84.9	9.59
1974	684.8	-201.0	-22.69
1975	852.6	-33.2	-3.75
1976	1533.3	647.5	73.09

1977	1204.0	318.2	35.92
1978	813.9	-71.9	-8.12
1979	907.4	21.6	2.43
1980	690.5	-195.3	-22.05
1981	1160.1	274.3	30.97
1982	697.2	-188.7	-21.30
1983	1076.7	190.9	21.55
1984	765.2	-120.6	-13.62
1985	524.4	-361.4	-40.80
1986	526.1	-359.8	-40.61
1987	502.1	-383.7	-43.31
1988	1080.8	195.0	22.02
1989	942.6	56.8	6.41
1990	1042.2	156.4	17.65
1991	674.0	-211.8	-23.91
1992	816.5	-69.3	-7.83
1993	957.0	71.2	8.03
1994	1167.2	281.4	31.76
1995	721.6	-164.2	-18.54
1996	848.3	-37.5	-4.24
1997	1101.7	215.9	24.37
1998	1111.4	225.6	25.47
1999	581.4	-304.5	-34.37
2000	473.0	-412.8	-46.60
2001	798.5	-87.3	-9.86
2002	720.0	-165.8	-18.72
2003	1106.3	220.5	24.89
2004	1091.4	205.6	23.21
2005	1191.9	306.1	34.56
2006	1580.8	695.0	78.46
2007	1242.3	356.5	40.25
2008	1022.2	136.4	15.39
2009	745.8	-140.0	-15.80
2010	823.2	-62.6	-7.07
2011	800.7	-85.1	-9.61
2012	727.5	-158.3	-17.87
2013	1424.7	538.9	60.84
2014	616.3	-269.5	-30.42
2015	759.4	-126.4	-14.27
2016	715.7	-170.1	-19.20
Mean	885.8		
Max		1580.8	
Year		2006	
Min		473	
Year		2000	

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