

Analysis Techniques: Monthly Analysis Example

Information to get started:

- The lesson below contains step-by-step instructions and "snapshots" of what each step looks like when carried out in a Microsoft Excel workbook. Blue shading of information in the Excel illustrations denotes changes made from the previous step. Dots placed in three consecutive rows indicate that a portion of data is hidden from sight.
 - You can download an Excel workbook containing the complete data set by clicking on the "Download Data" link below. It contains each calculation step on a separate worksheet. To move between steps, click on the tabs at the bottom of the excel window.
 - When you download the file, it may open in your browser window. You may wish to use the "save as" function to save the file to a local drive and then reopen it in Excel. This will make it easier to flip between the online lesson and the example workbook.
 - Finally, we want to remind you that the techniques explained on this site are statistically based; therefore results must be viewed as predictions and not as facts. Please use the techniques and the information obtained from them responsibly!
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Download Data

Step 1: Calculate Mean Monthly Flow for Period of Record

- Find mean monthly flow for each month of every year in period of record
- Refer to [Tips for Data Manipulation](#) section

Microsoft Excel - monthstep2

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	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	AGENCY	STATION	DATE (Month, Day, Year)	STREAMFLOW (CFS)	MONTHLY AVERAGE									
2	USGS	14306500	10/1/99	64										
3	USGS	14306500	10/2/99	66										
4	USGS	14306500	10/3/99	68										
5	USGS	14306500	10/4/99	200										
6	USGS	14306500	10/5/99	200										
7	USGS	14306500	10/6/99	200										
8	USGS	14306500	10/7/99	150										
9	USGS	14306500	10/8/99	120										
10	USGS	14306500	10/9/99	100										
11	USGS	14306500	10/10/99	90										
12	USGS	14306500	10/11/99	85										
13	USGS	14306500	10/12/99	81										
14	USGS	14306500	10/13/99	78										
15	USGS	14306500	10/14/99	75										
16	USGS	14306500	10/15/99	72										
17	USGS	14306500	10/16/99	70										
18	USGS	14306500	10/17/99	100										
19	USGS	14306500	10/18/99	159										
20	USGS	14306500	10/19/99	172										
21	USGS	14306500	10/20/99	169										
22	USGS	14306500	10/21/99	137										
23	USGS	14306500	10/22/99	112										
24	USGS	14306500	10/23/99	106										
25	USGS	14306500	10/24/99	128										
26	USGS	14306500	10/25/99	146										
27	USGS	14306500	10/26/99	204										
28	USGS	14306500	10/27/99	528										
29	USGS	14306500	10/28/99	510										
30	USGS	14306500	10/29/99	300										
31	USGS	14306500	10/30/99	193										
32	USGS	14306500	10/31/99	161	159 ← Average for month of October 1999									
33	.	.	.	.						
34	.	.	.	.						
35	.	.	.	.						
22283	USGS	14306500	9/28/00	82										
22284	USGS	14306500	9/29/00	83										
22285	USGS	14306500	9/30/00	96	113									

monthly averages (Sheet1 / Sheet2)

Microsoft Excel - monthstep3

X63

	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
1			STREAMFLOW (CFS)												
2		WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	
3	1940	159	115	2232	2007	4550	2908	1154	911	254	132	81.5	90.5		
4	1941	201	1027	1974	3068	1035	604	695	920	309	154	116	452		
5	1942	274	1404	4271	2004	3053	1019	636	710	470	250	138	96.8		
6	1943	112	3578	5261	3895	3635	1775	2313	615	430	195	143	98.4		
7	1944	738	969	1695	1647	1704	1557	1507	695	379	171	109	95.1		
8	1945	101	702	802	2394	3909	3407	2002	1535	494	197	119	156		
9	1946	102	2773	3815	3879	3376	2574	995	412	288	205	110	131		
10	1947	495	3478	4137	1778	2912	2039	1494	404	666	245	165	142		
11	1948	2521	2624	1814	4222	3308	2352	2238	1465	486	231	147	138		
12	1949	235	1313	4566	1380	6586	1669	741	1097	293	162	108	102		
13	1950	152	1174	2245	5533	5588	3741	1394	711	302	159	105	96.6		
14	1951	1419	4134	3976	6119	3940	3140	964	829	319	170	91.4	83.2		
15	1952	1600	2494	4936	4092	4142	2708	1038	472	285	163	109	85.5		
16	1953	76.8	151	1613	7874	3879	2896	1287	1549	724	269	189	134		
17	1954	387	2782	5291	5654	4876	2051	2130	460	323	191	138	159		
18	1955	361	1451	2691	2701	2001	3132	3173	899	320	219	109	139		
19	1956	1002	3929	6765	6734	3234	4375	1487	441	248	138	90.3	93.8		
20	.	.	.	.	.	.	.	.	.	.	.	.	.
21	.	.	.	.	.	.	.	.	.	.	.	.	.
22	.	.	.	.	.	.	.	.	.	.	.	.	.
58	1992	92.4	721	1464	1760	2525	774	1303	503	209	116	71.8	82.6		
59	1993	124	878	2478	2371	921	2456	2958	1341	1053	346	173	105		
60	1994	100	108	1389	1533	1969	1485	1208	410	332	151	89.1	80.8		
61	1995	314	2254	3925	4823	3646	3029	1784	880	402	188	109	123		
62	1996	327	2412	5250	4745	6909	1395	2012	1262	493	224	120	122		
63	1997	323	2307	6977	4115	2127	3035	1314	746	443	203	128	262		
64	1998	1291	2039	2085	4233	3675	2533	1055	738	446	211	118	102		
65	1999	170	2782	5507	4848	6750	2954	1441	962	383	191	128	80.5		
66	2000	133	2189	3879	3535	2903	1620	650	961	602	229	125	113		
67	.	.	.	.	.	.	.	.	.	.	.	.	.

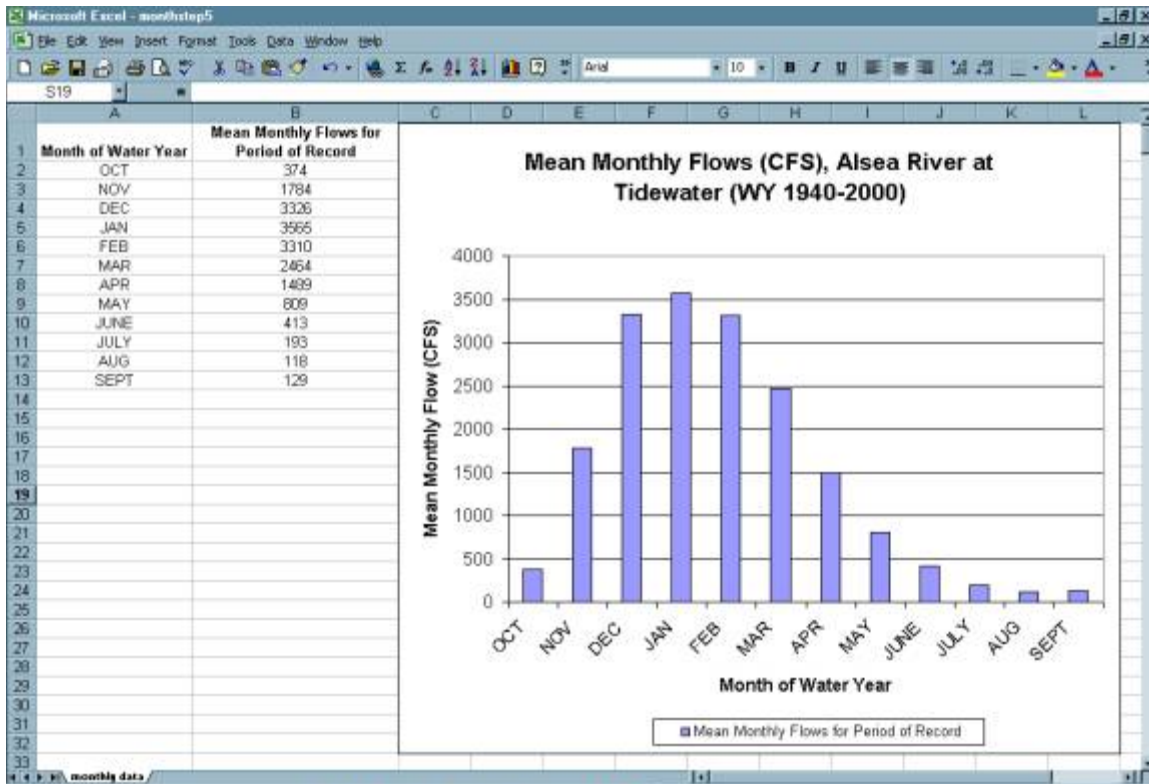
monthly data (Sheet1 / Sheet2)

- Calculate Mean Monthly Flow for Period of Record

Microsoft Excel - monthstep4

MEAN MONTHLY FLOW (CFS)												
WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT
1940	159	115	2232	2007	4550	2908	1154	911	254	132	81.5	90.5
1941	201	1027	1974	3068	1035	604	695	920	309	154	116	452
1942	274	1404	4271	2004	3053	1019	636	710	470	250	138	96.8
1943	112	3578	5261	3895	3635	1775	2313	615	430	195	143	98.4
1944	738	969	1695	1647	1704	1557	1507	595	379	171	109	95.1
1945	101	702	802	2394	3809	3407	2002	1535	494	197	119	196
1946	102	2773	3815	3879	3376	2574	995	412	268	205	110	131
1947	495	3478	4137	1778	2912	2039	1494	404	666	245	165	142
1948	2521	2624	1814	4222	3308	2352	2238	1465	466	231	147	138
1949	236	1313	4566	1380	6595	1669	741	1097	293	162	108	102
1950	152	1174	2245	5533	5568	3741	1394	711	302	159	105	96.6
1951	1419	4134	3976	6119	3940	3140	964	629	319	170	91.4	83.2
1952	1600	2494	4936	4092	4142	2708	1038	472	265	183	109	85.5
1953	76.8	151	1613	7874	3879	2895	1287	1549	724	269	189	134
1954	387	2782	5291	5654	4876	2061	2130	460	323	191	138	159
1955	361	1451	2691	2701	2001	3132	3173	689	320	219	109	139
1956	1002	3929	6795	6734	3234	4375	1487	441	248	138	90.3	93.8
1994	100	108	1389	1533	1969	1486	1208	410	332	151	89.1	80.8
1995	314	2254	3925	4823	3646	3029	1784	880	402	188	109	123
1996	327	2412	5290	4745	6909	1386	2012	1262	493	224	120	122
1997	323	2307	6977	4115	2127	3035	1314	746	443	203	128	262
1998	1291	2039	2085	4233	3675	2533	1055	738	446	211	118	102
1999	170	2782	5507	4948	6750	2854	1441	962	383	191	128	80.5
2000	133	2189	3879	3535	2903	1620	660	861	602	229	125	113
Mean Monthly Flows for Period of Record	374	1784	3326	3565	3310	2464	1489	809	413	193	118	129

- Plot Mean Monthly Flow vs. Month

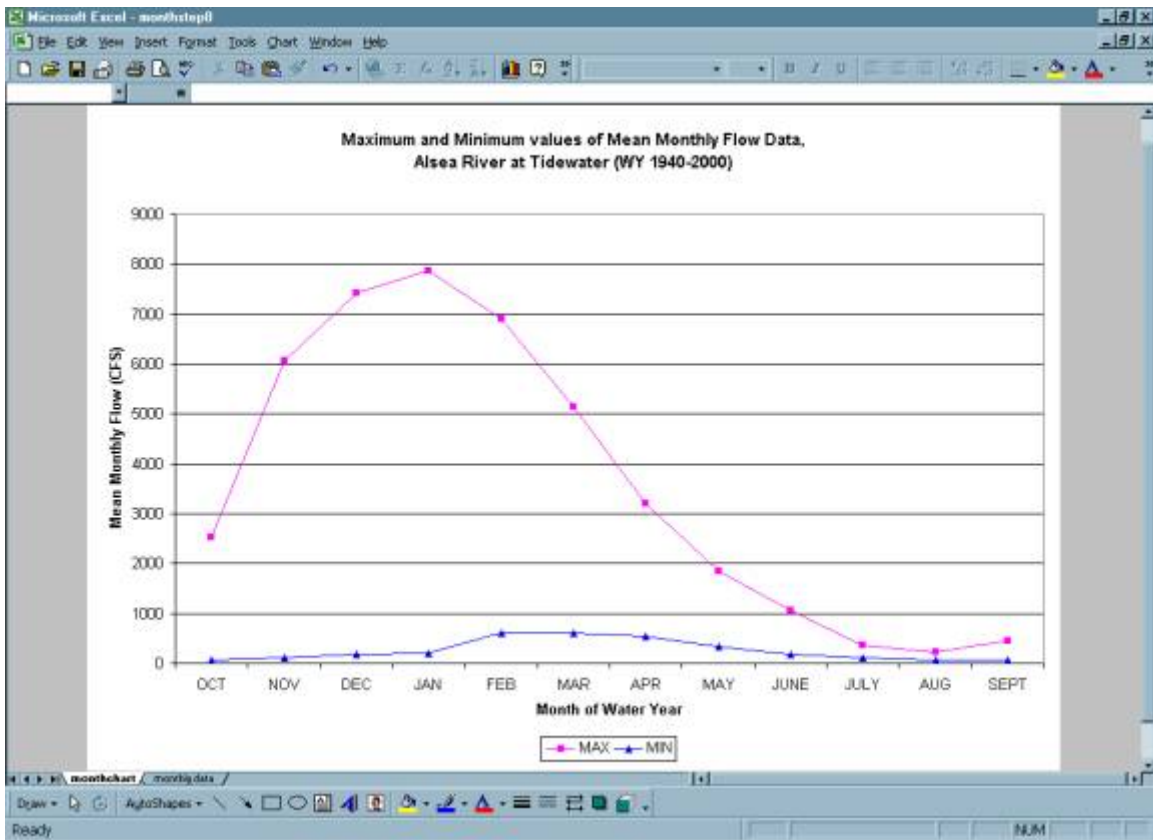
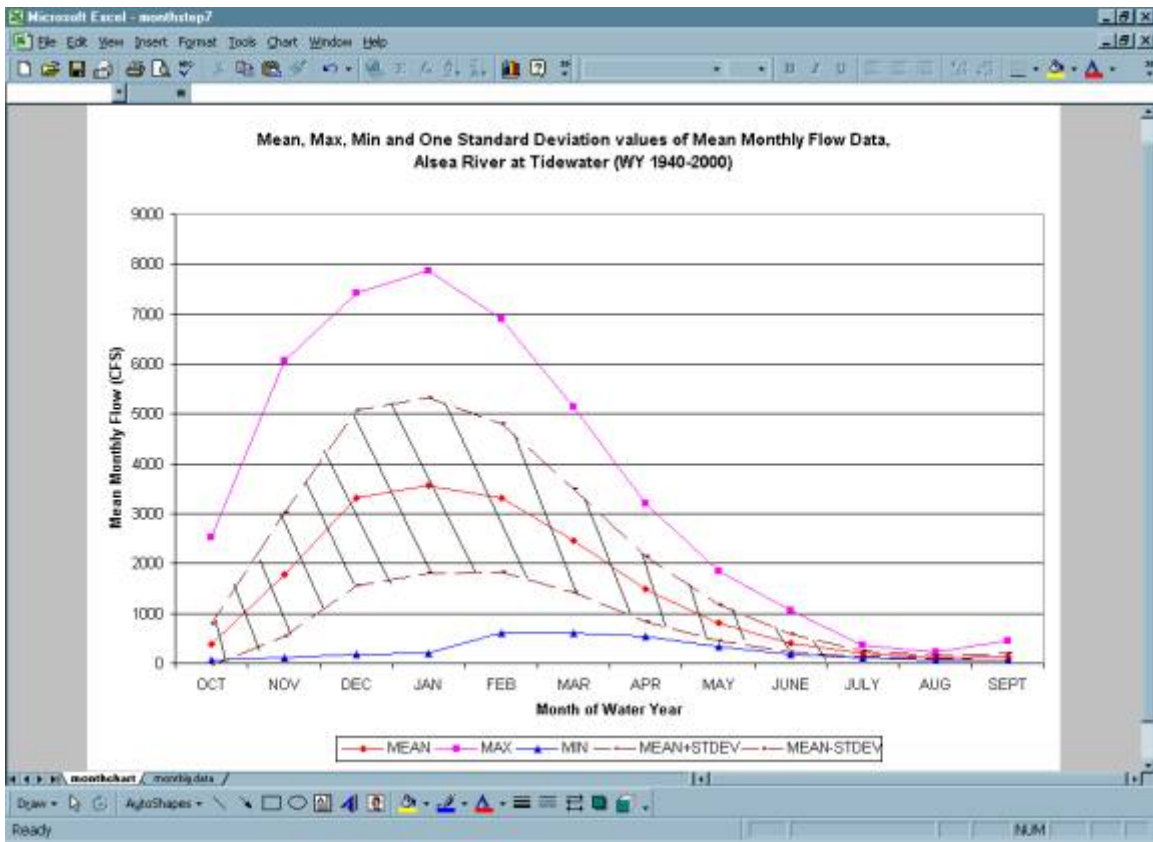


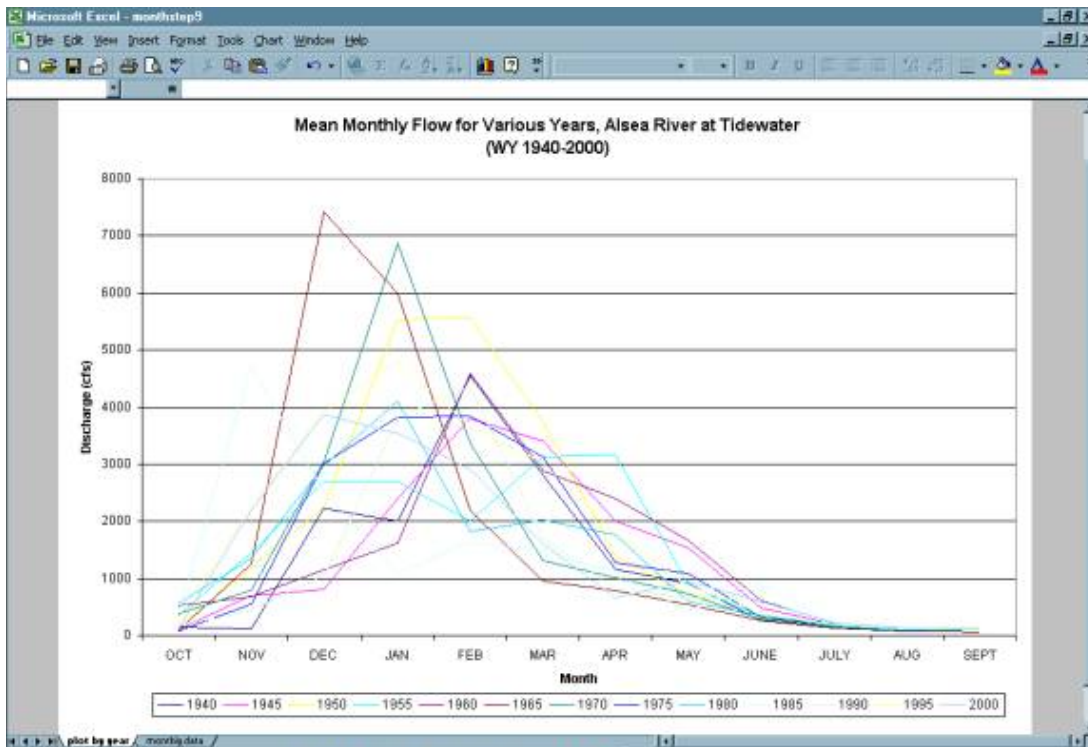
Step 2: Calculate the Simple Statistics on Monthly Data

MEAN MONTHLY FLOW (CFS)												
WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT
1940	159	115	2232	2007	4550	2908	1154	911	254	132	81.5	90.5
1941	201	1027	1974	3068	1035	604	695	920	309	154	116	452
1942	274	1404	4271	2004	3053	1019	636	710	470	250	138	96.8
1943	112	3578	5261	3885	3635	1775	2313	615	430	195	143	98.4
1944	738	969	1695	1647	1704	1557	1507	595	379	171	109	95.1
1945	101	702	802	2394	3909	3407	2002	1535	494	197	119	196
1946	102	2773	3815	3879	3376	2574	995	412	268	205	110	131
1947	495	3478	4137	1778	2912	2039	1494	404	666	245	165	142
1948	2521	2624	1814	4222	3308	2352	2238	1465	486	231	147	138
1949	236	1313	4566	1380	6586	1669	741	1097	293	162	108	102
1950	152	1174	2245	5533	5568	3741	1394	711	302	159	105	96.6
1951	1419	4134	3976	6119	3940	3140	994	629	319	170	91.4	83.2
1952	1600	2484	4936	4092	4142	2708	1038	472	265	103	109	85.5
1953	76.8	151	1613	7874	3879	2896	1287	1549	724	269	189	134
1954	387	2782	5291	5654	4876	2061	2130	460	323	191	138	159
1955	361	1451	2691	2701	2001	3132	3173	899	320	219	109	139
1956	1002	3929	6785	6734	3234	4375	1487	441	248	138	90.3	93.8
1997	323	2307	6977	4115	2127	3035	1314	746	443	203	128	262
1998	1291	2039	2085	4233	3675	2533	1055	738	446	211	118	102
1999	170	2782	5507	4848	6750	2954	1441	962	363	191	128	80.5
2000	133	2189	3879	3535	2903	1620	650	961	602	229	125	113
Mean Monthly Flows for Period of Record	374	1784	3326	3995	3310	2464	1489	809	413	193	118	129
Standard Deviation	427	1242	1760	1761	1484	1041	658	359	183	51	30	69
Maximum Flow	2521	6058	7419	7874	6909	5144	3202	1848	1053	363	234	452
Minimum Flow	62	108	182	211	607	604	550	331	178	116	66	60

- Various Plots of Monthly Data with Simple Statistics Included

MONTH	MEAN	MAX	MIN	MEAN+STDEV	MEAN-STDEV
OCT	374	2521	62	801	-53
NOV	1784	6058	108	3026	541
DEC	3326	7419	182	5086	1566
JAN	3995	7874	211	5326	1804
FEB	3310	1484	607	4795	1826
MAR	2464	5144	604	3505	1423
APR	1489	658	550	2148	831
MAY	809	359	331	1168	450
JUNE	413	183	178	596	230
JULY	193	51	116	244	143
AUG	118	30	66	148	88
SEPT	129	69	60	198	61





Step 3: Normalize Monthly Data

(Mean Monthly Flow as Ratio and Percentage of Annual Flow)

Calculate and Plot Mean Monthly Flows as ratio and percentage of Mean Annual Flow for Period of Record

Month of Water Year	Mean Monthly Flows for Period of Record, MMQ (cfs)	Mean Annual Flow for Period of Record, MAQ (cfs)	MMQ as Percentage of MAQ [(MMQ/MAQ)x100]
OCT	374	1490	25
NOV	1784	1490	120
DEC	3326	1490	223
JAN	3565	1490	239
FEB	3310	1490	222
MAR	2464	1490	165
APR	1489	1490	100
MAY	609	1490	54
JUNE	413	1490	28
JULY	193	1490	13
AUG	118	1490	8
SEPT	129	1490	9

Month of Water Year	MMQ as Percent Ratio of MAQ [(MMQ/MAQ)]
OCT	0.25
NOV	1.20
DEC	2.23
JAN	2.39
FEB	2.22
MAR	1.65
APR	1.00
MAY	0.54
JUNE	0.28
JULY	0.13
AUG	0.08
SEPT	0.09

