```matlab
[filepath,name,ext] = fileparts(which('fmc_demo'));
filepath_model = strjoin({filepath,'fmc.inp'},'\');
mdl = swmm(filepath_model);
```

```matlab
% all model components are contained in mdl.p
disp(mdl.p.subcatchments) % display the subcatchment data
```

Name	RainGage	Outlet	Area	PercentImperv	Width	PercentSlope	CurbLen	Sr
{'S101' }	{'S101' }	{'J71.72631'}	29.66	10.304	380.26	0.012	0	{0>
{'S102' }	{'S102' }	{'J895.8482'}	124.61	14.392	1832.5	0.018	0	{0>
{'S103' }	{'S103' }	{'J1060.963'}	51.96	13.776	731.83	0.016	0	{0>
{'S104' }	{'S104' }	{'J2173.272'}	39.8	15.232	552.78	0.016	0	{0>
{'S105' }	{'S105' }	{'J2546.464'}	61.1	36.624	565.74	0.016	0	{0>
{'S106' }	{'S106' }	{'J3246.464'}	76.74	32.592	1279	0.012	0	{0>
{'S107' }	{'S107' }	{'J4248.377'}	155.8	4.256	1038.7	0.024	0	{0>
{'S108' }	{'S108' }	{'J7322.142'}	26.52	1.176	228.62	0.014	0	{0>
{'S109' }	{'S109' }	{'J718.547' }	8.68	8.232	104.58	0.01	0	{0>
{'S110' }	{'S110' }	{'J1200.117'}	19.88	14.168	239.52	0.016	0	{0>
{'S111' }	{'S111' }	{'J400.215' }	10.63	1.232	236.22	0.018	0	{0>
{'S112' }	{'S112' }	{'J1388.055'}	106.47	2.912	819	0.06	0	{0>
{'S113' }	{'S113' }	{'J113' }	232.12	1.12	1547.5	0.056	0	{0>
{'S151' }	{'S151' }	{'J151' }	24.92	30.688	207.67	0.04	0	{0>
{'S152' }	{'S152' }	{'J152' }	25.32	17.752	177.06	0.038	0	{0>
{'S153' }	{'S153' }	{'J60.22' }	70.58	28.672	588.17	0.008	0	{0>
{'S154_1'}	{'S154_1'}	{'J674.6' }	32.868	17.192	1442.3	0.03	0	{0>
{'S154_2'}	{'S154_2'}	{'J1286.17' }	86.842	17.192	1442.3	0.03	0	{0>
{'S155' }	{'S155' }	{'J3500.1' }	11.27	9.744	197.72	0.012	0	{0>
{'S156' }	{'S156' }	{'SU156' }	26.18	18.536	436.33	0.014	0	{0>
{'S157' }	{'S157' }	{'SU157' }	39.34	17.64	578.53	0.03	0	{0>
{'S158' }	{'S158' }	{'J4731.82' }	9.48	19.6	210.67	0.022	0	{0>
{'S159' }	{'S159' }	{'SU159' }	20.41	12.768	340.17	0.026	0	{0>
{'S160' }	{'S160' }	{'J5598.608'}	69.57	1.12	615.66	0.032	0	{0>
{'S161_1'}	{'S161_1'}	{'J300' }	24.048	14.112	1662.8	0.02	0	{0>
{'S161_2'}	{'S161_2'}	{'J1002.010'}	95.672	14.112	1662.8	0.02	0	{0>
{'S162' }	{'S162' }	{'J142.6492'}	71.6	13.552	1101.5	0.034	0	{0>
{'S163' }	{'S163' }	{'SU163' }	58.33	13.552	897.38	0.016	0	{0>
{'S164' }	{'S164' }	{'J3200' }	11.65	5.04	208.04	0.02	0	{0>
{'S165' }	{'S165' }	{'SU165' }	23.84	13.44	366.77	0.026	0	{0>
{'S166' }	{'S166' }	{'SU166' }	71.04	16.632	1044.7	0.042	0	{0>
{'S167' }	{'S167' }	{'J167' }	26.36	1.12	219.67	0.012	0	{0>
{'S171' }	{'S171' }	{'SU171' }	34.01	16.352	523.23	0.046	0	{0>
{'S172' }	{'S172' }	{'SU172' }	15.04	22.064	221.18	0.034	0	{0>
{'S180' }	{'S180' }	{'J749.08' }	28.57	2.128	420.15	0.02	0	{0>
{'S181' }	{'S181' }	{'J181' }	15.96	31.024	192.29	0.05	0	{0>
{'S182' }	{'S182' }	{'SU182' }	22.52	5.936	229.8	0.016	0	{0>
{'S183' }	{'S183' }	{'J2460.36' }	7.59	2.296	168.67	0.018	0	{0>
{'S184' }	{'S184' }	{'J3.2' }	105.67	1.12	960.64	0.032	0	{0>
{'S185' }	{'S185' }	{'J185' }	43.32	1.344	393.82	0.024	0	{0>
{'S186' }	{'S186' }	{'J186' }	193.34	1.344	1288.9	0.08	0	{0>
{'S187' }	{'S187' }	{'J7232.906'}	1.93	4.368	32.167	0.036	0	{0>
{'S191' }	{'S191' }	{'SU191' }	89.38	16.688	1686.4	0.024	0	{0>
{'S192' }	{'S192' }	{'J1130.117'}	3.43	3.08	57.167	0.026	0	{0>
{'S193' }	{'S193' }	{'SU193' }	21.79	16.632	302.64	0.024	0	{0>
{'S194' }	{'S194' }	{'J7232.906'}	123.76	2.072	825.07	0.036	0	{0>
{'S195' }	{'S195' }	{'SU220' }	9.45	16.576	178.3	0.034	0	{0>
{'S201' }	{'S201' }	{'SU201' }	16.42	13.44	273.67	0.052	0	{0>
{'S202' }	{'S202' }	{'SU202' }	29.6	8.736	493.33	0.024	0	{0>
{'S203' }	{'S203' }	{'J1700.117'}	12.96	11.2	216	0.02	0	{0>
{'S204' }	{'S204' }	{'J1361.769'}	48.81	1.736	375.46	0.012	0	{0>
{'S205' }	{'S205' }	{'J2266.899'}	54.06	1.288	386.14	0.024	0	{0>

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{'S210' }    {'S210' }    {'J2604.897'}      10.87       1.624       241.56       0.028          0        {0>
{'S211' }    {'S211' }    {'SU211'    }      29.63      10.808       493.83       0.026          0        {0>
{'S212' }    {'S212' }    {'J212'     }       8.58       3.024       81.714        0.02          0        {0>
{'S213' }    {'S213' }    {'J3'       }      11.91       1.344       104.47       0.024          0        {0>
{'S214' }    {'S214' }    {'J1041.555'}       6.37        1.12       76.747       0.046          0        {0>
{'S215' }    {'S215' }    {'J3'       }     129.18        1.12        861.2       0.044          0        {0>
{'S216' }    {'S216' }    {'J216'     }     267.14        1.12       1780.9       0.056          0        {0>
{'S220' }    {'S220' }    {'SU220'    }      34.67      14.784       577.83        0.02          0        {0>
{'S221' }    {'S221' }    {'SU220'    }       4.53        1.12       50.333       0.022          0        {0>
```

```matlab
figure('Name','model_layout')
mdl = mdl.draw; % plot the model shapes
```
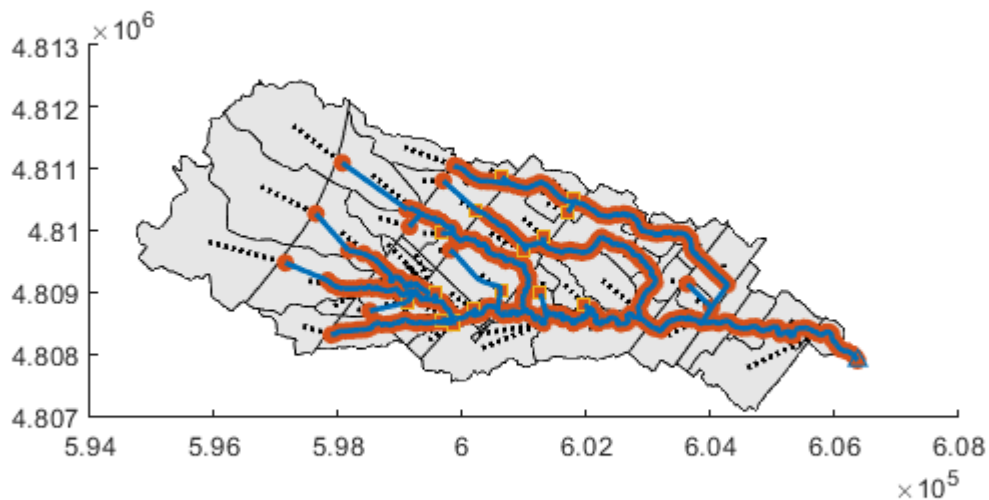

- Set the **report_start_date** (based on the evnet), **start_date** (7 days before the reporting date), and **end_date**
- Use **.runsim** to execute the simulation
- Use **.results_tt** to read the timeseries results
- Plot the modelled and observed timeseries using **plot_tt()**

```matlab
mdl.p.options.REPORT_START_DATE = datetime('2019-10-01 12:00:00','InputFormat','yyyy-MM-dd HH:m
mdl.p.options.START_DATE = mdl.p.options.REPORT_START_DATE - days(7); % start 7 days before rep
mdl.p.options.END_DATE = mdl.p.options.REPORT_START_DATE + hours(24); % end date 36 hours after
mdl.write_inp; % write the changes to the INP file

% run the model and save report to a specified location
dir_report = [cd,'\02_swmm_calibration\models\temp\output.rpt'];
mdl.runsim(dir_report);
```

```matlab
tt_mod = mdl.results_tt('CJ1902.476'); % read the conduit timeseries results from the RPT file
tt_mod = tt_mod(:,'flow');
figure('Name','outflow_hydrograph');
plot_tt(tt_mod(:,'flow'),'o-','DisplayName','modelled flow'); % plot the modelled flow

load('02_swmm_calibration\models\fourteenmile\data\flow_obs_jan18-jan20.mat'); % load the obser
tt_tgt = retime(tt_flow_obs,tt_mod.Properties.RowTimes,'mean'); % synchronize the observed time
hold on
plot_tt(tt_tgt(:,'flow'),'o-','DisplayName','observed flow'); % plot the observed flow
```
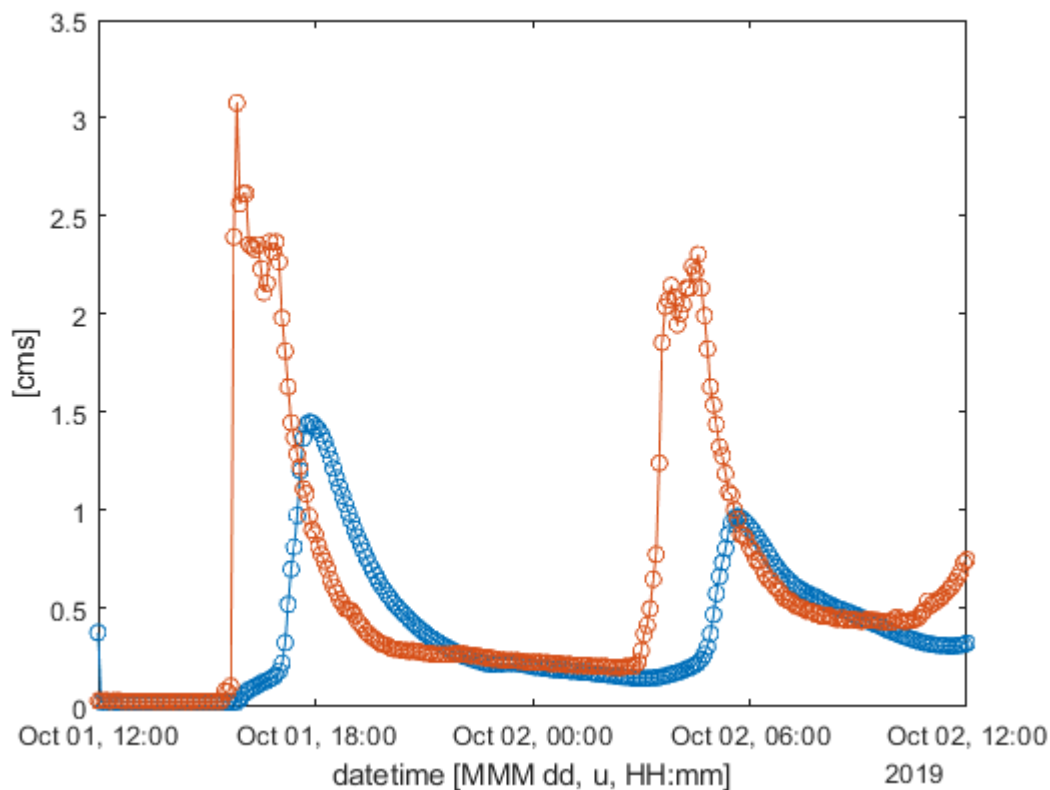


```matlab
legend('location','northeast');

fun_nse = @(x_obs,x_mod) 1 - sum((x_obs - x_mod).^2) / sum((x_obs - mean(x_obs)).^2); % anonymo
fun_nse(tt_tgt.Variables,tt_mod.Variables) % calculate the nash-sutcliffe efficiency
```

ans = -0.2893

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