

# CompareMelt

November 11, 2025

## 1 Snow simulations

```
[1]: import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import time

from soilice.src_snow import runModel
from soilice.balanceChecks import snowBalanceCheck

from soilice.snowParameters import pars
from soilice.constants import const
```

```
[2]: # start='18-Nov-2015'
# end='23-Nov-2015'
start='1-Oct-2015'
end='1-May-2016'
dd=pd.read_pickle('drivingdata.pkl')[start:end]

U=dd['U'].values
dd['U']=dd['U'].clip(lower=0.1)
```

```
[3]: dd
```

```
[3]:
```

	SW	LW	P	T	SH	U \
2015-10-01 00:00:00	0.000	304.408150	0.0	7.9855	0.006644	0.100000
2015-10-01 01:00:00	0.000	301.365250	0.0	7.9710	0.006721	0.100000
2015-10-01 02:00:00	0.000	305.939500	0.0	7.9035	0.006749	0.100000
2015-10-01 03:00:00	0.000	315.173650	0.0	6.9255	0.006337	0.100000
2015-10-01 04:00:00	0.000	318.867500	0.0	6.5070	0.006169	0.100000
...	...	...	...	...	...	...
2016-05-01 19:00:00	133.500	320.942433	0.0	19.9300	0.003536	0.419353
2016-05-01 20:00:00	22.820	313.653183	0.0	17.5750	0.003649	0.370030
2016-05-01 21:00:00	0.235	281.439333	0.0	14.1200	0.004384	0.341825
2016-05-01 22:00:00	0.000	277.909000	0.0	10.4250	0.005195	0.302588
2016-05-01 23:00:00	0.000	276.813350	0.0	10.1600	0.004900	0.299509

BP

```

2015-10-01 00:00:00  95180.0350
2015-10-01 01:00:00  95210.1700
2015-10-01 02:00:00  95223.7620
2015-10-01 03:00:00  95256.7005
2015-10-01 04:00:00  95309.8485
...
2016-05-01 19:00:00  95100.0000
2016-05-01 20:00:00  95100.0000
2016-05-01 21:00:00  95100.0000
2016-05-01 22:00:00  95100.0000
2016-05-01 23:00:00  95100.0000

```

[5136 rows x 7 columns]

```

[4]: # Run the model
snow_df=runModel(dd,pars,const,msini=0,Tsini=0.,TSS=0,dz_soil=0.01)

```

ode, with jac runtime = 1.52 seconds

```

/Users/ani378/pyenvs/3-12/lib/python3.12/site-
packages/scipy/integrate/_ode.py:431: UserWarning: vode: Excess work done on
this call. (Perhaps wrong MF.)

```

```

    self._y, self.t = mth(self.f, self.jac or (lambda: None),

```

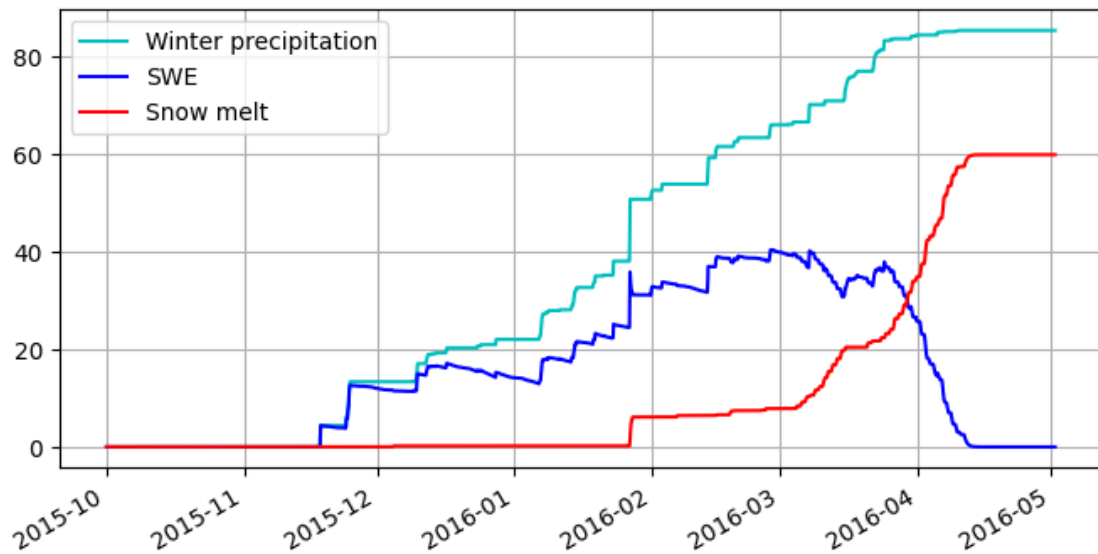
```

[5]: SWE=snow_df['mi']+snow_df['ml']
snow_df['SWE']=SWE

pl.figure(figsize=(8,4))
pl.plot((snow_df['qR_snow']+snow_df['qS']).cumsum(),'c',label='Winter_
precipitation')
pl.plot(snow_df['SWE'],'b',label='SWE')
pl.plot(snow_df['qD'].cumsum(),'r',label='Snow melt')

pl.legend(loc=2)
pl.grid()
pl.gcf().autofmt_xdate()

```

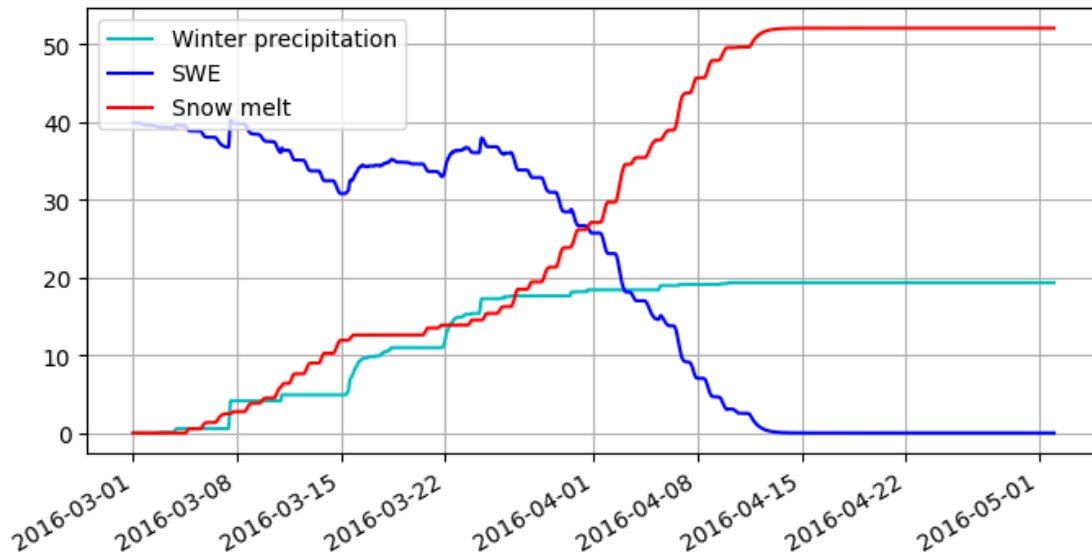


```
[9]: snow_df=snow_df['2016-03-01':]
inputData=dd['2016-03-01':]
```

```
[10]: SWE=snow_df['mi']+snow_df['ml']
snow_df['SWE']=SWE

pl.figure(figsize=(8,4))
pl.plot((snow_df['qR_snow']+snow_df['qS']).cumsum(),'c',label='Winter_
↳precipitation')
pl.plot(snow_df['SWE'],'b',label='SWE')
pl.plot(snow_df['qD'].cumsum(),'r',label='Snow melt')

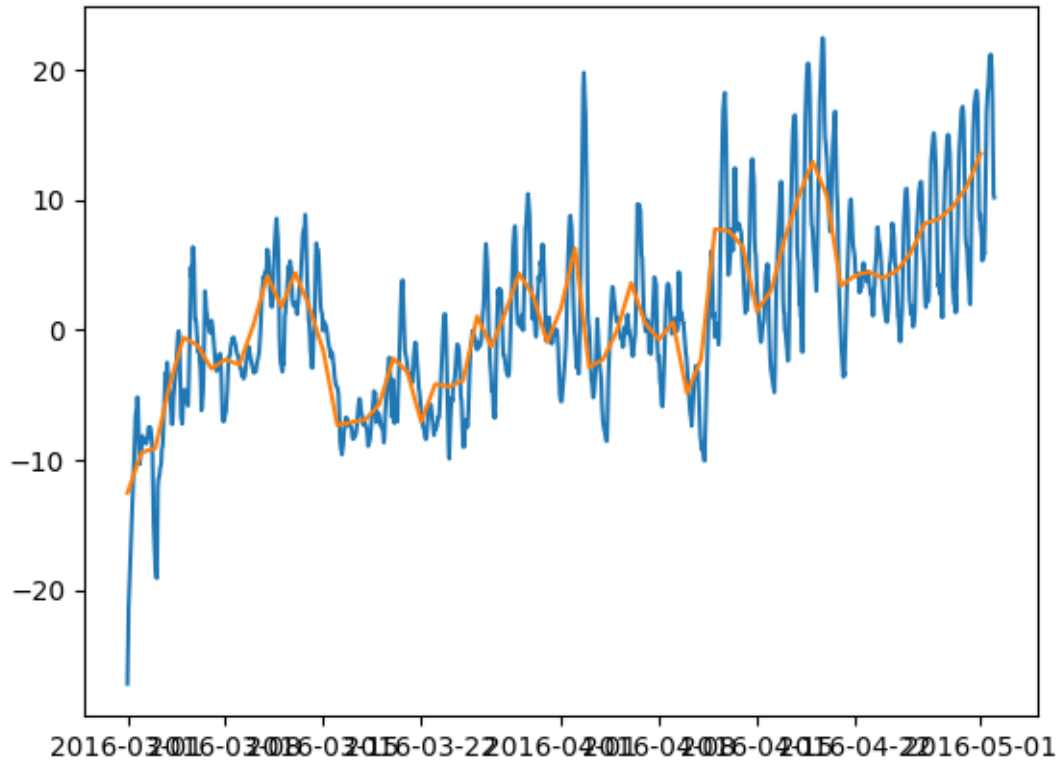
pl.legend(loc=2)
pl.grid()
pl.gcf().autofmt_xdate()
```



```
[15]: tD=inputData.resample('D').mean().index
      TA=inputData['T'].resample('D').mean().values
```

```
[17]: pl.plot(inputData['T'])
      pl.plot(tD,TA)
```

```
[17]: [<matplotlib.lines.Line2D at 0x1408570e0>]
```



```
[46]: SWEd=np.zeros(len(tD))
      SWEd[0]=39.88
      SWEd

      r=1.5
      TM=1.
      cumMelt=np.zeros(len(tD))

      for i in range(len(tD)-1):
          melt=r*(TA[i]-TM)
          if melt<0: melt=0.
          if melt>SWEd[i]: melt=SWEd[i]
          SWEd[i+1]=SWEd[i]-melt
          cumMelt[i+1]=cumMelt[i]+melt

      SWEd
```

```
[46]: array([39.88      , 39.88      , 39.88      , 39.88      , 39.88      ,
          39.88      , 39.88      , 39.88      , 39.88      , 39.88      ,
          39.88      , 35.16884375, 34.03475   , 28.999875   , 27.88334375,
          27.88334375, 27.88334375, 27.88334375, 27.88334375, 27.88334375,
          27.88334375, 27.88334375, 27.88334375, 27.88334375, 27.88334375,
```

```

27.88334375, 27.8415625 , 27.8415625 , 27.41990625, 22.44053125,
20.0061875 , 20.0061875 , 18.99184375, 11.13065625, 11.13065625,
11.13065625, 11.13065625, 7.23275 , 7.23275 , 7.23275 ,
7.23275 , 7.23275 , 7.23275 , 0. , 0. ,
0. , 0. , 0. , 0. , 0. ,
0. , 0. , 0. , 0. , 0. ,
0. , 0. , 0. , 0. , 0. ,
0. , 0. ])
```

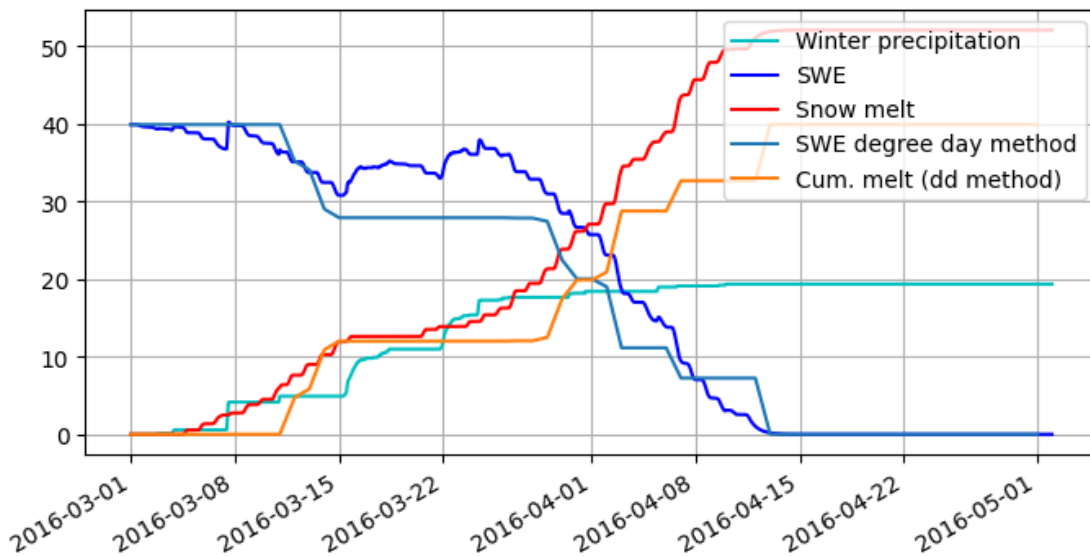
```

[47]: SWE=snow_df['mi']+snow_df['ml']
snow_df['SWE']=SWE

pl.figure(figsize=(8,4))
pl.plot((snow_df['qR_snow']+snow_df['qS']).cumsum(),'c',label='Winter_
    precipitation')
pl.plot(snow_df['SWE'],'b',label='SWE')
pl.plot(snow_df['qD'].cumsum(),'r',label='Snow melt')

pl.plot(tD,SWEd,label='SWE degree day method')
pl.plot(tD,cumMelt,label='Cum. melt (dd method)')

pl.legend(loc=1)
pl.grid()
pl.gcf().autofmt_xdate()
```



```
[ ]:
```