

# CompareMelt

November 11, 2025

## 1 Snow simulations

```
[1]: import numpy as np
import pandas as pd
import matplotlib.pyplot as pl
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)
```

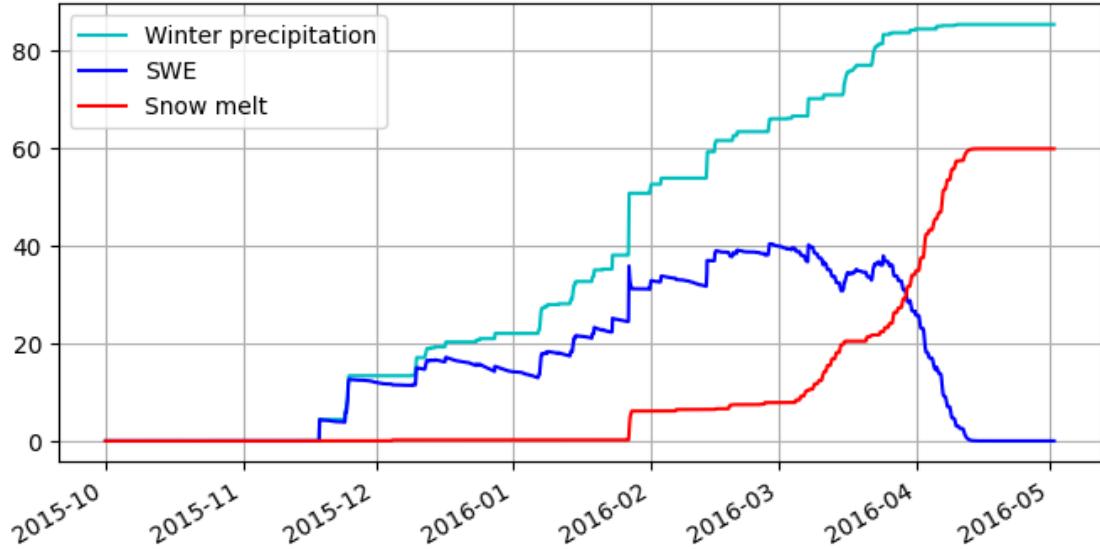
ode, with jac runtime = 1.52 seconds

```
/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()
```

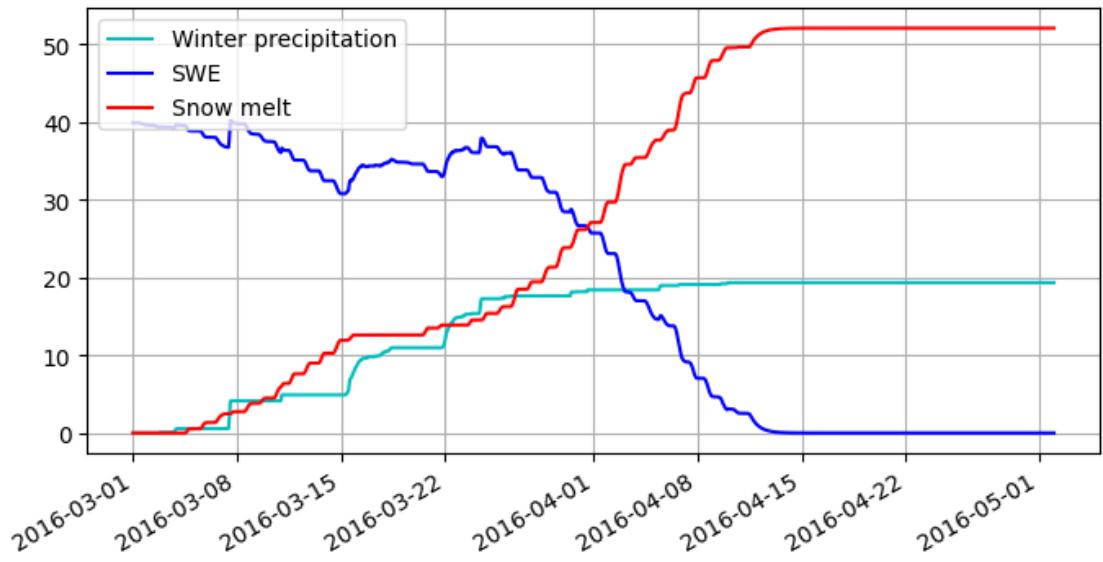


```
[9]: snow_df=snow_df['2016-03-01':]
inputData=dd['2016-03-01':]
```

```
[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')

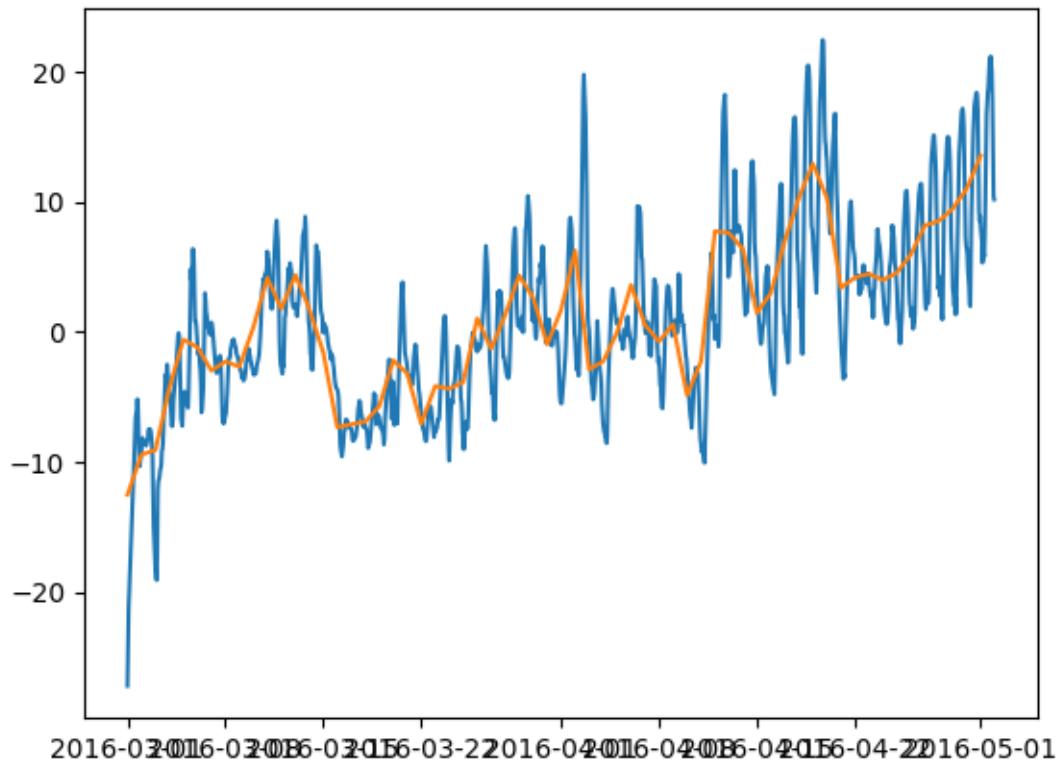
pl.legend(loc=2)
pl.grid()
pl.gcf().autofmt_xdate()
```



```
[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      , 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. )])

```

```

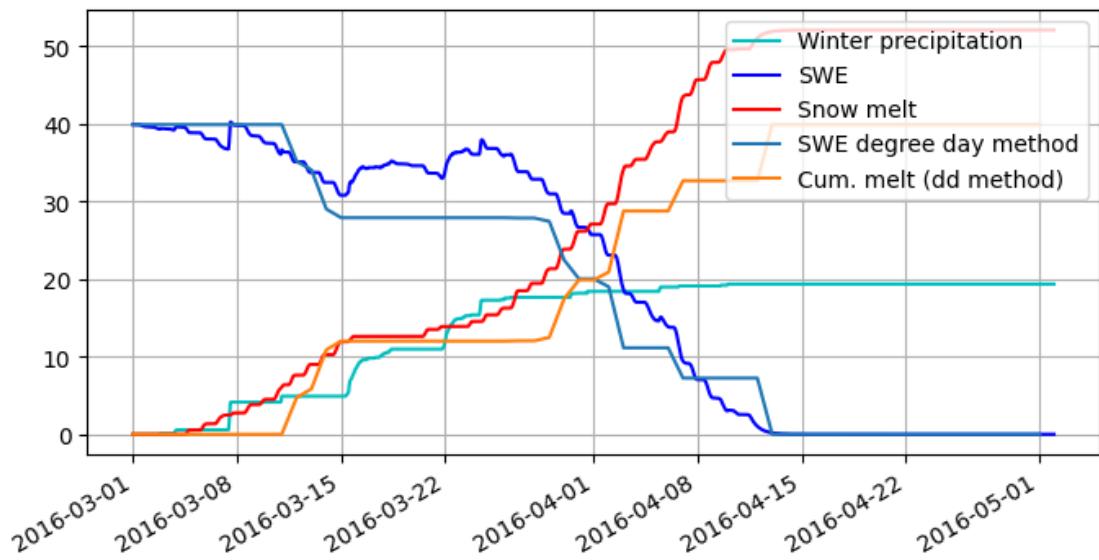
[47]: SWE=snow_df['mi']+snow_df['ml']
snow_df['SWE']=SWE

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

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

```



[ ]: