

SMOS IC

Version 1, date 09/09/2017

Version #	Date	Comments		
1.a	02/03/2017			
1.b	22/05/2017			
1.c	30/05/2017	Flags adjusted		
1.d	09/09/2017	v105		

References :

Fernandez-Moran, R., Wigneron, J.-P., De Lannoy, G., Lopez-Baeza, E., Parrens, M., Mialon, A., Mahmoodi, A, Al-Yaari, A., Bircher, S., Al Bitar, A., Richaume, P, Kerr, Y., 2017. A new calibration of the effective scattering albedo and soil roughness parameters in the SMOS SM retrieval algorithm, accepted International Journal of Applied Earth Observation and Geoinformation

Fernandez-Moran, R., Al-Yaari, A. , Mialon, A. , Mahmoodi, A , Al Bitar, A. , De Lannoy, G., Lopez-Baeza, E., Kerr, Y., Wigneron, J.-P., 2017.

SMOS-IC: An alternative SMOS soil moisture and vegetation optical depth product, Remote Sens., 9, 457; doi:10.3390/rs9050457

*) **Product Version** = V.105

*) **Naming convention**

example :

SM_OPER_MIR_CDF3SA_20160726T000000_20160726T235959_105_001_8.DBL.nc

SM : SMOS

OPER : OPER or REXX, depends if SMOS L3 brightness temperatures are from the operational or reprocessing campaign

MIR : MIRAS SMOS instrument

CDF3SA/CDF3SD : Cats Daily, Full polarization, level 3, Smosic, Ascending/Descending orbits

20160726 : Tag for the day as 4 digit year, 2 digit month, 2 digit day

000000 & 235959 : time window, as HHMMSS, means all orbits of the day are considered

105 : version of the SMOS IC product

001 : file counter

8 : processing site, 8 stands for Cesbio

DBL.nc : DataBLock, nc is the extension for netcdf format

*) **Product Content**

- **lat** : dimension 1 x 584, latitude in degrees
- **lon** : dimension 1 x 1388, longitude in degrees
- **Soil_Moisture** : dimension 1388 x 584, Soil moisture in m³/m³
- **Soil_Moisture_StdError** : dimension 1388 x 584, Error on the derived Soil moisture in m³/m³
- **Quality_Flag** : dimension 1388 x 584
 - 0 : SM/TAU are retrieved and recommended
 - 1 : SM/TAU are retrieved, but NOT recommended (Scene or Processing Flags are ≠ 0)
 - 2 : SM NOT retrieved (missing inputs -TB or ECMWF, not enough angles)
- **Scene_Flags** : dimension 1388 x 584, see next paragraph
- **Processing_Flags** : dimension 1388 x 584, see next paragraph
- **RMSE** : dimension 1388 x 584, Root Mean Square error between SMOS L3 TB and modeled ones
- **Soil_Temperature_Level1** : dimension 1388 x 584, Soil Temperature level 1, taken from ECMWF auxiliary files (CATDS)
- **Days** : dimension 1388 x 584, number of days since 01/01/2000
- **UTC_Seconds** : dimension 1388 x 584
- **UTC_Microseconds** : dimension 1388 x 584

```
Time :
To convert Days/Sec/MicroSec with matlab :
>> time = 730486 + Days + UTC_Seconds/86400 ;
```

☑ Good Practice

SM / TAU can be slightly negative. This is expected from the point of view of the minimization process, even if negative values are not physical.

So, except for specific analysis, consider the valid range of SM values is [0.0 m³/m³, 1 m³/m³].

If one wants a fullproof SM, consider the node with a Quality_Flag set to 0

***) Meaning of flags**

- **Quality_Flag**
 - 0 : SM/TAU are retrieved and recommended
 - 1 : SM/TAU are retrieved, but NOT recommended (Scene or Processing Flags are ≠ 0)
 - 2 : SM NOT retrieved (missing inputs -TB or ECMWF, not enough angles)

is set to 1 if one of the scene_flag or processing_flag is equal to 1

- **Scene_Flag**

8-bit flag

'00000001' : moderate Topo

'00000010' : strong Topo

'00000100' : polluted scene (water+urban+ice > 10% of the pixel),

'00001000' : frozen scene, ECMWF_Surf_Temperature < 273K

- **Processing_Flags**

8-bit flag

'00000001' : RMSE > 12 K, RMSE being RMSE of (TB model - L3TB)

```

Read Flags with Matlab :
>> if flag < 0
    flag = dec2bin(typecast(int8(flag),'uint8')) ;
else
    flag = dec2bin(flag,8) ;
end
    
```

***) Other Considerations**

- Land cover map : IGBP
- The retrieval is attempted with incidence angles between 20° and 55°, angle separation of 10°
- Parameters

LANDCOVER R CODE	Name	aggreg cla	HR	HR_MIN	QR	NR_H	NR_V	CL	BS_L	a_L	b_L	b'	b''	Omega_H	DIFF_Omega	TT_H	RTT	B_t	DLCC
0	Water	CWS:5	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	-999
1	Evergreen Needle Leaf Forest	CFO:2	0.3	0.3	0	1	-1	0	0.3	2.33	0	0.337	0.000	0.060	0	1	1	1.5	-999
2	Evergreen Broadleaf Forest	CFO:2	0.3	0.3	0	1	-1	0	0.3	2.33	0	0.295	0.000	0.060	0	1	1	1.5	-999
3	Deciduous Needle Leaf Forest	CFO:2	0.3	0.3	0	1	-1	0	0.3	2.33	0	0.337	0.000	0.060	0	1	1	1.5	-999
4	Deciduous Broadleaf Forest	CFO:2	0.3	0.3	0	1	-1	0	0.3	2.33	0	0.295	0.000	0.060	0	1	1	1.5	-999
5	Mixed Forests	CFO:2	0.3	0.3	0	1	-1	0	0.3	2.33	0	0.310	0.000	0.060	0	1	1	1.5	-999
6	Closed Shrublands	CNO:1	0.27	0.27	0	-1	-1	0	0.3	2.33	0	0.06	0	0.1	0	1	1	1.7	-999
7	Open Shrublands	CNO:1	0.17	0.17	0	-1	-1	0	0.3	2.33	0	0.06	0	0.08	0	1	1	1.7	-999
8	Woody Savannas	CFO:2	0.3	0.3	0	1	-1	0	0.3	2.33	0	0.310	0.000	0.060	0	1	1	1.5	-999
9	Savannas	CNO:1	0.23	0.23	0	-1	-1	0	0.3	2.33	0	0.06	0	0.1	0	1	1	1.7	-999
10	Grasslands	CNO:1	0.12	0.12	0	-1	-1	0	0.3	2.33	0	0.06	0	0.1	0	1	1	1.7	-999
11	Permanent Wetlands	CWL:3	0.19	0.19	0	-1	-1	0	0.3	2.33	0	0.06	0	0.1	0	1	1	1.7	-999
12	Corpland	CNO:1	0.17	0.17	0	-1	-1	0	0.3	2.33	0	0.06	0	0.12	0	1	1	1.7	-999
13	Urban and Built-up	CEU:8	0.21	0.21	0	-1	-1	0	0	0	0	0	0	0.1	0	0	0	0	-999
14	Barren or Sparsely Vegetated	CNO:1	0.22	0.22	0	-1	-1	0	0.3	2.33	0	0.06	0	0.12	0	1	1	1.7	-999
15	Snow and Ice	CEI:7	0.12	0.12	0	-1	-1	0	0	0	0	0	0	0.1	0	0	0	0	-999
16	Barren or Sparsely Vegetated	CNO:1	0.02	0.02	0	-1	-1	0	0.3	2.33	0	0.06	0	0.12	0	1	1	1.7	-999

- T vegetation = T skin (ECMWF)