

```

1 #PSP_TTwaterContent.py
2 from __future__ import division
3 from math import sqrt
4
5 c = 299792458
6 airPermittivity = 1.00058986
7
8 def getLiquidPermittivity(temperature):          Calculate dielectric
9     deltaT = temperature - 25.                  constant of water
10    return(78.54 * (1-4.579E-03 * deltaT))
11
12 def getBulkPermittivity(probleLenght, travelTime, Vp):      Estimate e_r of soil
13    return(((c * Vp * travelTime) / (2. * probleLenght))**2) with travelTime
14
15 def getWaterContentTopp(bulkPermittivity):              Topp model
16    return(-5.3E-02 + 2.92E-02 * bulkPermittivity - 5.5E-04 * bulkPermittivity**2
17           + 4.3E-06 * bulkPermittivity**3)
18
19 def getWaterContentMalicki(bulkPermittivity, bulkDensity):  Malicki model
20    bulkDensity /= 1000.
21    return((sqrt(bulkPermittivity) - 0.819 - 0.168*bulkDensity -
22            0.159*bulkDensity**2)
23           / (7.17 + 1.18*bulkDensity))
24
25 def getWaterContentMixModel(bulkPermittivity, bulkDensity, solidPermittivity, liquidPermittivity, alpha):  Dielectric mixtin model
26    porosity = 1. - bulkDensity/2650.
27    numerator = bulkPermittivity**alpha - ((1. - porosity) *
28    solidPermittivity**alpha
29           + porosity * airPermittivity**alpha)
30    denominator = liquidPermittivity**alpha - airPermittivity**alpha
31    return(numerator/denominator)

```