

program TOSwhole

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! This program computes daily mean solar radiation of
! the first day from Jan to Dec and 90S to 90N every 5 degrees
!
! Input: lat [the latitude in degrees]
! j [the Julian day of year(first day of each month)]
! Output: qinte [daily mean value of q]
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! modified by Wenting 9/7/2010
!cccccc
  real qinte(12,37),doymon(12)

!ccccccc  input & preprocess data
  data doymon /1,32,60,91,121,152,182,213,244,274,305,335/
  pi = 3.1415926
  s0 = 1367.          !Wm^-2
  open(7,file='result')
  write(7,*) 'daily average solar insolation at the first day of each month:'
  write(7,200) 'lat','Jan','Feb','Mar','Apr','May','Jun','July','Aug','Sep','Oct','Nov','Dec'

!cccccccc  computing daily mean solar radiation of 1st day of every month
  do 100 i=1,12      !month loop (Jan to Dec)
    j = doymon(i)    !Julian day number: first day of each month
    fe = 1 + 0.033*cos(2.*pi*j/365.) !the eccentricity factor or the relative distance between Earth
and Sun
    delta = 0.4093*sin(2*pi*j/365.0 - 1.405) !the solar declination in radians
    do k=1,37        !latitude loop (90S to 90N)
      phi = (90.0-(k-1)*5.)*pi/180.0 !latitude in radians
      if(lat.eq.90..and.tan(delta).ge.0..OR.tan(phi)*tan(delta).gt.1..OR.lat.eq.-90..and.tan(delta).lt.0)
then
        h0=pi      !polar day
      else if(lat.eq.90..and.tan(delta).lt.0..OR.tan(phi)*tan(delta).lt.-1..OR.lat.eq.-90..and.tan(delta).ge.0)
then
        h0=0.      !polar night situation
      else
        h0 = acos(-tan(phi)*tan(delta))      !the hour angle at sunrise or sunset
      end if
      qinte(i,k) =(s0*fe/pi)*(h0*sin(phi)*sin(delta)+cos(phi)*cos(delta)*sin(h0)) !daily mean in
analytical form
    end do
  100 continue
  write(7,900) (90.0-(k-1)*5.,(int(qinte(i,k)),i=1,12), k=1,37)
  write(6,*) 'the result shows in the file result'
900 format(2x,f4.0,2x,12I5)
200 format(2x,A4,A9,11A5)

end program
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