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!
! This program computes daily sunlight time length for the first day of each month in a
!
! Input: city_name
!         lat
!
! Output: sun_time_h
!         sun_time_min
!
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!

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program LAID_ex1_2
INTEGER :: lat, j, sun_time_h, sun_time_min
CHARACTER (len=20):: city_name, month_name
REAL :: sun_time

s0 = 1367. !Wm^-2
pi = 3.1415937

write(6,*) 'enter city name'
read(5,*) city_name
write(6,*) 'enter the latitude of this city in degree (-90, 90), except -90 and 90.'
read(5,*) lat
phi = lat*pi/180.0 !convert to radians

write(6,*) 'Length of Sunlight Time for the First Day of Every Month, for the City of',
  city_name
write(6,*) 'latitude', lat
write(6,100) 'MONTH', 'Sunlight Time'
100 FORMAT (1X, A5, 5X, A13)
write(6,200) 'Hour', 'Min'
200 FORMAT (1X, 10X, A5, 2X, A3)

DO i=1,12

  if (i==1) THEN
    j=1      ! j is the num of day is a year (suppose a 365-day year)
    month_name='January'
  ENDIF
  if (i==2) THEN
    j=32
    month_name='Feburary'
  ENDIF
  if (i==3) THEN
    j=60
    month_name='March'
  ENDIF
  if (i==4) THEN
    j=91
    month_name='April'
  ENDIF
  if (i==5) THEN
    j=121
    month_name='May'

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ENDIF
if (i==6) THEN
j=152
month_name=' June'
ENDIF
if (i==7) THEN
j=182
month_name=' July'
ENDIF
if (i==8) THEN
j=213
month_name=' August'
ENDIF
if (i==9) THEN
j=244
month_name=' September'
ENDIF
if (i==10) THEN
j=274
month_name=' October'
ENDIF
if (i==11) THEN
j=305
month_name=' November'
ENDIF
if (i==12) THEN
j=335
month_name=' December'
ENDIF

delta=0.4093*sin(2*pi*j/365.0-1.405) !the solar declination in radians
cos_h0=-tan(phi)*tan(delta)
if (cos_h0>1.0) cos_h0=1.0
if (cos_h0<-1.0) cos_h0=-1.0
h0 = acos(cos_h0) !the hour angle at sunrise or sunset
sun_time=24*h0/pi
sun_time_h=floor(sun_time)
sun_time_min=nint(60*(sun_time-sun_time_h))
if (sun_time_min==60) then
    sun_time_h=sun_time_h+1
    sun_time_min=0
endif
write(6, 300) month_name, sun_time_h, sun_time_min
300 FORMAT(1X, A10, 2X, I2, 4X, I2)
END DO
END

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