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pro SystemConstants, planet, SystemConsts, DipoleConsts

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;;
;; Version 2.0: 15 June 2010
;;   Creates the systemconsts and dipoleconsts structures from data stored
;;   in the !Planet system variables
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SystemConsts = {Planet:'', rPlan:0d, aPlan:0d, epsPlan:0d, $
  Objects:ptr_new(0), GM:ptr_new(0), radius:ptr_new(0), a:ptr_new(0), eps:ptr_new(0), $
  orbvel:ptr_new(0), period:ptr_new(0), orbrate:ptr_new(0)}

case strlowcase(planet) of
  'sun': plan = !sun
  'mercury': plan = !Mercury
  'venus': plan = !Venus
  'earth': plan = !Earth
  'mars': plan = !Mars
  'jupiter': plan = !Jupiter
  'saturn': plan = !Saturn
  'uranus': plan = !Uranus
  'neptune': plan = !Neptune
  'pluto': plan = !Pluto
endcase

SystemConsts.planet = plan.name
SystemConsts.rplan = plan.radius
SystemConsts.aplan = plan.a
SystemConsts.epsplan = plan.e

tt = tag_names(plan)
if (total(strcmp(tt, 'satellites', /fold))) then begin
  *SystemConsts.objects = [plan.name, plan.satellites]

  mm = [plan.mass, plan.msat]
  rr = [plan.radius, plan.rsat]
  tt = [0d, plan.orbsat*24.*3600.]
  vv = [0d, 2*!dpi*plan.asat*plan.radius/tt[1:*]]

  *SystemConsts.GM = -!const.G*mm*1e3/(plan.radius*1e5)^3
  *SystemConsts.radius = rr/plan.radius
  *SystemConsts.a = [0d, plan.asat]
  *SystemConsts.eps = [0d, plan.esat]
  *SystemConsts.period = tt
  *SystemConsts.orbvel = vv
  *SystemConsts.orbrate = [0d, 2*!dpi/tt[1:*]]
endif else begin
  *SystemConsts.objects = plan.name
  *SystemConsts.GM = -!const.G*plan.mass*1d3/(plan.radius*1d5)^3
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    *SystemConsts.radius = 1d
    *SystemConsts.a = 0d
    *SystemConsts.eps = 0d
    *SystemConsts.period = 0d
    *SystemConsts.orbvel = 0d
    *SystemConsts.orbrate = 0d
  endelse

  ;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
  ;; Read in the dipole constants
  file = !model.basepath + 'Work/Data/PhysicalData/DipoleConstants.dat'
  if ~file_test(file) then stop ;; file = (file_search('$HOME', 'DipoleConstants.dat'))[0]
  readcol, /silent, file, delim=':', ob, mm, t, tdir, o, olon, olat, per, $
    format='A,D,D,D,D,D,D,D'
  ob = strtrim(ob, 2)
  q = (where(strcmp(planet, ob, /fold), nq))[0]
  if (nq) $
    then DipoleConsts = {$
      strength:mm[q], $
      tilt:t[q]*!dtor, $
      lam3:tdir[q]*!dtor, $
      offset:o[q], $
      offlong:olon[q]*!dtor, $
      offlat:olat[q]*!dtor, $
      period:per[q], $
      magrat:2*!dpi/per[q]} $
     else DipoleConsts = -1

  end
```