Assignment #5: Silver Springs Model

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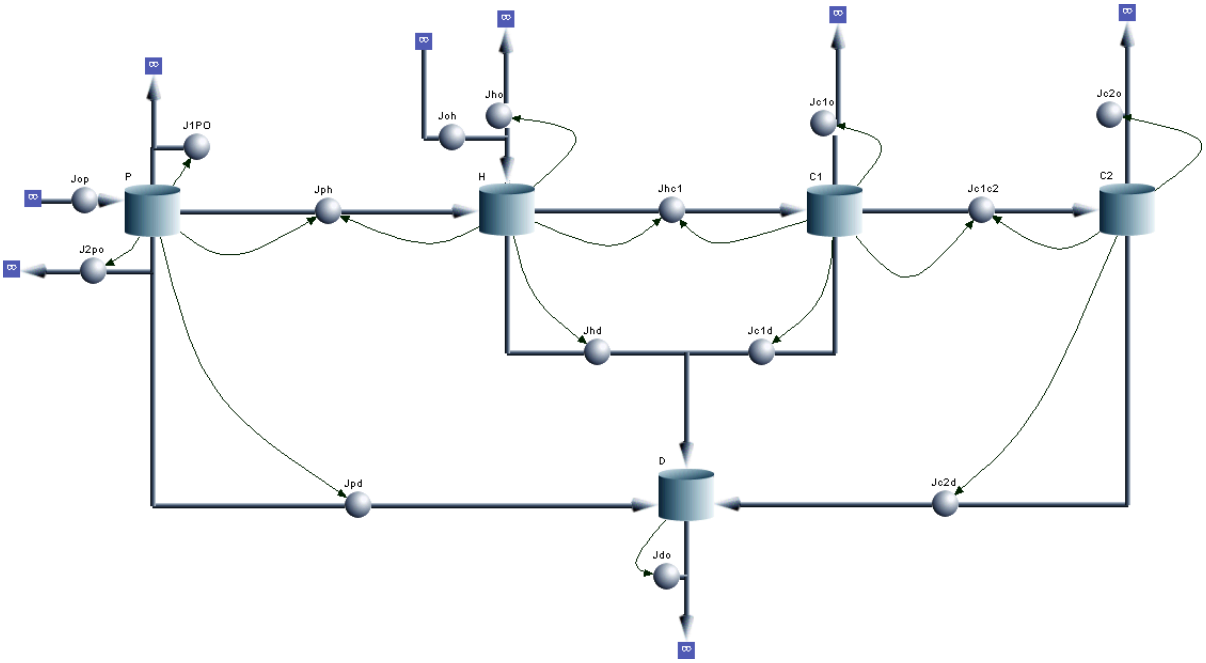
1 A Brief Introduction

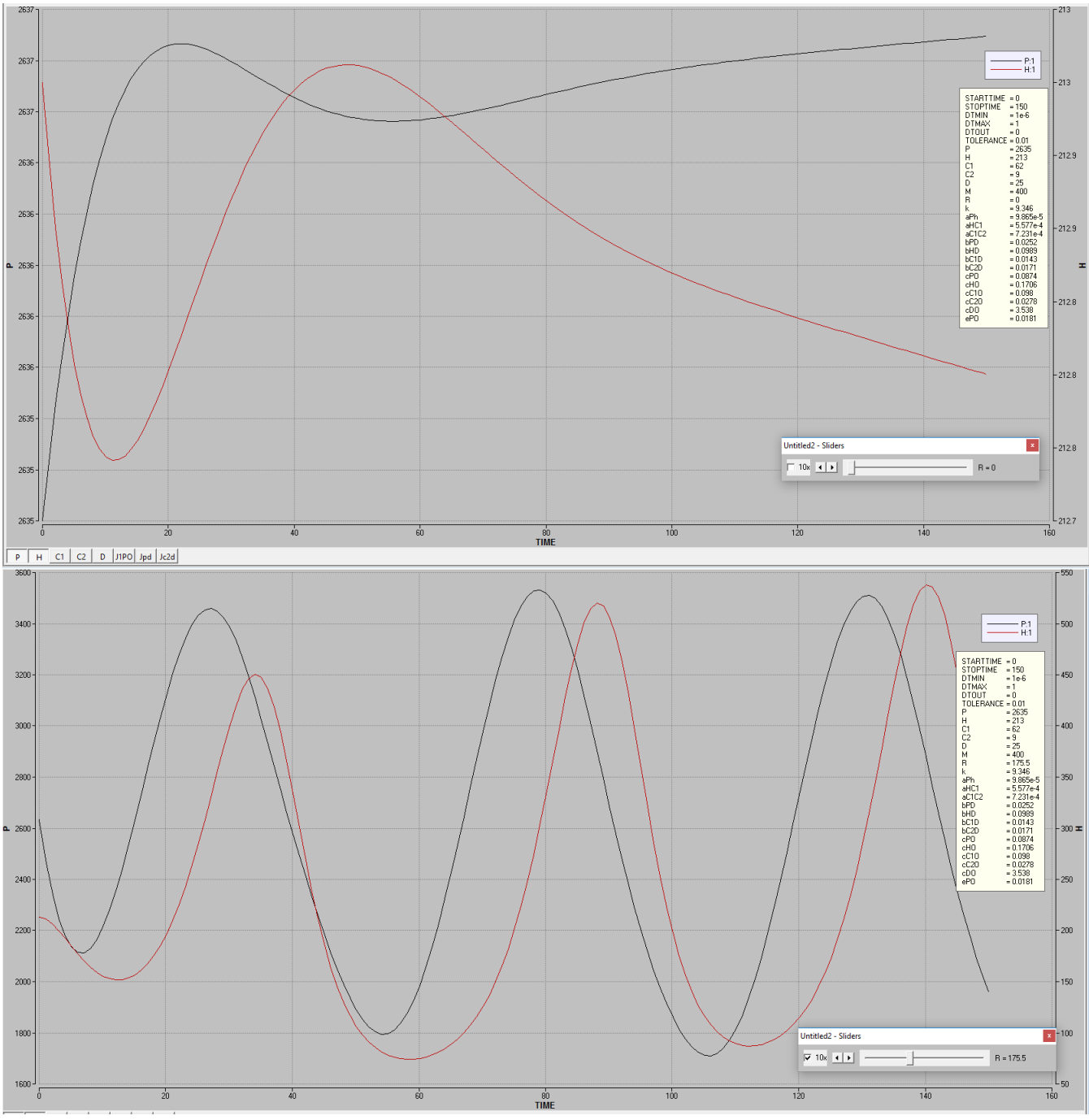
In this assignment, we learn how energy flows in a system using the Silver Springs model. Here the trophic levels are represented P, H, C1, C2 and D – producers, herbivores, carnivores, top carnivores, and decomposers. Below are the figures representing the model and the results generated.

2 Results

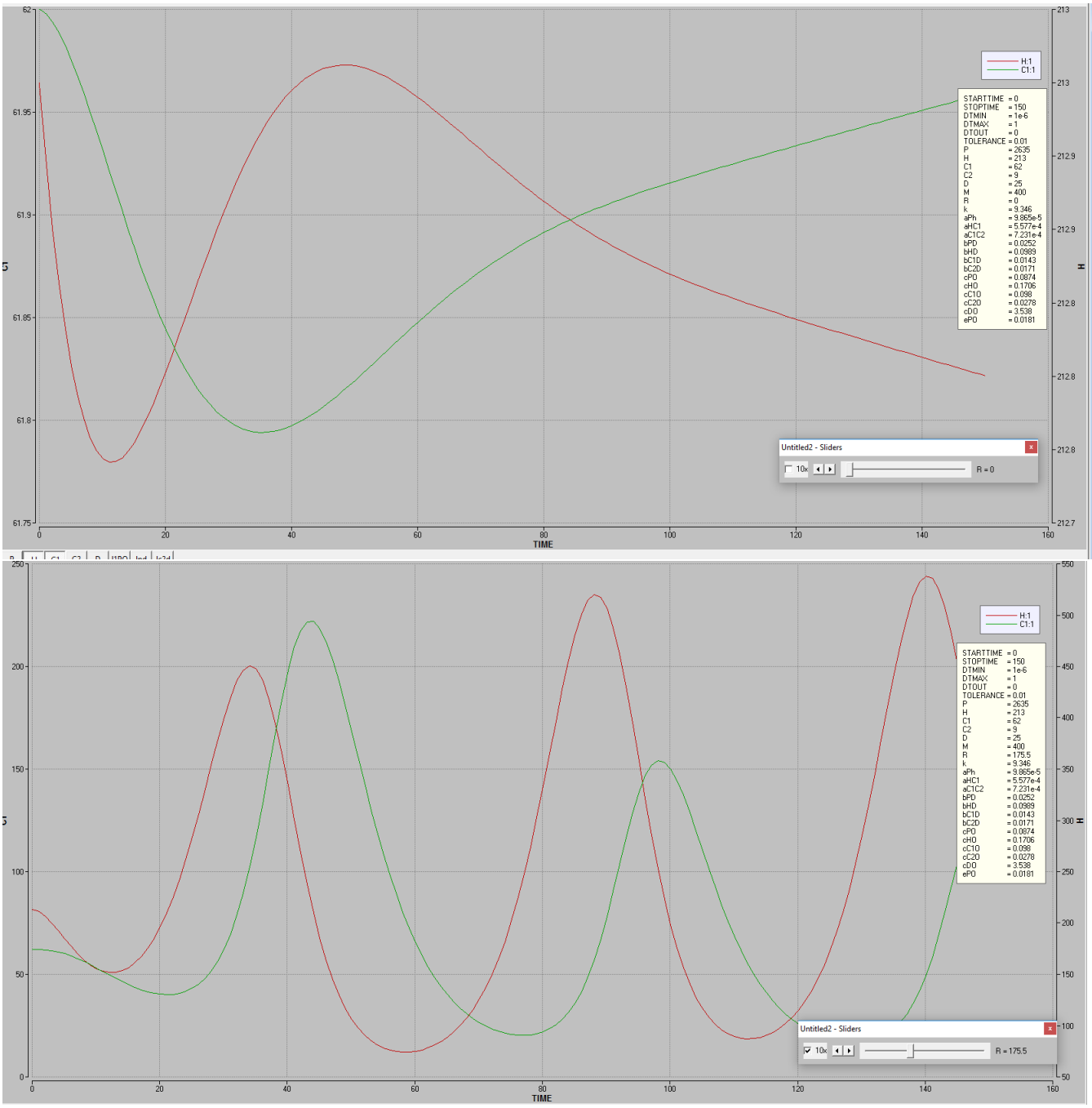
2.0.1 Silver Springs Aquatic Model



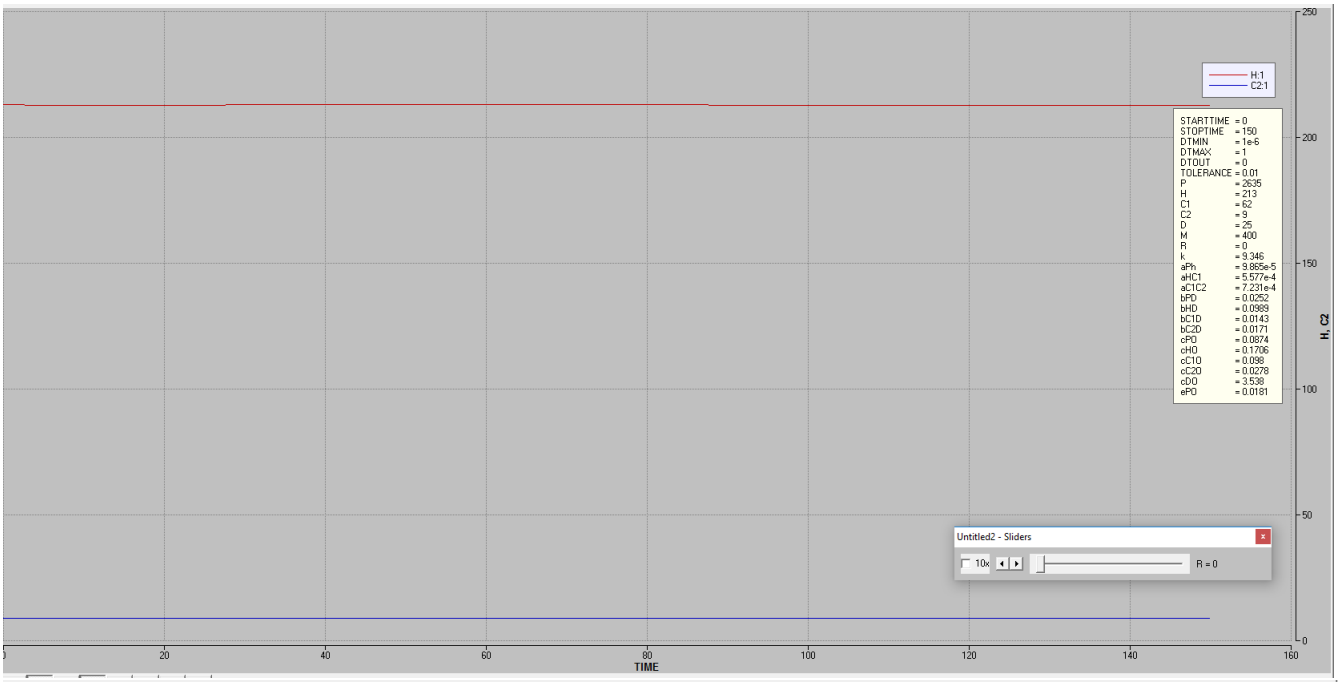
2.0.2 P and H over Time

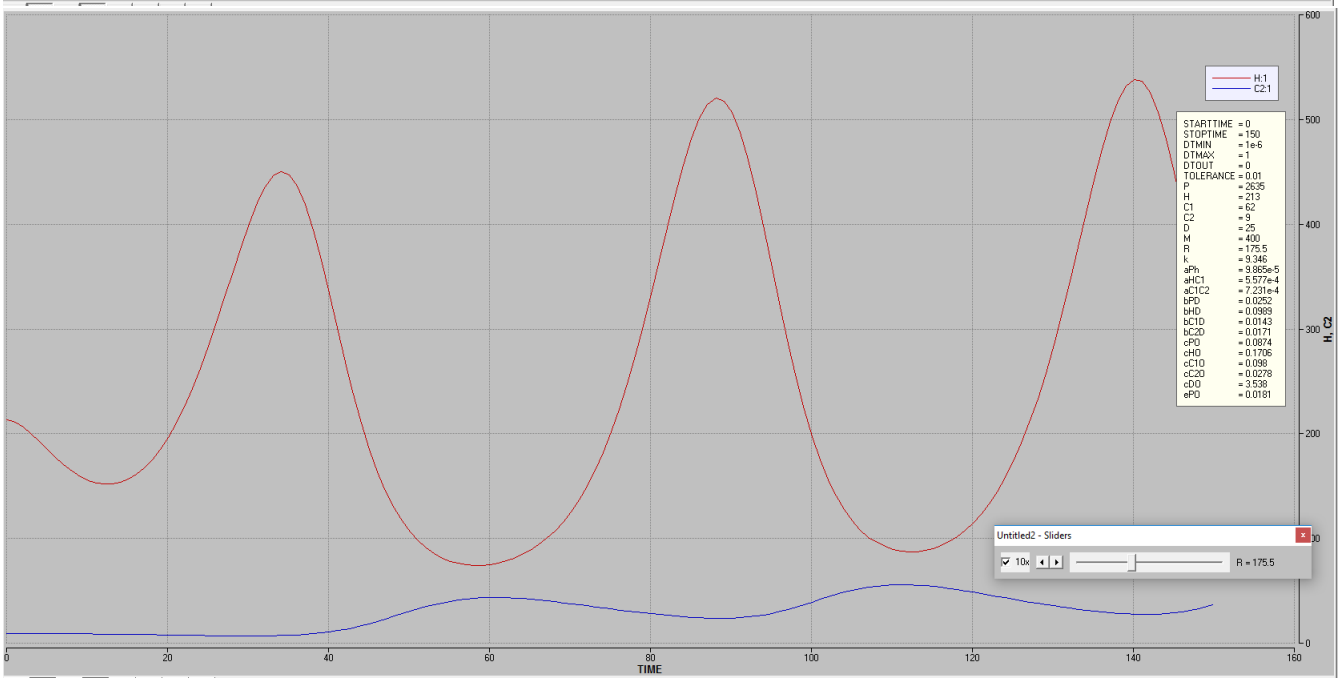


2.1 H and C1 over Time

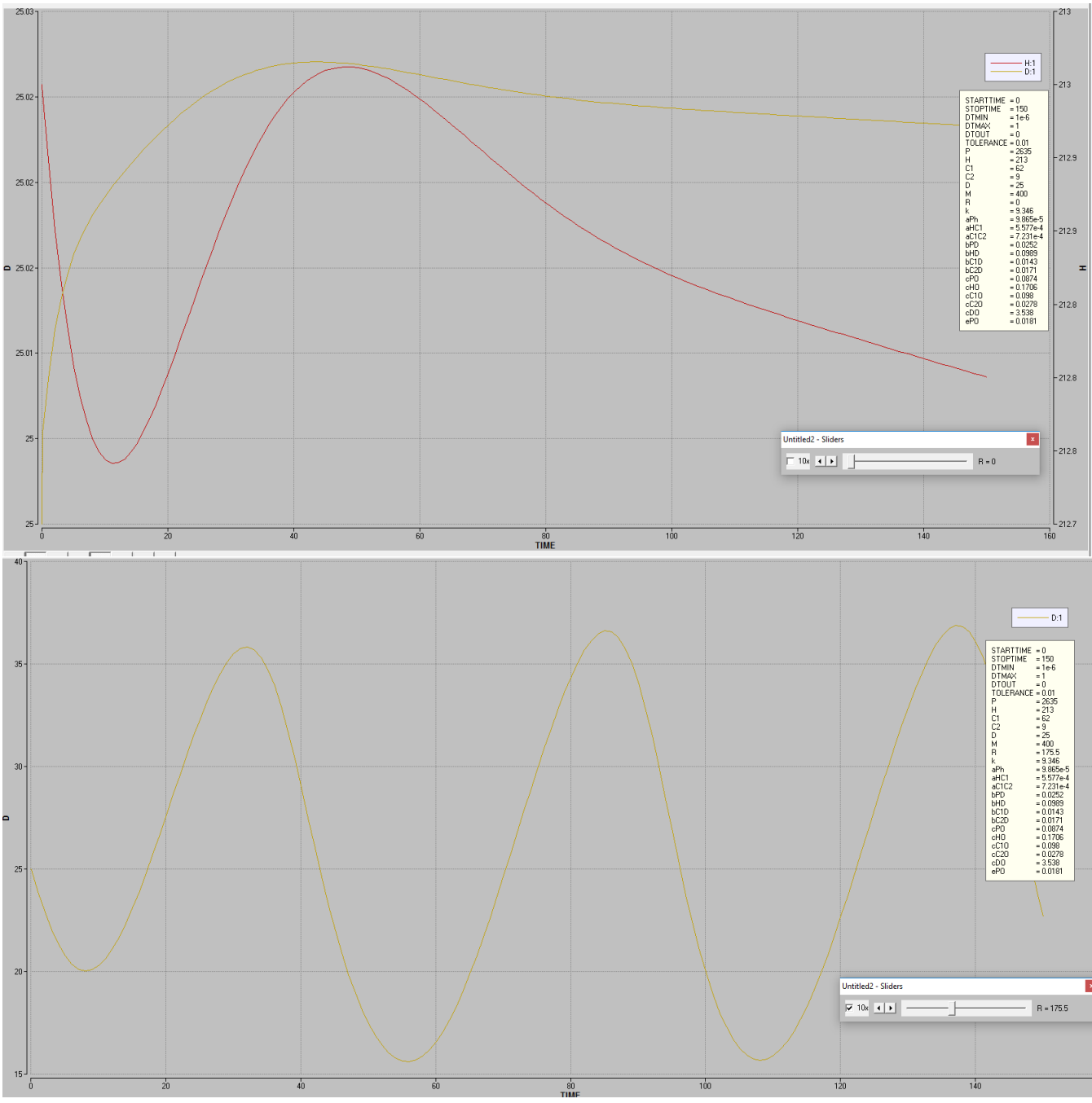


2.2 H and C2 over Time





2.3 H and D over Time



3 Conclusion

The driving forces in this model are *Jop* and *Joh*. They represent the energy input from the sun and the energy input from bread feeding. As energy flows into each trophic level, much of the energy is either lost as heat or waste which would then be consume by the decomposers. In the graph of *P and H*, energy output from producers takes time to build up due to photosynthesis where herbivores has to to wait for the producers to build up energy. In the graph of *H and C1*, carnivores outputs less energy. Lastly, Decomposer energy increases as Herbivores increases.

4 Appendix

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{Top model}

  {Reservoirs}
  d/dt (P) = - J1PO - Jpd - J2po - Jph + Jop
    INIT P = 2635
  d/dt (H) = - Jhd + Jph - Jho + Joh - Jhc1
    INIT H = 213
  d/dt (C1) = - Jc1d + Jhc1 - Jc1o - Jc1c2
    INIT C1 = 62
  d/dt (C2) = - Jc2d + Jc1c2 - Jc2o
    INIT C2 = 9
  d/dt (D) = + Jpd + Jc2d - Jdo + Jhd + Jc1d
    INIT D = 25

  {Flows}
  J1PO = cPO*P
  Jpd = bPD*P
  Jc2d = bC2D*C2
  Jdo = cDO*D
  Jhd = bHD*H
  Jc1d = bC1D*C1
  Jop = M+R*sin(2*pi*(TIME-11) / 52)
  J2po = ePO*P
  Jph = aPh * P * H
  Jho = cHO*H
  Joh = k
  Jhc1 = aHC1*H*C1
  Jc1o = cC1O*C1
  Jc1c2 = aC1C2*C1*C2
  Jc2o = cC2O*C2
{Globals}
{Globals}
M = 400
R = 175
k = 9.346
aPh = 9.865e-5
aHC1 = 5.577e-4
aC1C2 = 7.231e-4
bPD = 0.0252
bHD = 0.0989
bC1D = 0.0143
bC2D = 0.0171
cPO = 0.0874
cHO = 0.1706
cC1O = 0.0980
cC2O = 0.0278
cDO = 3.538
ePO = 0.0181

{End Globals}
{End Globals}
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