

Figure 25. from

galpy: A python Library for Galactic Dynamics

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1 from galpy.df import quasiisothermaldf
2 from galpy.potential import MWPotential2014
3 from galpy.actionAngle import actionAngleStaeckel
4 # Setup actionAngle instance for action calcs
5 aAS= actionAngleStaeckel(pot=MWPotential2014,delta=0.45,
6                          c=True)
7 # Quasi-iso df w/ hr=1/3, hsr/z=1, sr(1)=0.2, sz(1)=0.1
8 df= quasiisothermaldf(1./3.,0.2,0.1,1.,1.,aA=aAS,
9                      pot=MWPotential2014)
10 # Evaluate DF w/ R,vR,vT,z,vz
11 df(0.9,0.1,0.8,0.05,0.02)
12 array([ 123.57158928])
13 # Evaluate DF w/ Orbit instance, return ln
14 from galpy.orbit import Orbit
15 df(Orbit([0.9,0.1,0.8,0.05,0.02]),log=True)
16 array([ 4.81682066])
17 # Evaluate DF marginalized over vz
18 df.pvRvT(0.1,0.9,0.9,0.05)
19 23.273310451852243
20 # Evaluate DF marginalized over vR,vT
21 df.pvz(0.02,0.9,0.05)
22 50.949586235238172
23 # Calculate the density
24 df.density(0.9,0.05)
25 12.73725936526167
26 # Estimate the DF's actual density scale length at z=0
27 df.estimate_hr(0.9,0.)
28 0.322420336223
29 # Estimate the DF's actual surface-density scale length
30 df.estimate_hr(0.9,None)
31 0.38059909132766462
32 # Estimate the DF's density scale height
33 df.estimate_hz(0.9,0.02)
34 0.064836202345657207
35 # Calculate the mean velocities
36 df.meanvR(0.9,0.05), df.meanvT(0.9,0.05),
37 df.meanvz(0.9,0.05)
38 (3.8432265354618213e-18, 0.90840425173325279,
39  -4.3579787517991084e-19)
40 # Calculate the velocity dispersions
41 from numpy import sqrt
42 sqrt(df.sigmaR2(0.9,0.05)), sqrt(df.sigmaz2(0.9,0.05))
43 (0.22695537077102387, 0.094215523962105044)
44 # Calculate the tilt of the velocity ellipsoid
45 df.tilt(0.9,0.05)
46 2.5166061974413765
47 # Calculate a higher-order moment of the velocity DF
48 df.vmomentdensity(0.9,0.05,6.,2.,2.,gl=True)
49 0.0001591100892366438
50 # Sample velocities at given R,z, check mean
51 vs= df.sampleV(0.9,0.05,n=500); mvt= numpy.mean(vs[:,1])
52 assert numpy.fabs(numpy.mean(vs[:,0])) < 0.05 # vR
53 assert numpy.fabs(mvt-df.meanvT(0.9,0.05)) < 0.01 #vT
54 assert numpy.fabs(numpy.mean(vs[:,2])) < 0.05 # vz

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