

```

1 import numpy as np
2
3 def kepler_J2_ODE(t, x, params):
4     # get params
5     mu_E = params['mu_E']
6     J2 = params['J2']
7     R_E = params['R_E']
8     n_objs = params['n_objs']
9
10    dxdt = np.zeros((n_objs * 6))
11
12    for k in range(n_objs):
13        r_vec = x[6*k:3+6*k]
14        X = r_vec[0]
15        Y = r_vec[1]
16        Z = r_vec[2]
17        rdot_vec = x[3+6*k:6+6*k]
18        r = np.linalg.norm(r_vec)
19        Z_r_2 = np.power(Z / r, 2.0)
20        p_J2 = 1.5 * J2 * mu_E / np.power(r, 2.0) * np.
21        power(R_E / r, 2.0) * \
22            np.array([X/r*(5.0*Z_r_2 - 1.0), Y/r*(5.0*
23            Z_r_2 - 1.0), Z/r*(5.0*Z_r_2 - 3.0)])
24        rddot_vec = -mu_E / np.power(r, 3.0)*r_vec + p_J2
25        dxdt[6*k:6*k+6] = np.concatenate((rdot_vec,
26        rddot_vec))
27
28    return dxdt

```