

Homework 6

ASE 366L

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CJL3282

1)

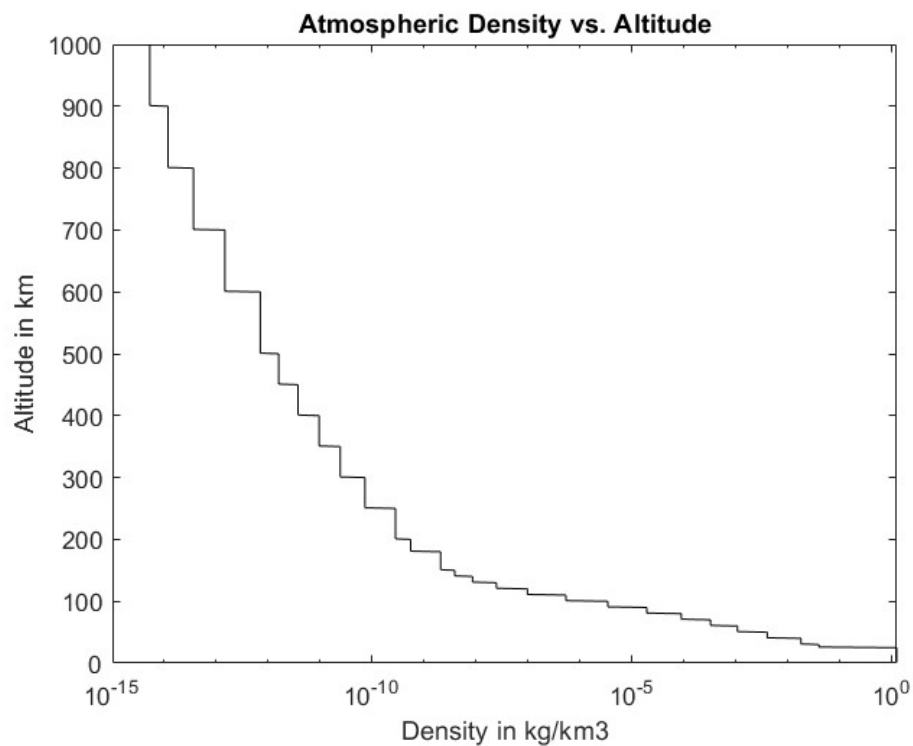
$$\begin{aligned}
 1) \quad \frac{d\vec{r}}{du} &= -\frac{3a^3 m_0}{2r^3 \phi_0 m \phi} \cdot (\cos u \sin u \cos(\alpha_0 - u) \sin(\alpha_0 - u) \\
 &\quad + \cos^2 u \sin^2(\alpha_0 - u)) \\
 1.1) \quad \frac{d\vec{r}}{du} &= \frac{1}{2} \int_0^{2\pi} \frac{-3a^3 m_0}{2r^3 \phi_0 m \phi} (11) du \\
 &= -\frac{1}{2} \frac{3a^3 m_0}{2r^3 \phi_0 m \phi} \int_0^{2\pi} (11) du \\
 &= \frac{1}{2} \int_0^{2\pi} \cos(\alpha_0 - u) \sin(\alpha_0 - u) du \\
 &\quad \int_0^{2\pi} \cos u \sin u du + \cos^2(\alpha_0 - u) \int_0^{2\pi} \sin^2 u du \\
 &= \boxed{-\frac{1}{2} \cdot \frac{3a^3 m_0}{2r^3 \phi_0 m \phi} \cos^2(\alpha_0 - u) = \frac{d\vec{r}}{du}} \\
 1.2) \quad \vec{r} &= \frac{d\vec{r}}{du} \cdot u = \frac{d\vec{r}}{du} \cdot u \\
 \vec{r} &= \frac{3a^3 m_0}{4r^3 \phi_0 m \phi} \cos^2(\alpha_0 - u) \sqrt{\frac{m_0}{a^3}} \\
 \vec{r} &= \boxed{\frac{-3m_0}{4r^3 \phi_0} \cos^2(\alpha_0 - u) \sqrt{\frac{a^3}{m_0}}}
 \end{aligned}$$

1.3) ~~for~~ for $\min |\vec{r}| = 90^\circ$
~~for~~ for $\min |\vec{r}| = 20$

2) $a_p = 1.0e-05 * [0.0177 \quad 0.8845 \quad 0.0281]$

3) $asrp = [-1.1000101008235e-11, -6.8539597139087e-10, 4.6486749696834e-12]$

4)

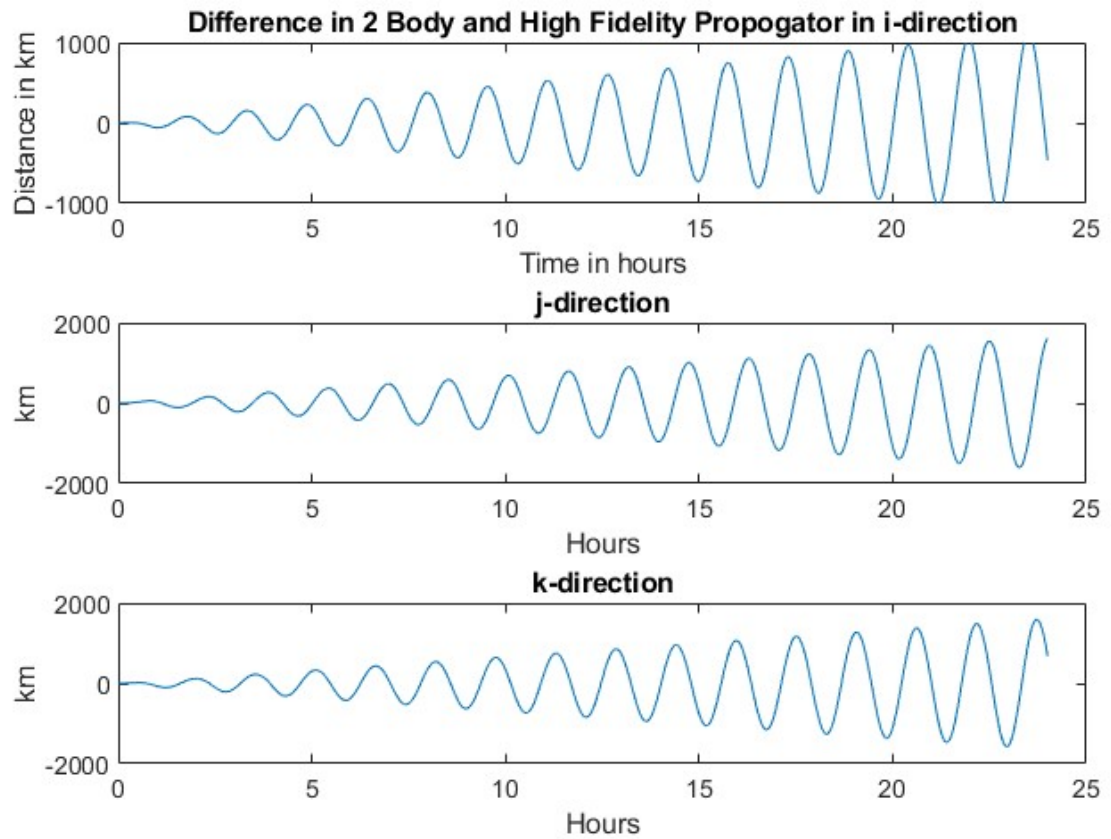


5) Position vector after 24-hour propagation:

$[-3.3688560252807e+03, 2.4132243409221e+03, -5.4577801900539e+03]$ km

Velocity vector after 24-hour propagation:

[1.7593040886166, -6.2915386405959, -3.8827784973974] km/s



The plot shows the differences between the 2 body and high fidelity propagator in each positional direction.