import numpy as np

import matplotlib.pyplot as plt

# Time: 1 year in days

days = np.linspace(0, 365, 365\*4)

# MBT inertia tide (annual)

mbt\_amplitude = 1.0

mbt\_wave = mbt\_amplitude \* np.sin(2\*np.pi \* days/365)

# Moon tide (27.3 days)

moon\_amplitude = 1.0

moon\_wave = moon\_amplitude \* np.sin(2\*np.pi \* days/27.3)

# Sun tide (daily)

sun\_amplitude = 0.5

sun\_wave = sun\_amplitude \* np.sin(2\*np.pi \* days/1)

# Combined

combined = mbt\_wave + moon\_wave + sun\_wave

# Plot

fig, axs = plt.subplots(4, 1, figsize=(12, 10), sharex=True)

axs[0].plot(days, mbt\_wave, 'b')

axs[0].set\_ylabel('MBT Inertia (m)')

axs[0].legend(['MBT Annual Wave'])

axs[1].plot(days, moon\_wave, 'g')

axs[1].set\_ylabel('Moon Tide (m)')

axs[1].legend(['Moon'])

axs[2].plot(days, sun\_wave, 'orange')

axs[2].set\_ylabel('Sun Tide (m)')

axs[2].legend(['Sun'])

axs[3].plot(days, combined, 'r')

axs[3].set\_ylabel('Combined (m)')

axs[3].set\_xlabel('Day of Year')

axs[3].legend(['Combined MBT + Moon + Sun'])

plt.suptitle('MBT + Moon + Sun Tidal Simulation Over 1 Year')

plt.tight\_layout()

plt.show()