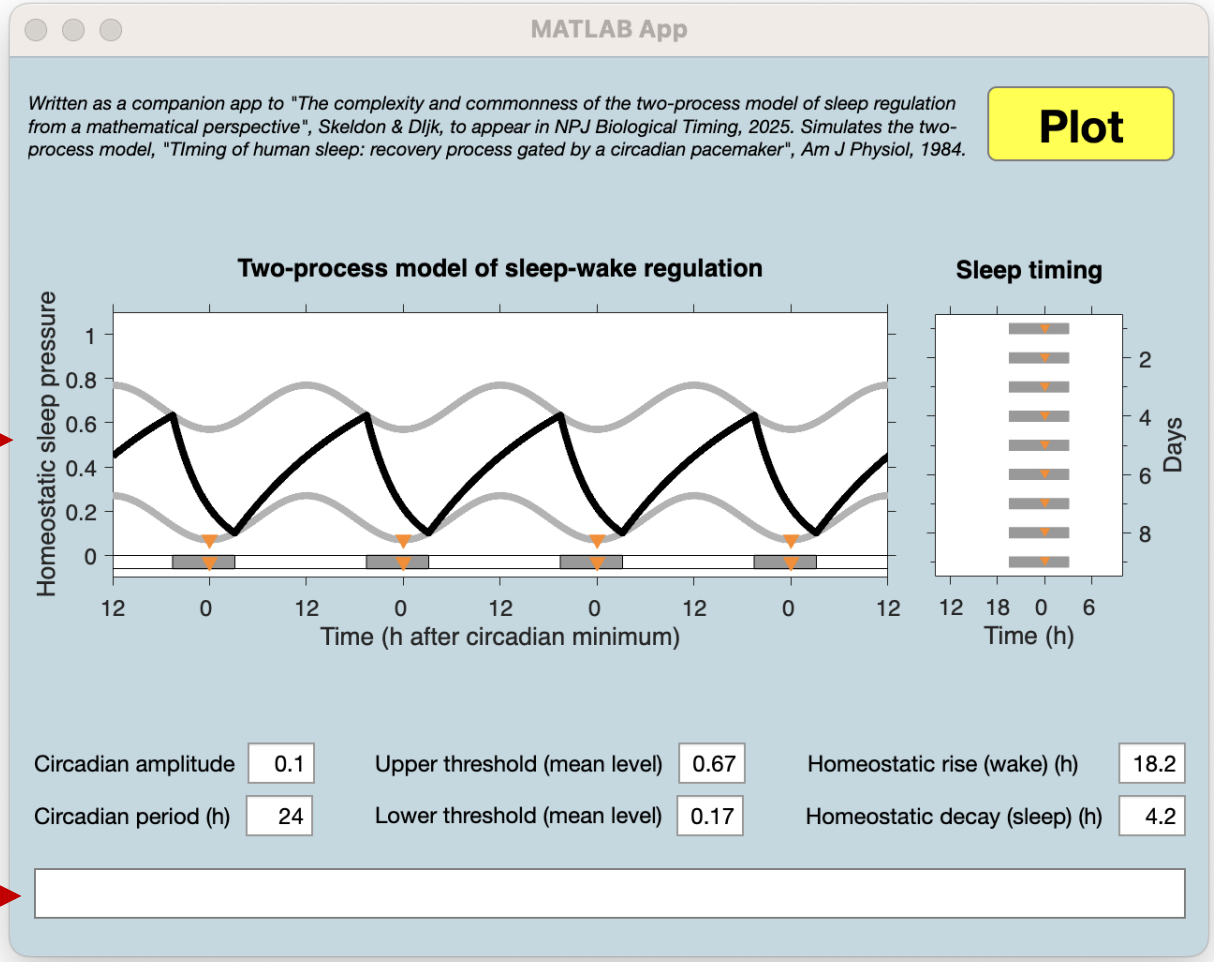
Matlab app to simulate the two-process model of sleep-wake regulation

This app enables the user to explore the dynamics of the two-process model shown in Fig. 3 of Daan, Beersma, Borbély *Am J Ph* *(*1984). Two example screenshots are shown below. The version of the model we simulate is the version with sinusoidal upper and lower thresholds. The app has been tested on both MAC and dell computers running MATLAB2024b with standard 16:9 aspect ration screens.

The following slides take you through how to install the app. Please contact a.skeldon@surrey.ac.uk if you have questions.



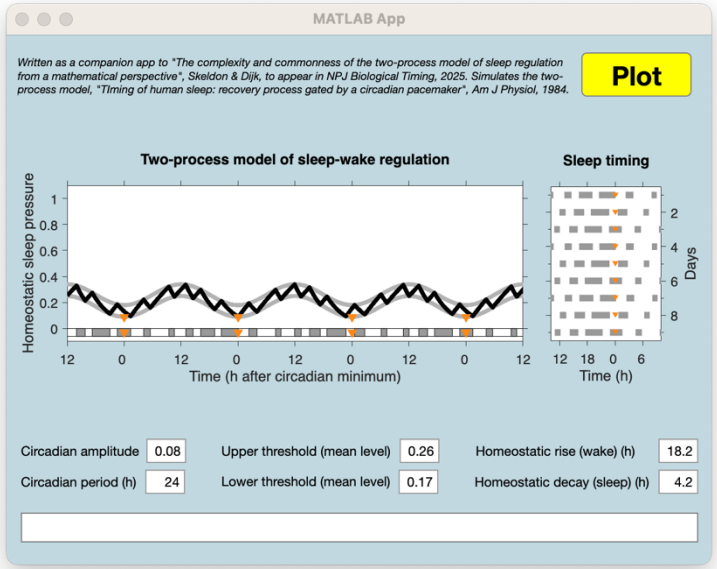
Two-process model simulation for 4 days. Black lines show homeostatic sleep pressure. Grey (wavy) lines show the thresholds modulated by the circadian rhythm. Orange triangles mark the time of the circadian minimum. Horizontal grey bars indicate the timing of sleep

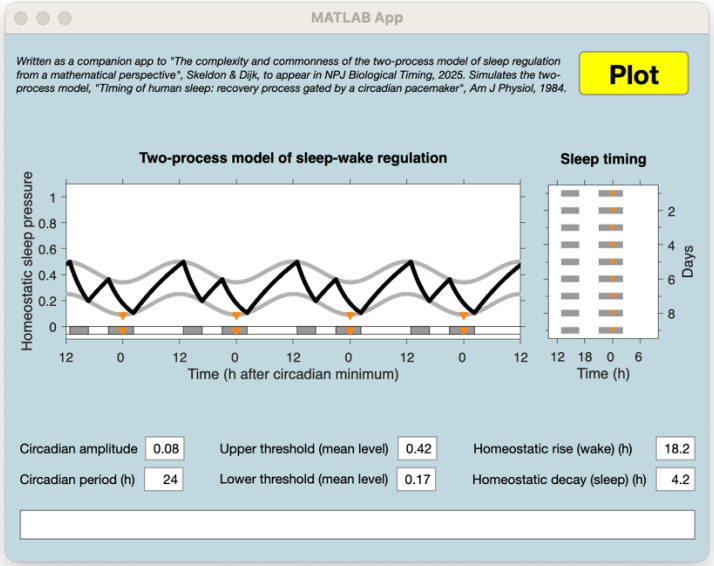
Horizontal bars indicate the timing of sleep on 9 successive days.

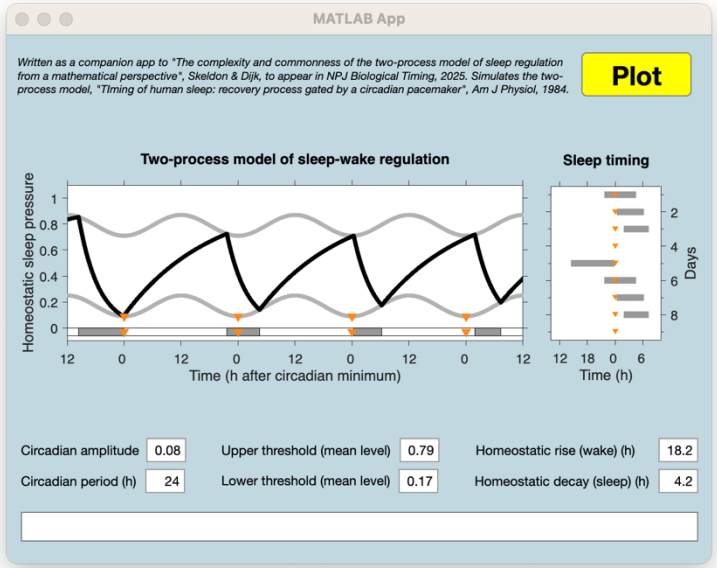
Parameter values, can be set by the user

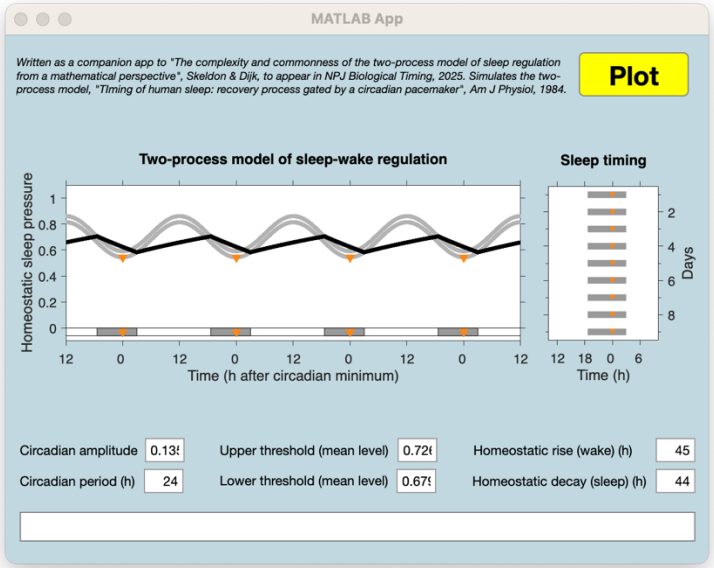
If the parameter values are set so that the thresholds do not stay between 0 and 1 an error message will appear here

More examples



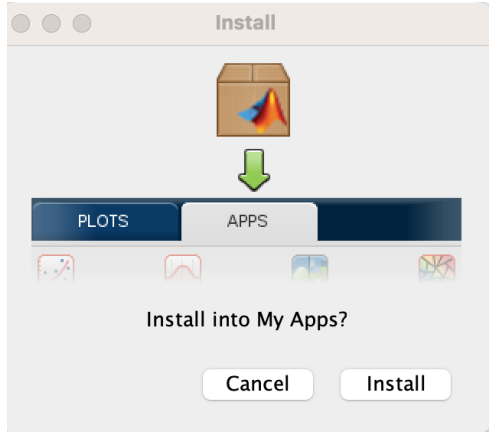




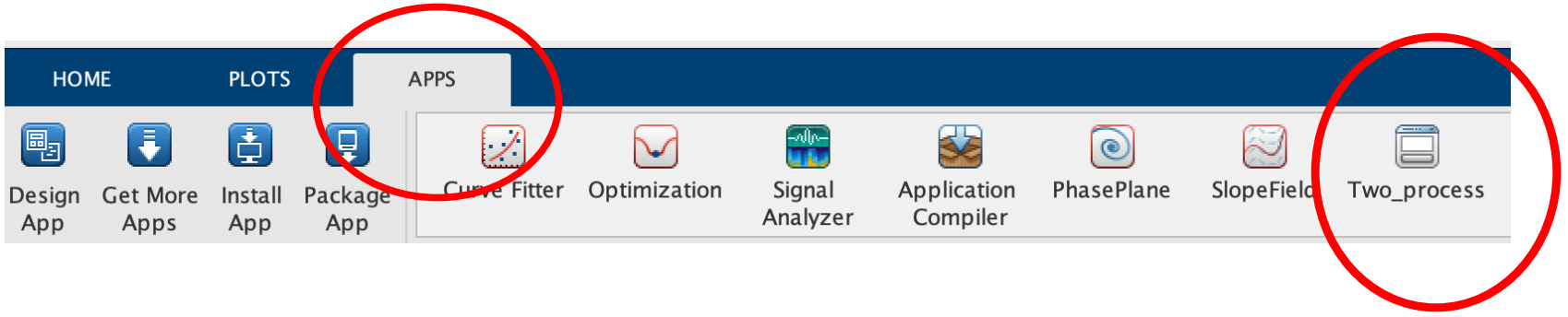


How to install the Matlab app:

1. Create a folder to store the app e.g. *MyDownloadedMatlabApps*
2. Download the Two_process.mlappinstall file and put in the folder *MyDownloadedMatlabApps*
3. Open Matlab and navigate to *MyDownloadedMatlabApps*
4. Double Click on Two_process.mlappinstall. This window should pop up:

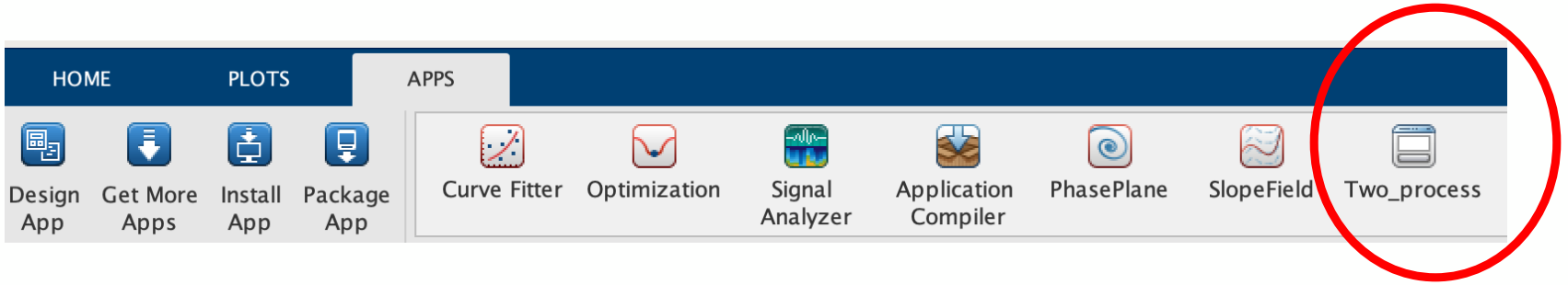


5. Click on the “Install” button. The model should then appear as one of your Matlab Apps. E.g.

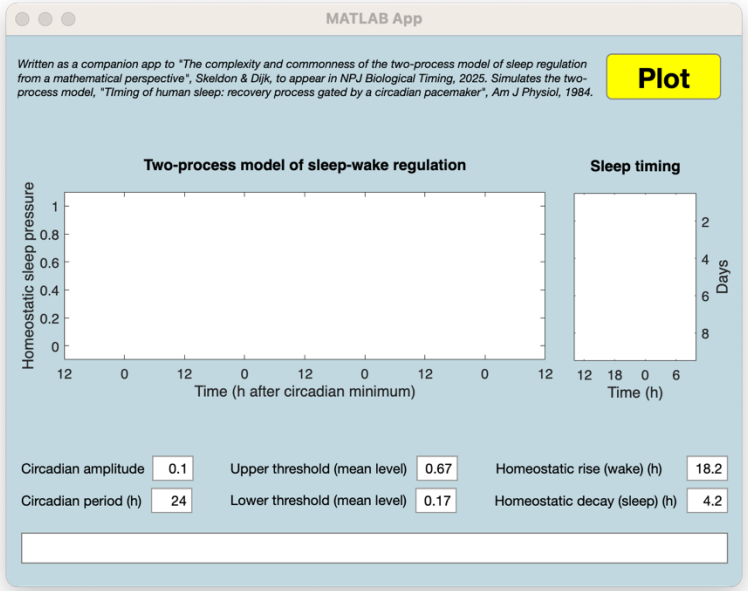


How to run:

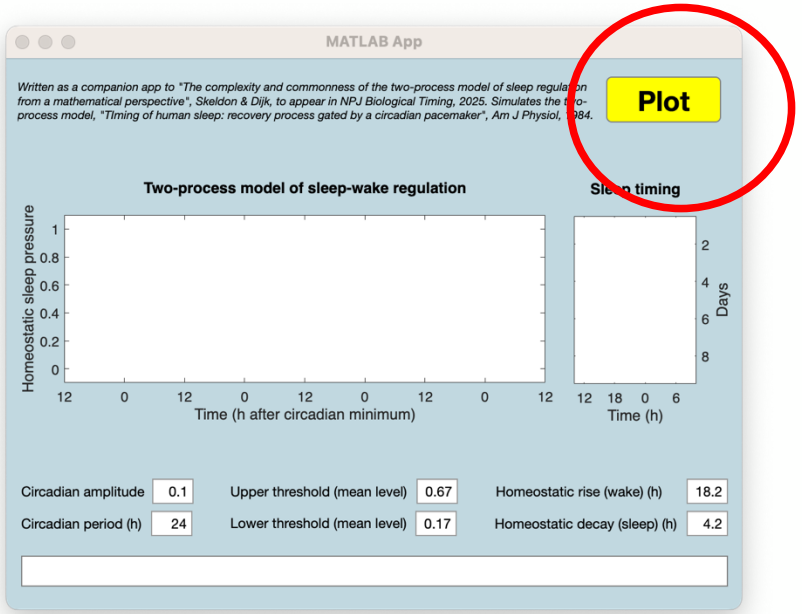
1. Click once on the TwoProcess app WAIT A FEW SECONDS



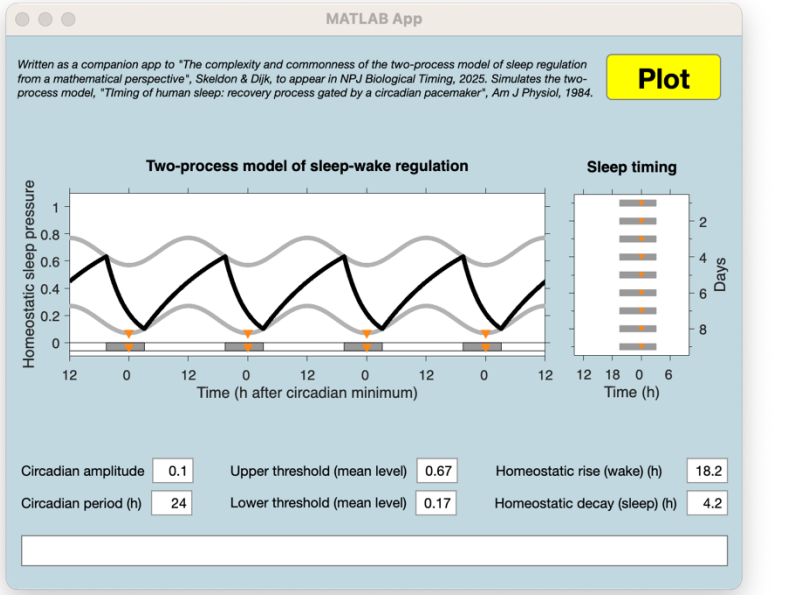
2. A pop-up window should appear:



3. Click on the “Plot” button



4. The results of a simulation of the two-process model for default parameter settings should appear along with a raster plot showing sleep timing.



4. You can change the values of the parameters and re-plot to investigate how the model behaves. For example: