## **Description of Additional Supplementary Files**

File Name: Supplementary Movie 1

Description: Top: Acetylcholine waves in the fluorescence ( $\Delta F/F0$ ) of GRAB-ACh3.0 that is expressed in the dorsal striatum of a mouse as viewed through a 3 mm diameter cranial window. Bottom: Space—time rendition of the wave activity collapsed along the mediolateral aspect of the image (See Fig. 1 in the Results). The central line corresponds to the frame shown above. Black points mark the location of the maximal activity along the mediolateral aspect. Movie slowed down by a factor of 12.5.

File Name: Supplementary Movie 2

Description: Top: Acetylcholine waves in the fluorescence ( $\Delta F/F0$ ) of iAChSnFR that is expressed in the dorsal striatum of a mouse as viewed through a 1 mm diameter GRIN lens. Bottom: Space—time rendition of the wave activity collapsed along the mediolateral aspect of the image (See Fig. 1 in the Results). The central line corresponds to the frame shown above. Black points mark the location of the maximal activity along the mediolateral aspect. Movie slowed down by a factor of 5.

File Name: Supplementary Code

Description: Code for running the simulations used in the manuscript. Please consult the

README.txt file included in the zipped file.