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| Nomenclature as in the manuscript | Nomenclature as in the Matlab codes | Remarks |
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| $$ J\_{55e}$$ | J55e | DRN's Glutamatergic neuronal excitatory coupling on 5-HT neurons |
| $$ J\_{5i}$$ | J5di | VTA's GABAergic neuronal inhibitory coupling on 5-HT neurons |
| $$ J\_{55i}$$ | J55i | DRN's GABAergic neuronal inhibitory coupling on 5-HT neurons |
| $$W\_{5d}$$ | wi4 | Connection weight from DA pop in VTA to 5-HT in DRN |
| $$ J\_{d5e}$$ | Jd5e | DRN's Glutamatergic neuronal excitatory coupling on DA neurons |
| $$ J\_{di}$$ | Jdi | VTA's GABAergic neuronal inhibitory coupling on DA neurons |
| $$ W\_{d5}$$ | wi3 | Connection weight from 5-HT in DRN to DA pop in VTA |
| $$ W\_{5e5}$$ | w5e1 | Connection weight from 5-HT neural pop to Glu pop in DRN, relative to 5-HT-to-DA connection |
| $$W\_{i5}$$ | wi1 | Connection weight from 5-HT in DRN to GABA pop in VTA |
| $$W\_{id}$$ | wi2 | Connection weight from DA in VTA to GABA pop in VTA |
| $$W\_{5i5}$$ | w5i1 | Connection weight from 5-HT to GABA pop in DRN, relative to 5-HT-to-DA |
| $$W\_{5id}$$ | w5i2 | Connection weight from DA in VTA to GABA in DRN, relative to DA-to-5-HT |
| $$J\_{self,Glu}$$ | w5ee | Self-inhibition of Glutamatergic population in DRN |
| $$J\_{self,GABA-DRN}$$ | w5ii | Self-inhibition of GABAergic population in DRN  |
| $$W\_{5ii}$$ | Jd5 | VTA's GABAergic neuronal inhibitory coupling on DRN's GABA |
| $$J\_{self,GABA-VTA}$$ | wii | Self-inhibition of GABAergic population in VTA |
| $$J\_{self, DA}$$ | wdd | Self-inhibition of DA population in VTA |
| $$J\_{self,5-HT}$$ | w55 | Self-inhibition of 5HT population in DRN |
| $$g\_{5-HT}$$ | g\_5 | Input-output function gain parameter for serotonin |
| $$I\_{5-HT}$$ | I5 | Total input current to 5-HT |
| $$I\_{0,5-HT}$$ | I\_05 | Threshold current for input-output function of 5-HT |
| $$F\_{5-HT}$$ | F5 | Threshold linear input-output function of 5-HT |
| $$F\_{DA}$$ | F | Threshold linear input-output function of DA |
| $$g\_{DA}$$ | g\_d | Input-output function gain parameter for DA |
| $$I\_{DA}$$ | I | Total input current to DA |
| $$I\_{0,DA}$$ | I\_0 | Threshold current for input-output function of DA |
| $$F\_{Glu}$$ | F5e | Threshold linear input-output function of Glu |
| $$g\_{Glu}$$ | g\_5e | Input-output function gain parameter for Glu |
| $$I\_{Glu}$$ | I5e | Total input current to Glu |
| $$I\_{0,Glu}$$ | I\_05e | Threshold current for input-output function of Glu |
| $$F\_{GABA-DRN}$$ | F5i | Threshold linear input-output function of GABA-DRN |
| $$g\_{GABA-DRN}$$ | g\_5i | Input-output function gain parameter for GABA-DRN |
| $$I\_{GABA-DRN}$$ | I5i | Total input current to GABA-DRN |
| $$I\_{0,GABA-DRN}$$ | I\_05i | Threshold current for input-output function of GABA-DRN |
| $$F\_{GABA-VTA}$$ | Fi | Threshold linear input-output function of GABA-VTA |
| $$g\_{GABA-VTA}$$ | g\_di | Input-output function gain parameter for GABA-VTA |
| $$I\_{GABA-VTA}$$ | Ii | Total input current to GABA-VTA |
| $$I\_{0,GABA-VTA}$$ | I\_0i | Threshold current for input-output function of GABA-VTA |
| $$I\_{DA,self}$$ | I\_ad | VTA's adaptive current in DA |
| $$I\_{DA,ext}$$ | I\_app | External excitatory input to DA |
| $$I\_{5-HT,self}$$ | I\_ad5 | DRN’s adaptive current in 5-HT |
| $$I\_{5-HT,ext}$$ | I\_app5 | External excitatory input to 5-HT |
| $$I\_{GABA-DRN, ext}$$ | I\_app5i | External excitatory input to GABA-DRN |
| $$I\_{Glu,ext}$$ | I\_appe | External excitatory input to Glu |
| $$I\_{GABA-VTA,ext}$$ | I\_appi | External excitatory input to GABA-VTA |
| $$τ\_{auto,5-HT}$$ | tau\_5\_auto | Time constant of 5-HT autoreceptor induced current |
| $$k\_{auto,5-HT}$$ | k\_a5 | Conversion factor from [5-HT] to 5-HT-induced current, fit to adjust 5-HT firing and [5-HT] baselines |
| $$\left[5-HT\right]$$ | s | concentration of 5-HT in DRN |
| $$τ\_{auto,DA}$$ |  | Time constant of DA autoreceptor induced current |
| $$k\_{auto,DA}$$ | k\_ad | Conversion factor from [DA] to DA-induced current, fit to baseline concentration  |
| $$\left[DA\right]$$ | d | concentration of DA in VTA |
| $$τ\_{DA,5-HT}$$ | tau\_d5 | Time constant in ms for 5-HT induced current on DA neurons  |
| $$k\_{DA,5-HT}$$ | Ad5 | Conversion from [5-HT] to 5-HT receptor induced current for DA neurons |
| $$I\_{DA,5-HT}$$ | Id5 | Current due to 5-HT receptors in DA |
| $$τ\_{5-HT,DA}$$ | tau\_5d | Time constant in ms for DA induced current on 5-HT neurons  |
| $$I\_{5-HT,DA}$$ | I5d | Current due to DA receptors in 5-HT |
| $$k\_{5-HT,DA}$$ | A5d | Conversion from [DA] to DA receptor induced current for 5-HT neurons |
| $$V\_{max,5-HT}$$ | Vmax5 | Maximal reuptake [5-HT] |
| $$[5-HT]\_{p}$$ | Cp5 | concentration release due to 5-HT neuronal firing rate |
| $$K\_{m,5-HT}$$ | Km5 | Half max reuptake [5-HT] microM (per litre) |
| $$[DA]\_{p}$$ | Cp | concentration release due to DA neuronal firing rate |
| $$V\_{max,DA}$$ | Vmax | Maximal reuptake [DA] |
| $$K\_{m,DA}$$ | Km | Half max reuptake [DA] microM (per litre) |