How to find and classify Dentate Spikes from LFP

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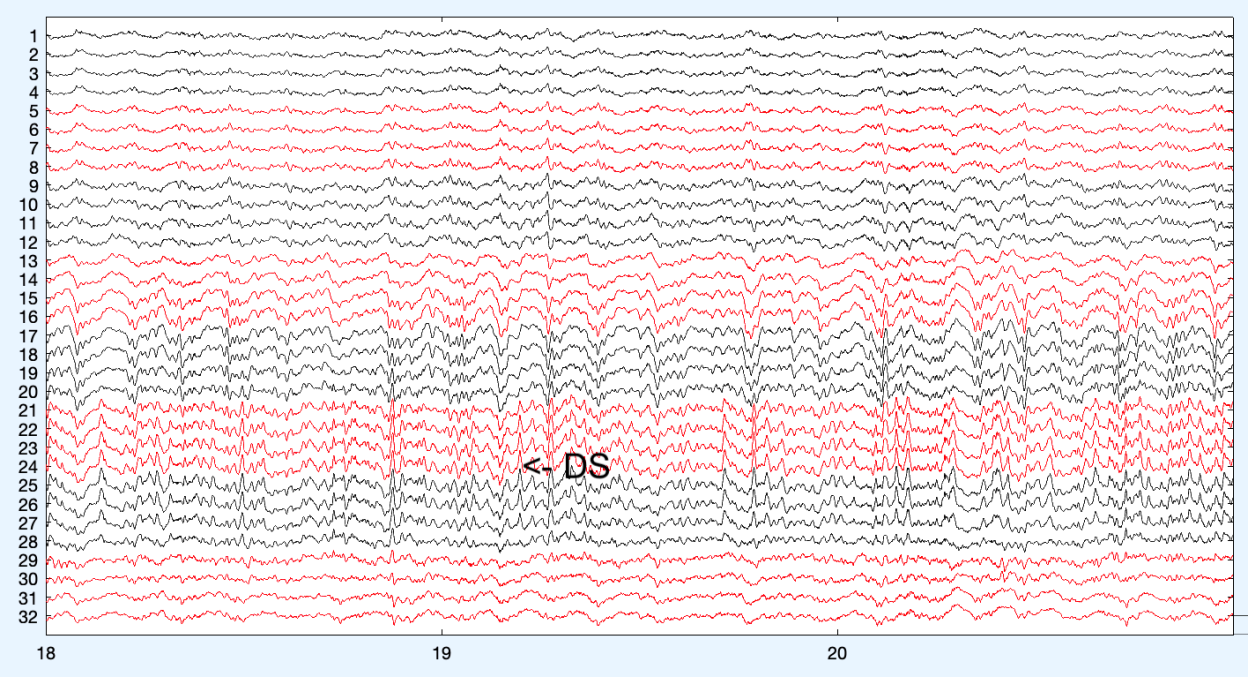
Algorithm requires linear silicon probe covering entire hippocampus. We used A1x32-6mm-50-703-CM32 by Neuronexus (6mm shank length, 50um inter-site distance, 703 um^2 site area, CM32 interface). Same results can be obtained with Neuropixels. We typically inserted probe at AP -1.85, ML 1.2, DV -2.3 relative to Bregma.

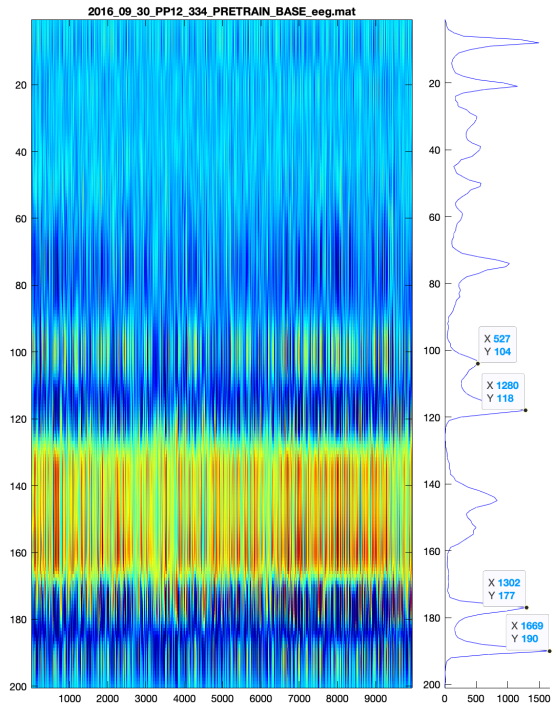
plotLFP.m - plots LFPs to find channel with strongest dentate spikes (in hilus of DG)
note channel of strongest DS amplitude = 24



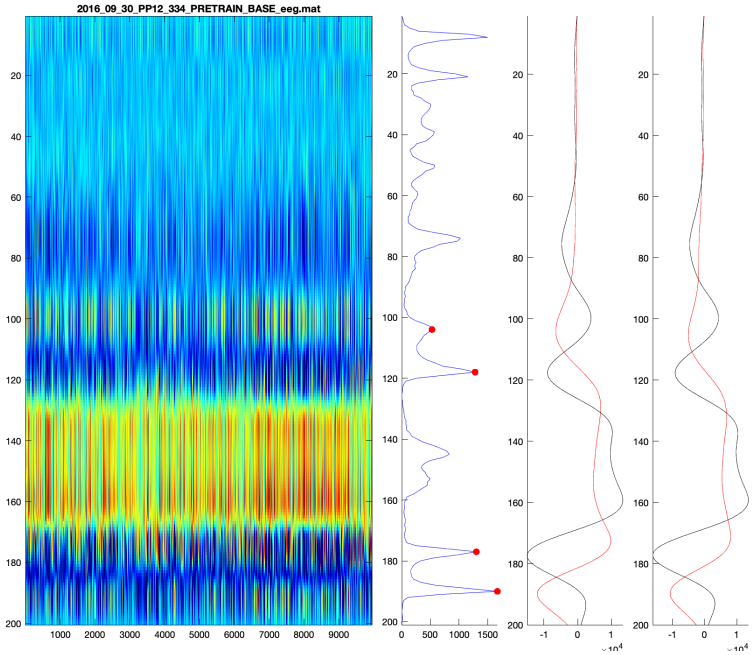
getDS.m - detects putative dentate spikes, extracts features and voltage profiles
saves output to DS folder

getDSCSD.m - computes CSDs of DS events, plots CSDs of all putative DS events (color=CSD)
saves output to DS_CSD folder
note depths (in arbitrary CSD values) of 4 sink bands as shown on the figure below, these mark outer and middle molecular layers of superior DG blade and middle and outer molecular layers of inferior DG blade.

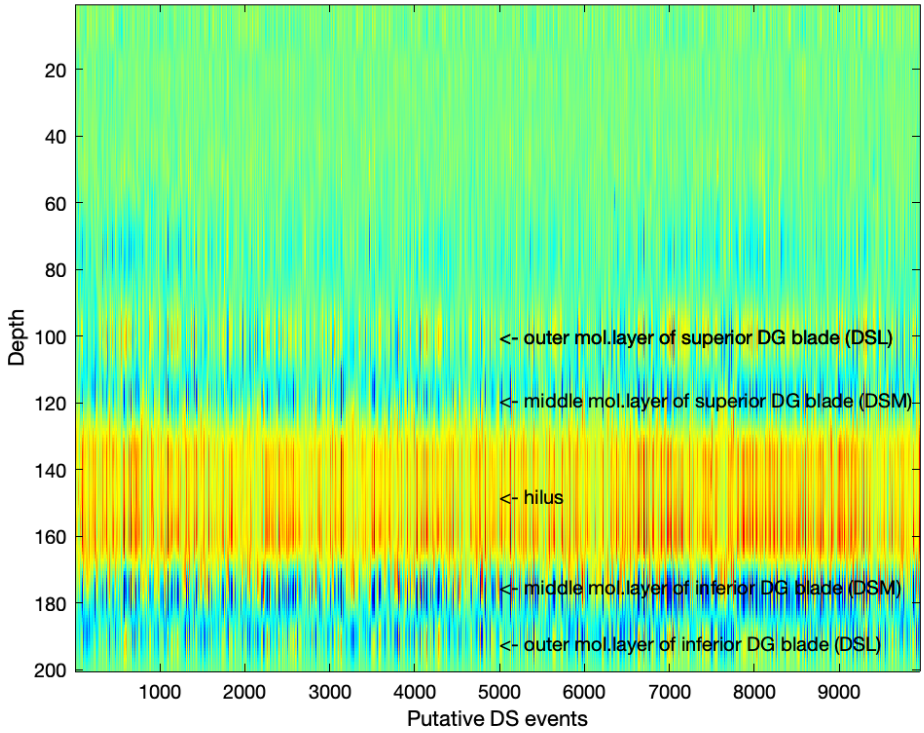
getDSsinks.m – allows plotting CSDs and picking up locations of molecular layers
for new files run first with sinks = nan(1,4), use mouse to locate local maxima in histograms of CSD minima



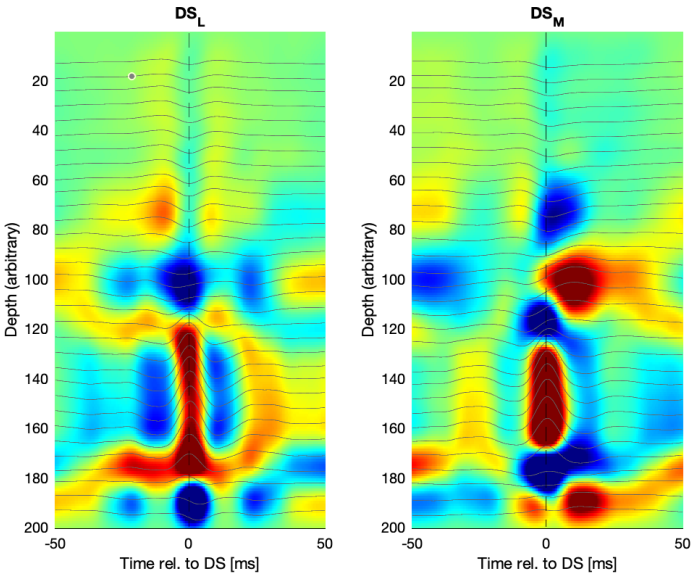
Now change sinks variable to selected local maxima and rerun
sinks = [104,118,177,190];
Script will show average DS CSDs when sinks from superior blade are used (104 for DS_L – red and 118 for DS_M – black; third panel) or when sinks from inferior blade are used (177 for DS_M – black and 190 for DS_L – red; fourth panel)



getDStypes.m - classify DS as DS_L and DS_M based on CSD
produces DS_TYPE12 with classified DS events



getDSCSDaver.m – computes average CSDs of DS_L and DS_M



Other functions:

getFIRbandpass.m - creates FIR filters with specs