1. Run\_cleanLidarProfiles.py – does a lot of removal/smoothing of weird data in profiles
   1. Lidar comes from IO\_alignedintime.pickle
   2. X-coordinate in separate file lidar\_xFRF.pickle
   3. Briefly uses lidar statistics from IO\_lidarquality.pickle and IO\_lidarhydro\_aligned.pickle
   4. Final acceptable profiles saved as cleanLidarProfiles.pickle; obj = [lidar\_xFRF,time\_fullspan,final\_profile\_fullspan\_best]
2. Run\_blendLidarBathy.py – combines best-available lidar and available bathy surveys and fills nans; blend between lidar and bathy overlap of 0.5m
   1. Lidar comes from cleanLidarProfiles.pickle
   2. Bathy comes from tidalAveragedMetrics.pickle
   3. Combined output saved to blendedLidarBathy.pickle; obj = [lidar\_xFRF, time\_fullspan, ZbFull\_addLidar]
3. Run\_prepDatasets.py – fills small gaps in bathy and hydro data (gaps remain in both); shifts profiles in x-shore (slightly) so they all start at x = 0, z = 6m
   1. Input topobathy comes from blendedLidarBathy.pickle
   2. Hydro timeseries come from IO\_alignedintime.pickle
   3. Final output saved as preppedHydroTopobathy.pickle; obj = [lidar\_xFRF, time\_fullspan, topobathy\_fullspan\_gapfilled, xplot\_shift, topobathy\_fullspan\_gapfilled\_shift]
4. Run\_PCAdecomp.py - isolates profiles with sufficient length and reasonable (< 5m^3) hrly volume change, then performs PCA on isolated profiles
   1. Input topobathy comes from preppedHydroTopobathy.pickle
   2. Final output saved as PCAoutput.pickle; obj = [xplot, time\_fullspan, dataNorm\_fullspan, dataMean,dataStd,PCs\_fullspan,EOFs,APEV]
5. Run\_LSTMpcaprofiles – develops and tests LSTM model for profiles derived from PCA-decomposition; includes routines for filtering to remove large changes in PC amplitudes; performs scaling of parameters before creating LSTM model; includes code for testing time-series prediction based on previous prediction but seeded with data
   1. Input hydrodynamic predictors come from preppedHydroTopobathy.pickle
   2. Input/output PC amplitudes for testing/training come from PCs\_fullspan.pickle
6. Run\_PCA\_ExtendedDatasets\_V2.py
   1. Performs PCA
   2. Creates shifted elevations, non-shifted elevations, PCs, and hydro datasets as full-span (t = 0:10yrs) so length of ML input data can be varies
   3. Checks that dVol between time steps is small
   4. Saves datasets to topobathyhydro\_ML\_final\_25Mar2025\_Nlook60\_PCApostDVol\_shifted.pickle
7. Run\_ML\_multivariate\_variableNLook.py