

Technical Note: Analysis of concentration-discharge hysteresis loops using Self-Organizing Maps

Supplementary Information

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S1. Curated dataset

We present details on the USGS monitoring sites where events and hysteresis loops were extracted to compile the curated
10 dataset (Table S1), along with the complete set of loops used to train the T-Q SOM (Fig. S1).

Table S1. USGS gages used to compile turbidity-discharge hysteresis loops for the curated dataset, including the number of extracted events and the corresponding time period.

USGS station code	Number of events	Data Period (UTC)	
		start	end
0165389205	34	2011/12/27 15:07	2014/12/24 12:21
01481500	30	2018/2/4 12:30	2019/5/11 1:00
01581752	22	2019/12/14 2:40	2021/2/17 14:50
01585075	21	2020/3/19 1:59	2022/10/5 4:15
0164579522	21	2021/5/26 19:48	2022/11/17 17:28
01208873	18	2020/2/13 4:30	2021/7/2 6:45
02336410	18	2007/10/9 19:18	2021/6/21 23:38
01196500	16	2013/11/26 16:45	2020/3/1 0:00
01651800	16	2020/1/25 3:18	2020/11/30 15:01
0204309906	14	2015/7/11 17:48	2023/7/15 22:55
01654107	13	2022/2/25 1:00	2023/9/24 21:06
01191000	12	2016/6/4 8:08	2017/4/12 10:34
07075250	12	2009/7/21 9:56	2016/8/12 1:37
01649190	10	2020/3/13 4:03	2022/7/14 0:41
0166818623	9	2014/5/15 18:15	2016/5/19 17:18

0205551460	9	2017/1/3 5:15	2019/10/21 3:38
02423160	9	2018/6/23 11:01	2021/9/1 15:09
01201487	8	2014/10/4 9:02	2022/9/9 19:39
0205551614	7	2020/12/4 19:04	2023/7/20 2:23
02336526	7	2007/10/24 6:45	2010/1/17 19:18
08048000	6	2011/12/19 19:07	2013/5/18 0:15
02301500	5	2018/6/24 11:08	2023/9/7 18:08
0344878100	4	2019/9/13 18:35	2020/8/13 19:26
03260015	3	2009/4/5 23:00	2009/8/5 16:45
02327033	2	2017/2/21 21:59	2017/4/17 3:33
02423586	2	2018/11/14 18:00	2020/6/30 19:24
07048550	2	2016/6/24 0:48	2019/1/8 10:41
02423571	1	2019/8/27 7:11	2019/8/28 10:51
03277075	1	2013/1/11 9:17	2013/1/12 4:19
03451500	1	2023/4/27 16:30	2023/5/1 18:45
05406500	1	2013/3/30 17:53	2013/3/31 16:11
07075270	1	2020/9/2 10:08	2020/9/3 15:03
071948095	1	2015/11/5 22:15	2015/11/6 17:15
07194933	1	2019/4/25 14:12	2019/4/26 6:15
08188060	1	2015/1/24 1:18	2015/1/28 3:33
14211010	1	2016/10/20 22:32	2016/10/24 10:44
14317600	1	2022/11/6 20:01	2022/11/9 13:36

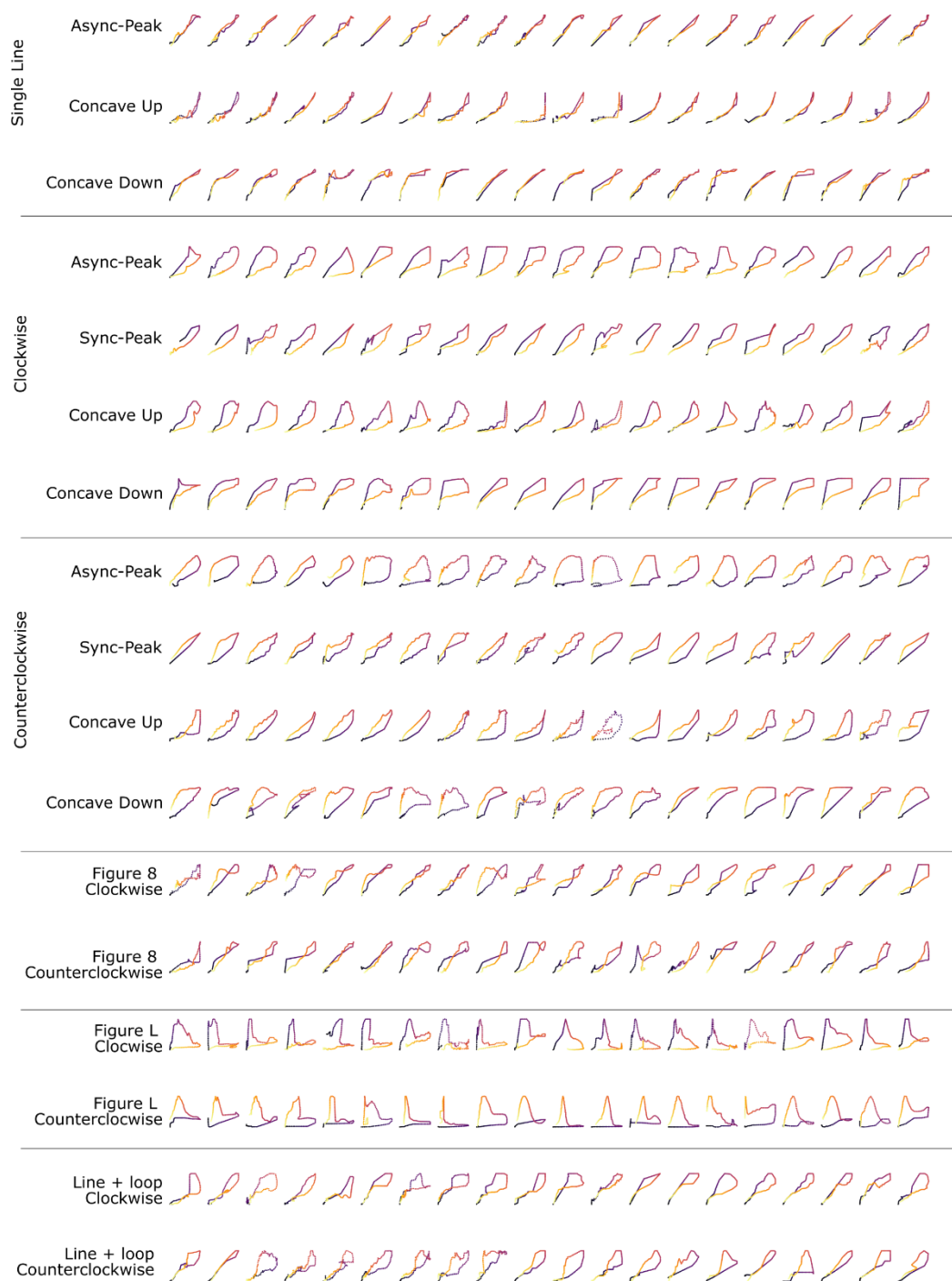


Figure S1. Curated dataset for T-Q hysteresis analysis

S2. Loop visualization

Fig. S2 Displays the curated dataset arranged according to the prototype distribution of the trained SOM. This visualization serves as a useful tool for exploring loops within the dataset, as its structure aids in identifying anomalous patterns. Since loops within each rectangle are expected to exhibit similar characteristics, deviations from these patterns become more apparent.

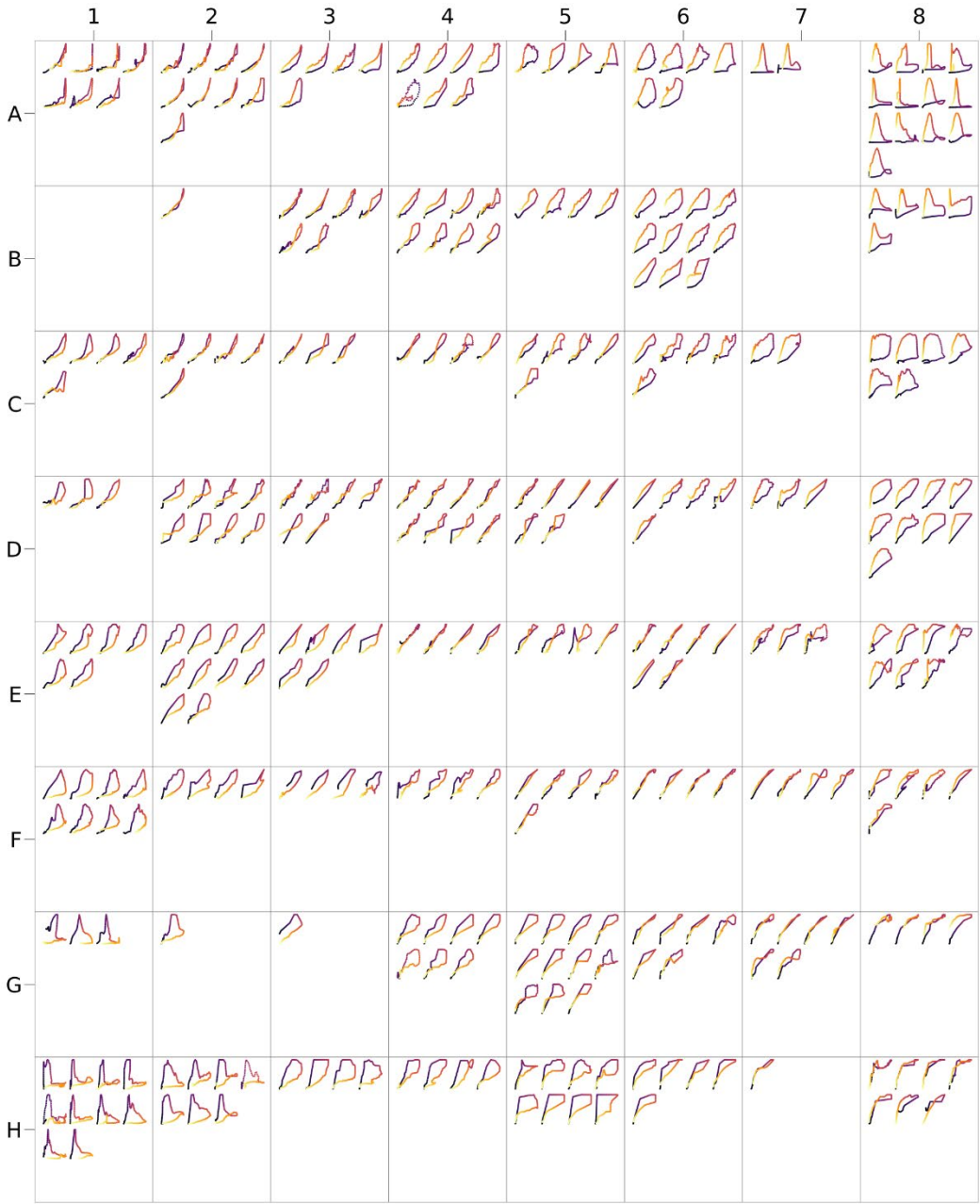


Figure S2. Hysteresis loops used to train the General T-Q SOM, arranged according to the prototype distribution of the
25 trained SOM (Fig. 7 in the main manuscript). This figure illustrates the structured visualization approach leveraged by the
General T-Q SOM. Since loops within each rectangle are expected to share similar characteristics, this visualization helps
identify loop shapes that deviate from the trained SOM.