

# Topological signal generation

- TSB-based models vs. SB-based models
- Generative modeling

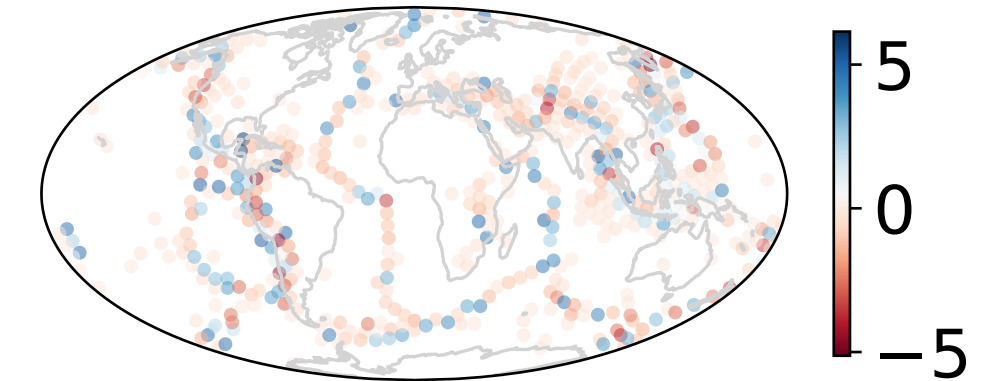
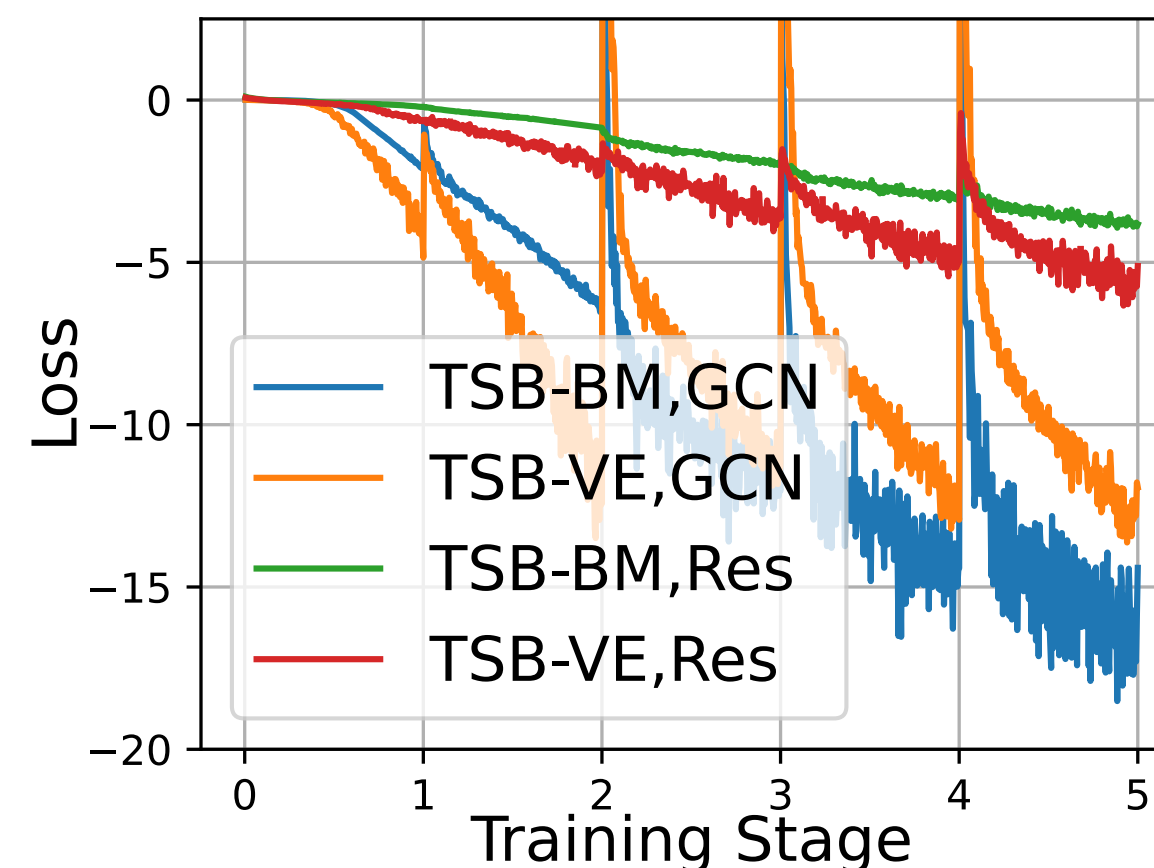


Table 1: Generative modeling results (NLL).

	SB-BM	SB-VE	SB-VP	TSB-BM	TSB-VE	TSB-VP
Seismic, Res	$2.78 \pm 0.01$	$2.94 \pm 0.03$	$2.28 \pm 0.02$	$2.13 \pm 0.01$	$2.22 \pm 0.02$	$2.00 \pm 0.02$
Seismic, GCN	$2.71 \pm 0.03$	$2.73 \pm 0.05$	$2.01 \pm 0.03$	$1.82 \pm 0.02$	$1.53 \pm 0.03$	$1.51 \pm 0.02$
Traffic, Res	$0.82 \pm 0.00$	$0.77 \pm 0.00$	$0.79 \pm 0.00$	$0.40 \pm 0.00$	$0.01 \pm 0.00$	$0.02 \pm 0.00$
Traffic, SNN	$0.18 \pm 0.02$	$-0.42 \pm 0.01$	$-0.09 \pm 0.01$	$-0.83 \pm 0.05$	$-1.26 \pm 0.05$	$-1.01 \pm 0.03$

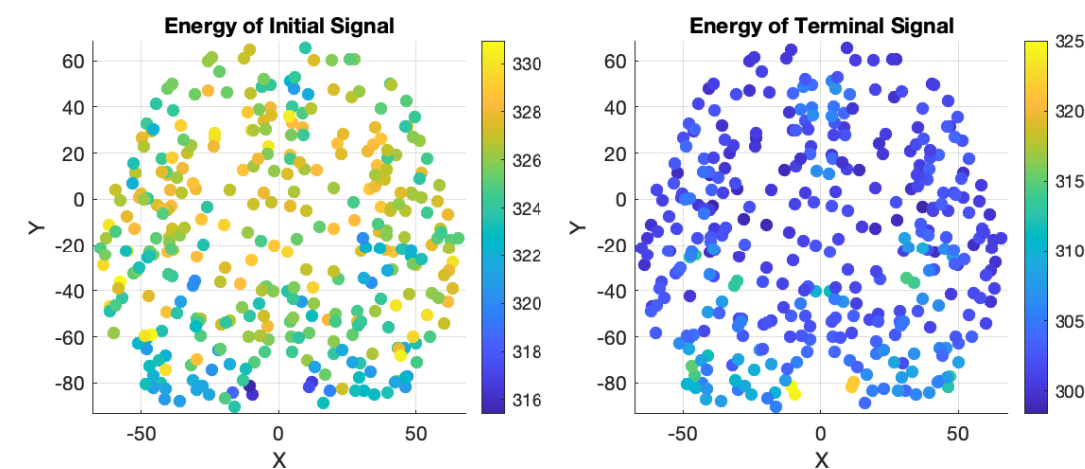
- Effect of policy models
  - ResBlock vs. topological NNs



Method	Seismic magnitudes		Traffic flows	
	$W_1$	$W_2$	$W_1$	$W_2$
SB-BM	$11.73 \pm 0.05$	$8.29 \pm 0.04$	$18.69 \pm 0.02$	$13.36 \pm 0.01$
SB-VE	$11.49 \pm 0.04$	$8.13 \pm 0.03$	$19.04 \pm 0.02$	$13.61 \pm 0.02$
SB-VP	$12.61 \pm 0.06$	$8.92 \pm 0.04$	$18.22 \pm 0.03$	$13.02 \pm 0.02$
TSB-BM	$9.01 \pm 0.03$	$6.37 \pm 0.03$	$10.57 \pm 0.02$	$7.62 \pm 0.01$
TSB-VE	$7.69 \pm 0.04$	$5.44 \pm 0.03$	$10.51 \pm 0.02$	$7.58 \pm 0.01$
TSB-VP	$8.40 \pm 0.04$	$5.95 \pm 0.03$	$9.92 \pm 0.02$	$7.16 \pm 0.01$

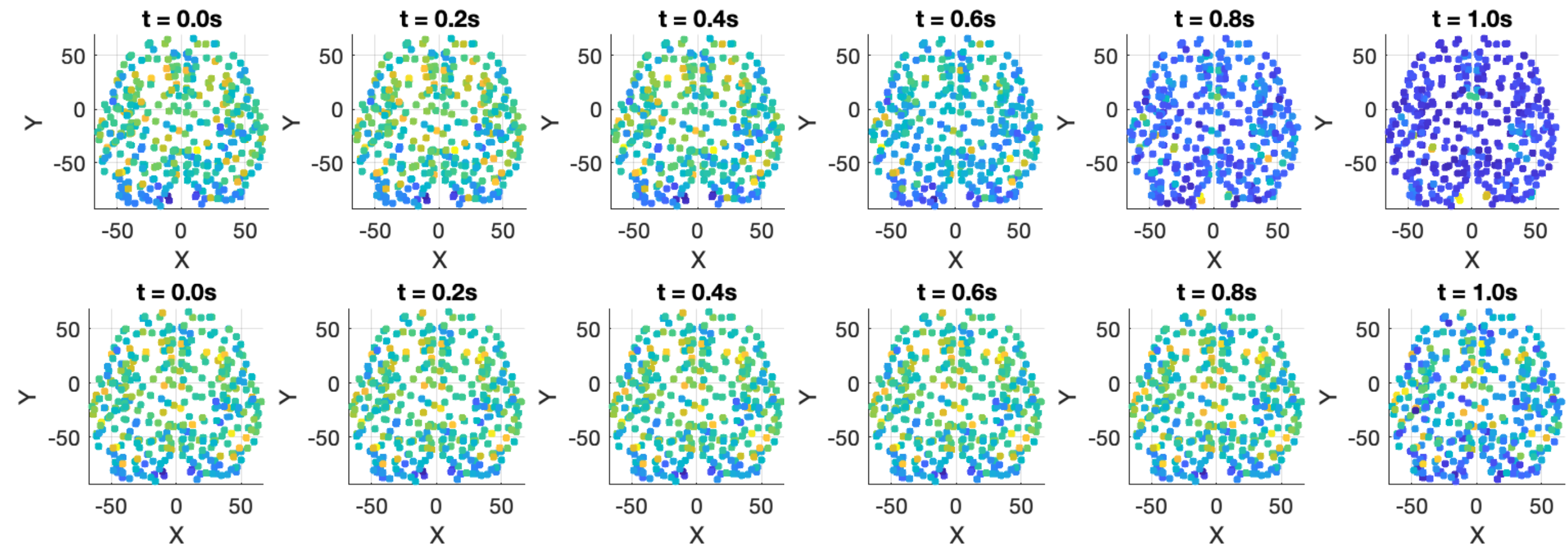
# Topological signal matching

- Brain fMRI signals



liberal

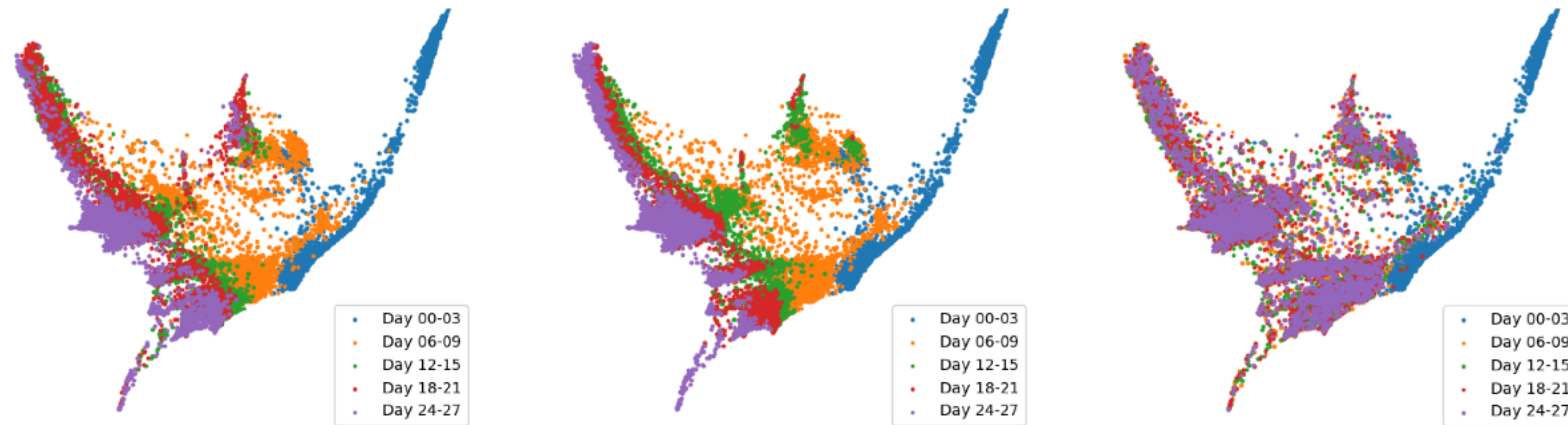
aligned



TSB-VE

SB-VE

- Single-cell dynamics [Moon 2019, Tong 2023, 2024]



Groundtruth

TSB-BM

SB-BM