

CliffCast Model Input Tensor Architecture

Transect Data (Spatio-Temporal Geometry)

(B, T, N, 12) where T≈10 epochs, N=128 points

- distance_m: From cliff toe
- elevation_m: Height MSL
- slope_deg: Local slope
- curvature: Profile curvature
- roughness: Surface texture
- intensity: LiDAR return
- red, green, blue: Color
- classification: Point type
- return_number: Echo #
- num_returns: Total echoes

Metadata (Broadcasted to all points)

(B, T, 12)

- cliff_height_m: Total height
- mean_slope_deg: Avg slope
- max_slope_deg: Max slope
- toe_elevation_m: Base elev
- top_elevation_m: Top elev
- orientation_deg: Azimuth
- transect_length_m: Length
- latitude: Lat coord
- longitude: Lon coord
- transect_id: MOP ID
- mean_intensity: Avg LiDAR
- dominant_class: Main type

Wave Data (Nearshore Forcing)

(B, T_w, n_features) where T_w=360, n_features∈{4,6}

Temporal Alignment:
 • Transect T: Multi-epoch
 • Wave T_w: 90d @ 6hr
 • Atmos T_a: 90d @ daily

Batch size

T: LiDAR epochs (~10)

N: Points (128)

- Basic (n=4):
- hs: Wave height (m)
 - tp: Peak period (s)
 - dp: Direction (°N)
 - power: Flux (kW/m)
 - shore_normal: Impact
 - runup_2pct: Runup (m)
- Config:
- 90d lookback
 - 6hr sampling
 - T_w = 360 steps
- Derived (n=6):

Atmospheric Data (Climate Forcing)

(B, T_a, 24) where T_a=90 days

- Precip:
- precip_mm
 - cumulative
 - intensity
 - api_7d, 30d
 - max_1d, 3d
- Temp:
- temp_mean
 - temp_min
 - temp_max
 - freeze_thaw
 - eto
 - wet_days_7d
 - dry_days_7d
- wet_dry_cycles
- Derived:
- vpd
 - gdd
 - (24 total)

Data Sources:
 • Transects: LiDAR (2017-2025, annual)
 • Waves: CDIP MOP (100m, hourly)
 • Atmospheric: PRISM (daily, 4km)

B = Batch size (typically 32)
 All inputs aligned by transect ID and scan date