

DRONE CONFLICT ANALYSIS SUMMARY

=====COMPREHENSIVE ANALYSIS SUMMARY=====

Report Generated: 2026-02-08 16:41:17

Analysis Type: Multi-threaded Parallel Processing

MISSION STATISTICS:

- Total Drones Analyzed: 50
- Trajectory Segments: 100,000
- Safety Radius: 10.0 meters
- Parallel Workers: 8

CONFLICT DETECTION RESULTS:

- Status: ⚠️ CONFLICTS DETECTED
- Total Conflicts Found: 850

SEVERITY BREAKDOWN:

- Critical Conflicts: 112
- High Severity: 80
- Medium Severity: 271
- Low Severity: 387

CONFLICT TIMING:

- Earliest Conflict: 36.4s
- Latest Conflict: 151.3s
- Average Time: 96.0s

SEPARATION DISTANCES:

- Minimum Distance: 0.00m
- Maximum Distance: 19.99m
- Average Distance: 9.63m

PERFORMANCE METRICS:

- Total Analysis Time: 100063.31s
- Data Loading: 1.09s
- Spatial Indexing: 1.96s
- Conflict Detection: 2.27s
- Segments per Second: 1

GENERATED OUTPUTS:

1. drone_conflict_analysis_report.pdf (This document)
2. detailed_analysis.json (Complete conflict data)
3. Interactive 4D OpenGL visualization

ALGORITHMS & OPTIMIZATIONS:

- 4D Continuous Closest Point of Approach (CPA)
- Octree spatial indexing for $O(\log n)$ queries
- Multi-process parallel conflict detection
- AABB culling for early rejection
- JIT compilation: ✓ Enabled (Numba)

□ RISK ASSESSMENT: HIGH RISK

192 critical/high severity conflicts detected

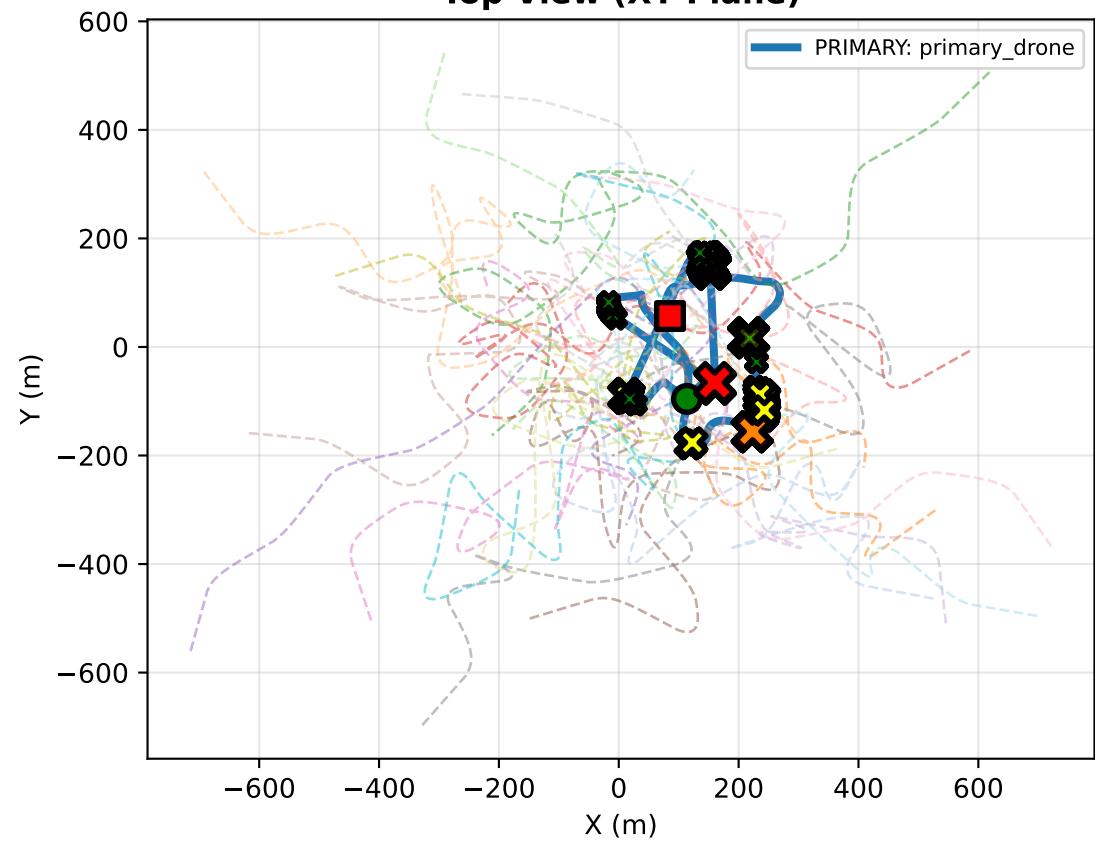
⚠️ MISSION REPLANNING REQUIRED

Recommend immediate trajectory adjustment

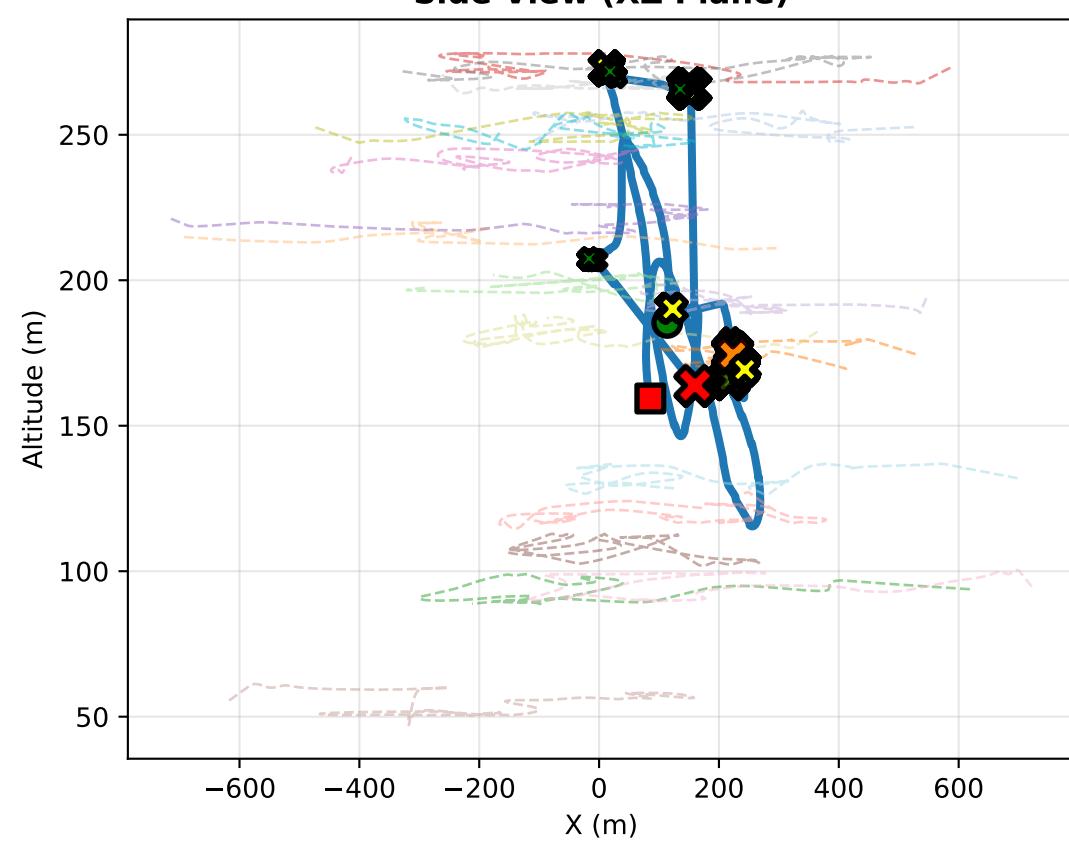
=====COMPREHENSIVE ANALYSIS SUMMARY=====

2D TRAJECTORY ANALYSIS

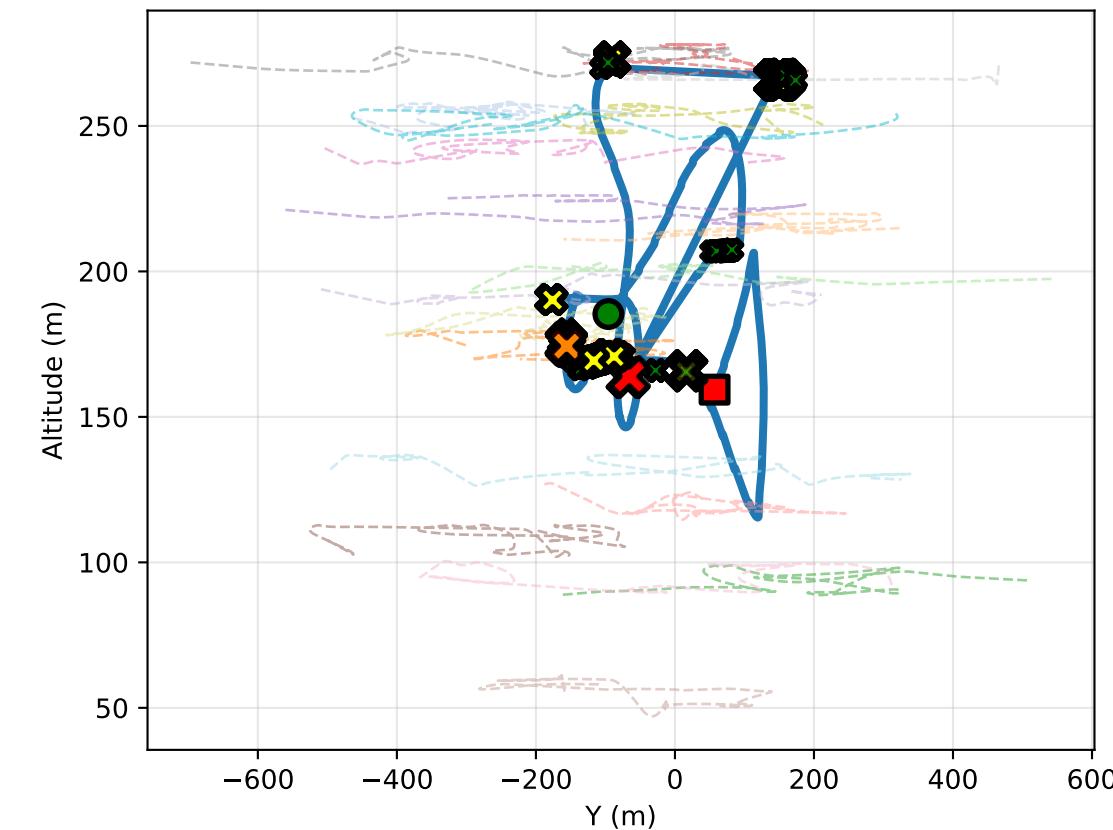
Top View (XY Plane)



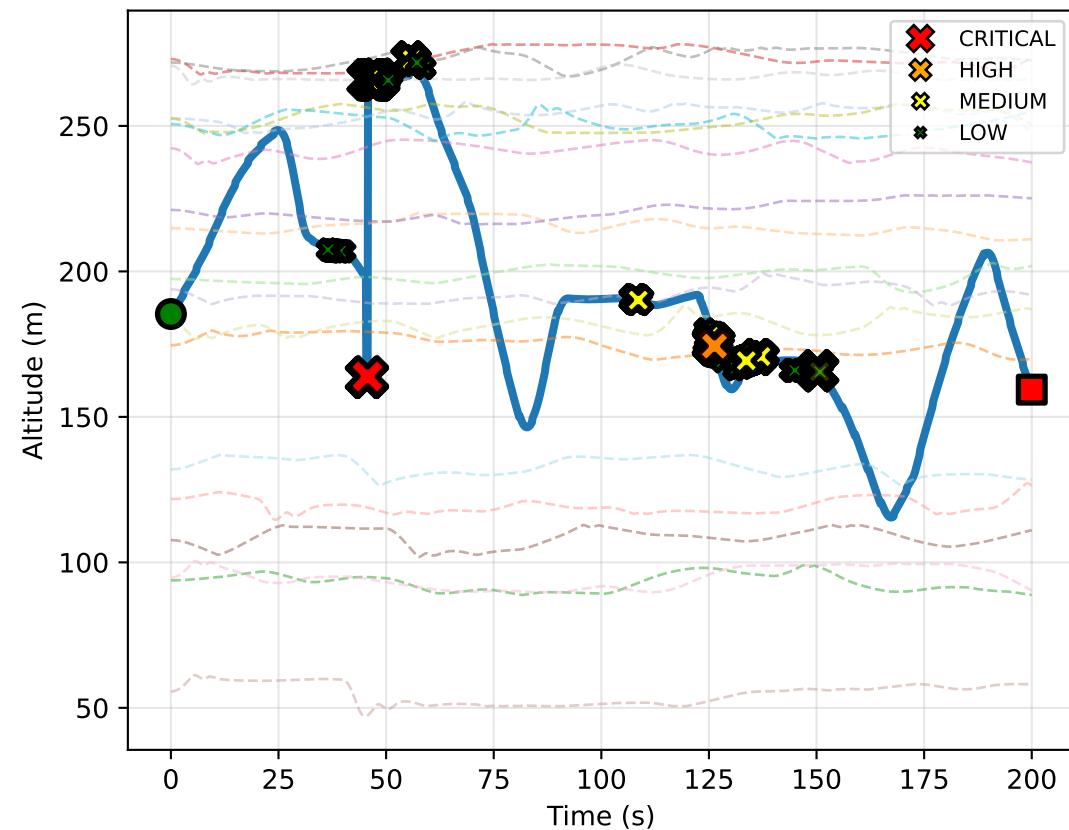
Side View (XZ Plane)



Front View (YZ Plane)

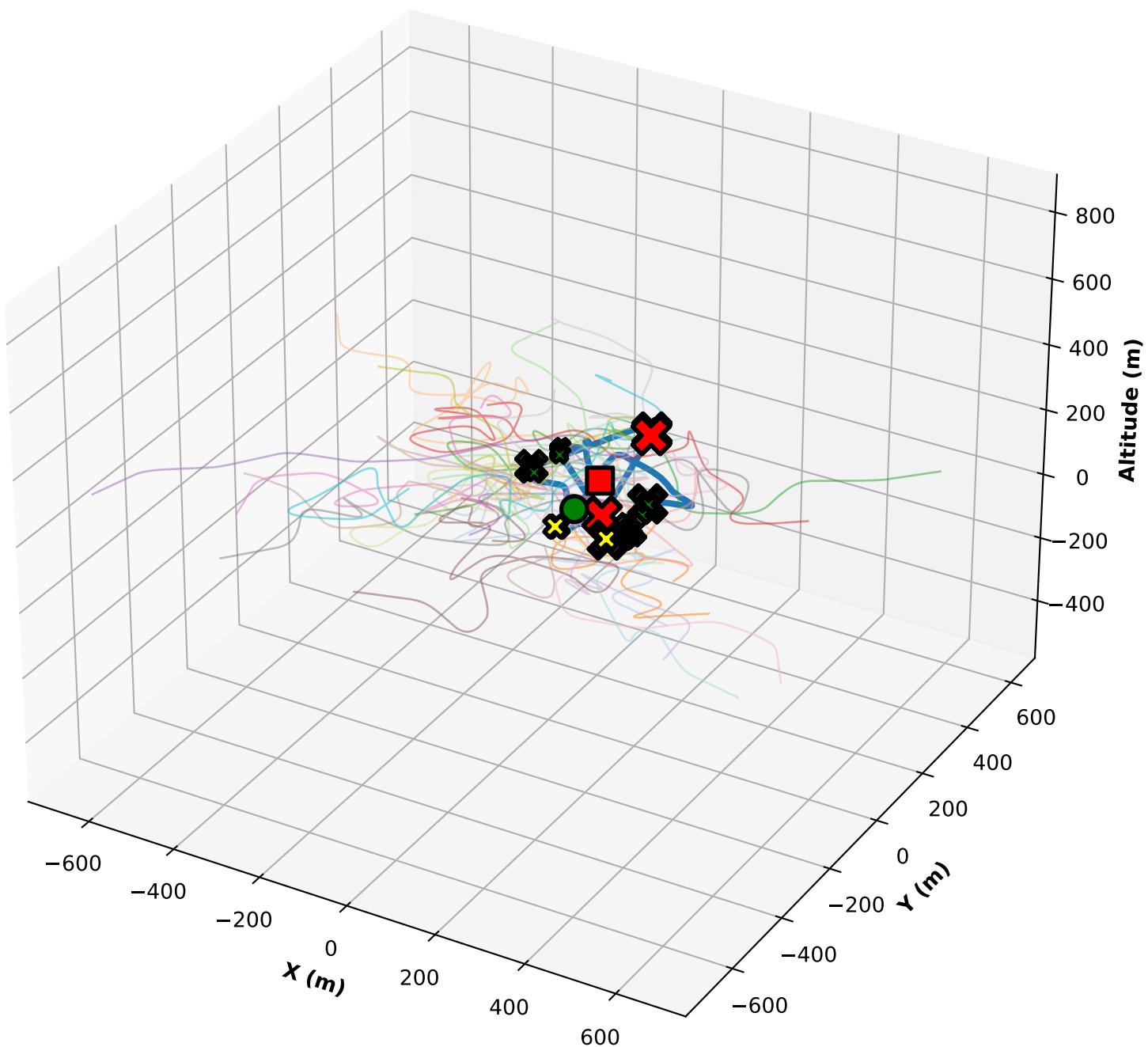


Time-Altitude Profile



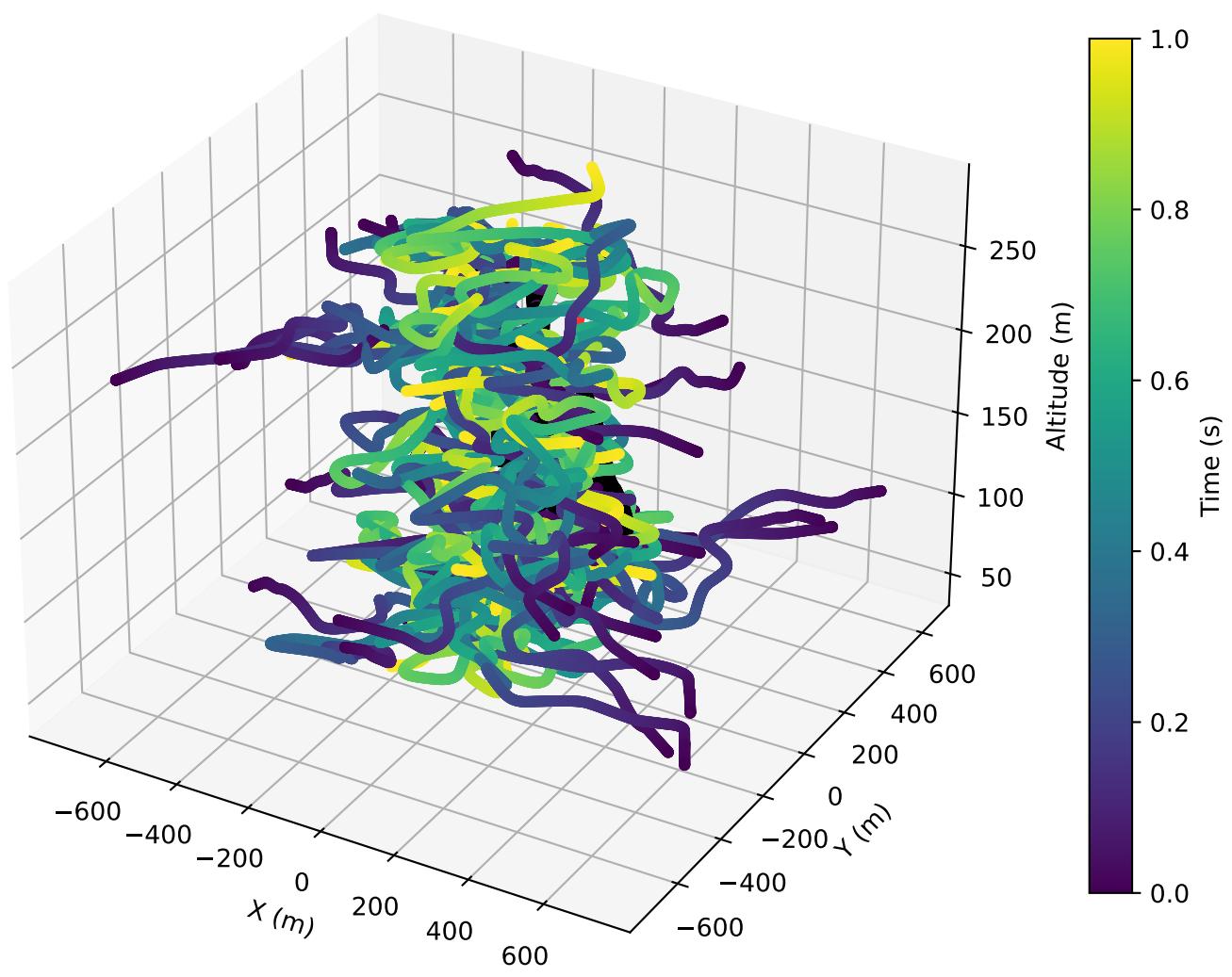
3D TRAJECTORY VISUALIZATION

PRIMARY: primary_drone

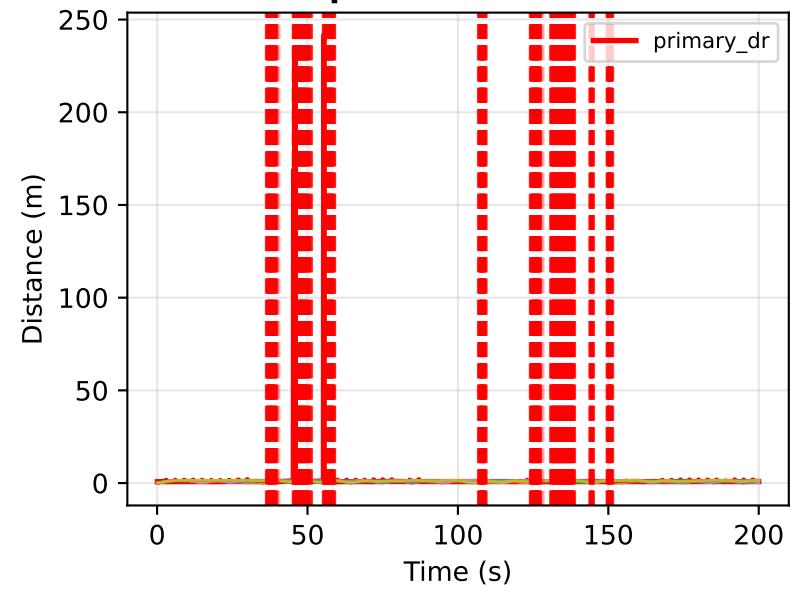


4D SPATIO-TEMPORAL ANALYSIS

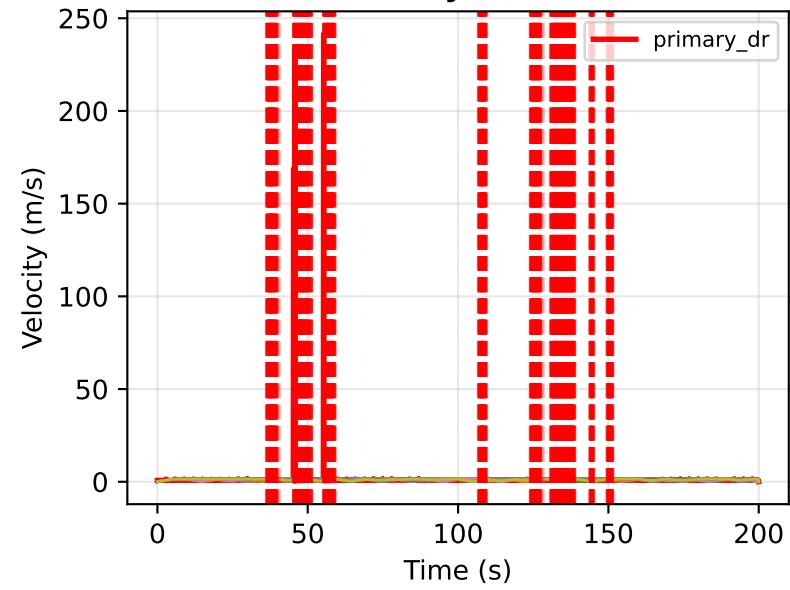
3D Trajectories (Time Gradient)



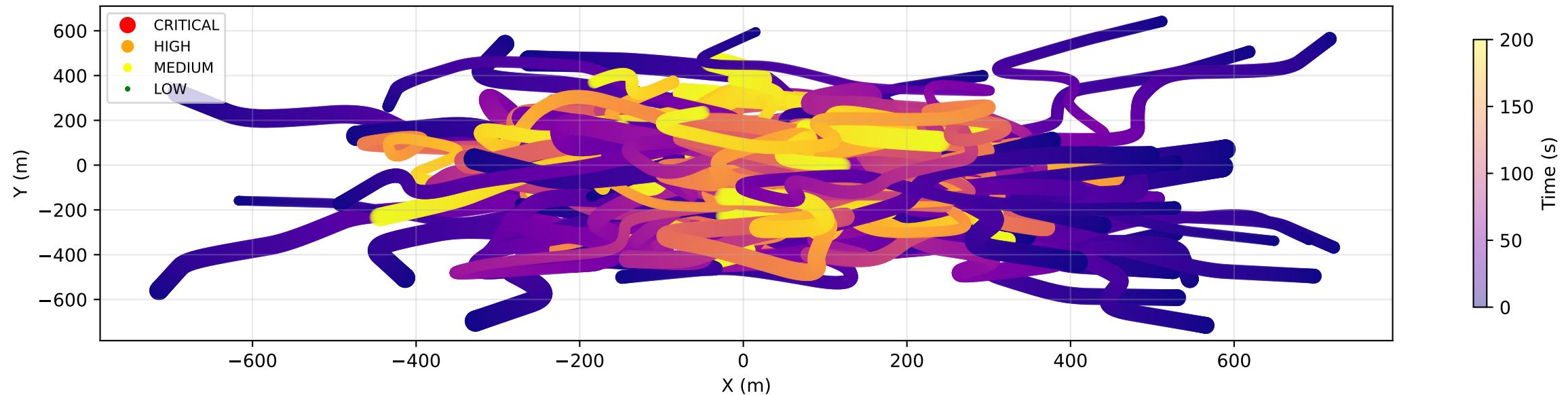
Separation vs Time



Velocity Profile

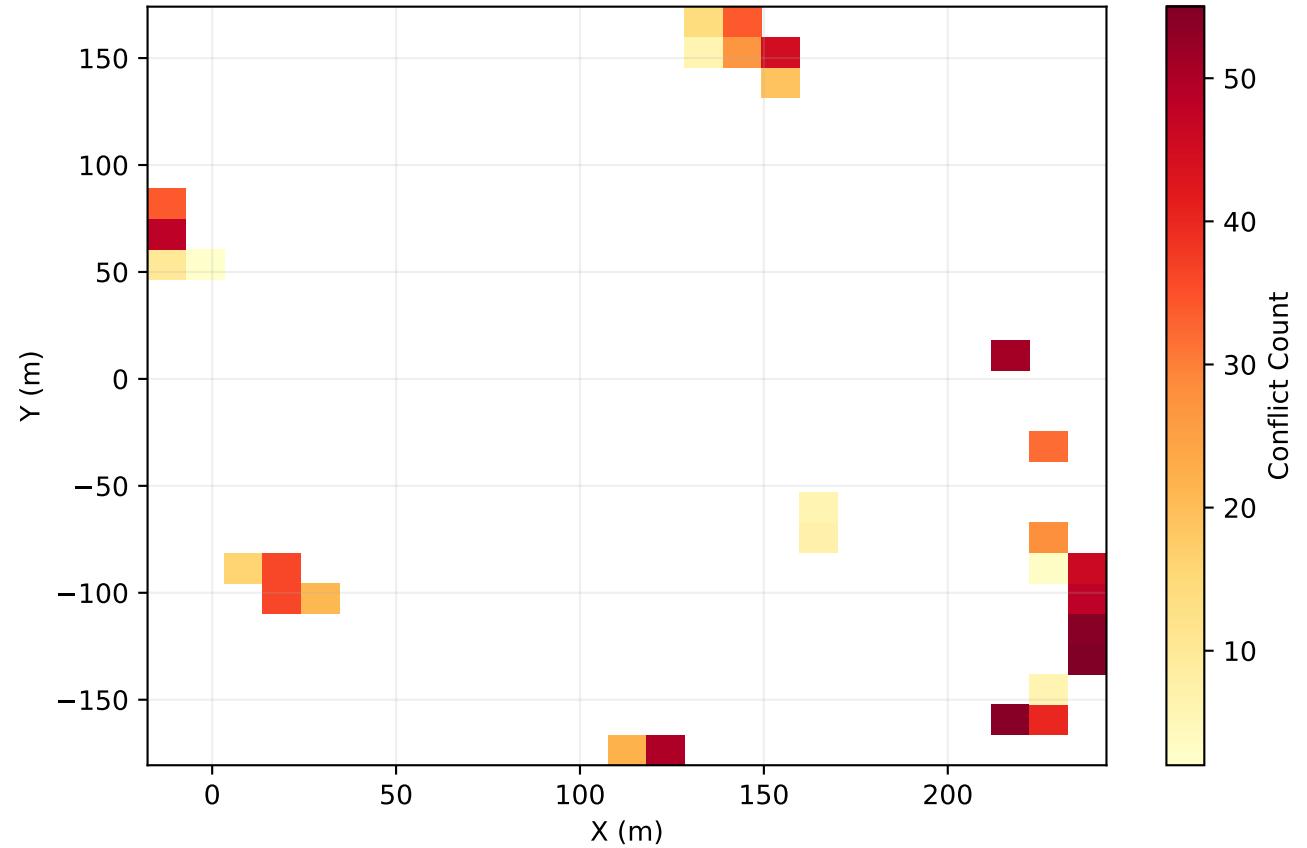


4D Projection (XY with Time & Altitude)

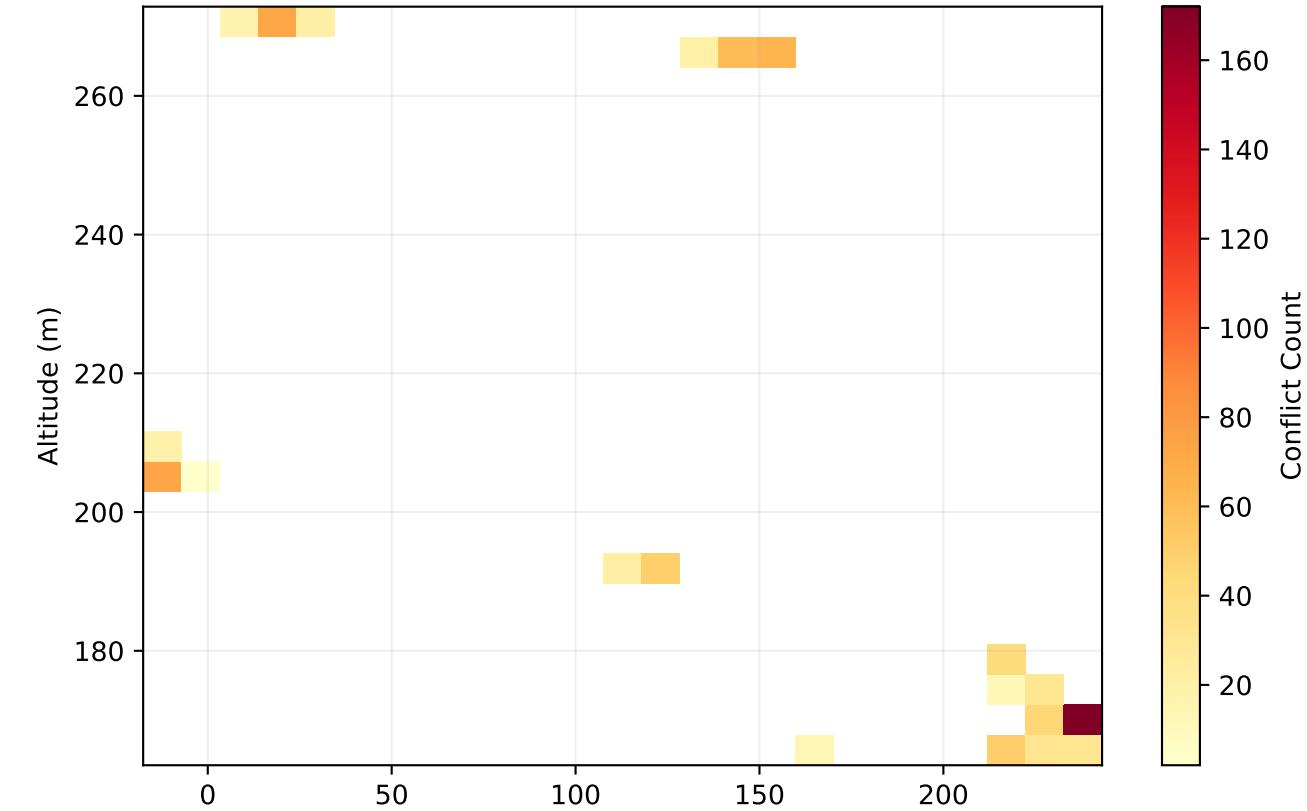


CONFLICT DENSITY ANALYSIS

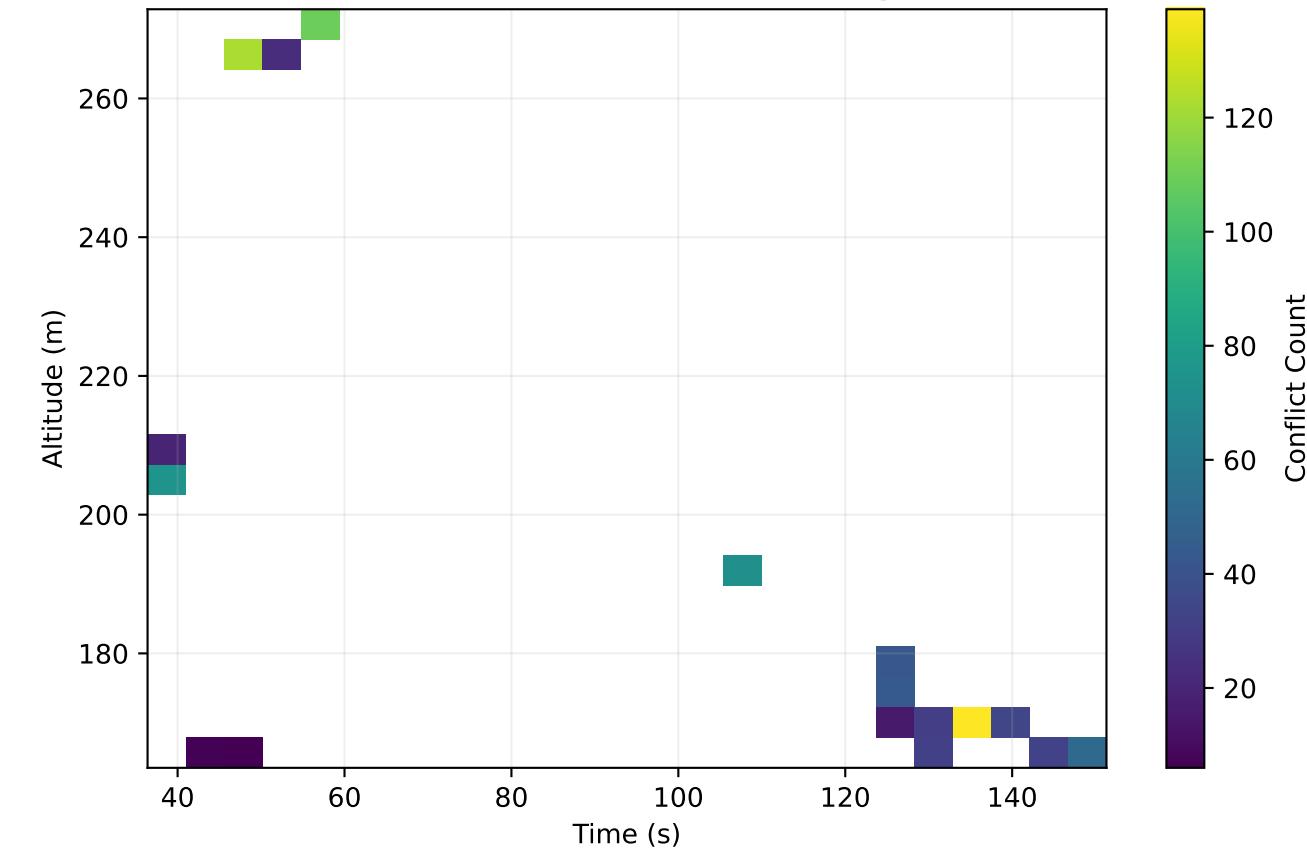
XY Plane Conflict Density



XZ Plane Conflict Density



Time-Altitude Conflict Density



Conflict Severity Distribution

