

# DRONE CONFLICT ANALYSIS SUMMARY

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

Report Generated: 2026-02-08 14:54:55

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: 83

### SEVERITY BREAKDOWN:

- Critical Conflicts: 7
- High Severity: 6
- Medium Severity: 12
- Low Severity: 58

### CONFLICT TIMING:

- Earliest Conflict: 164.7s
- Latest Conflict: 168.1s
- Average Time: 166.5s

### SEPARATION DISTANCES:

- Minimum Distance: 0.00m
- Maximum Distance: 19.78m
- Average Distance: 12.00m

### PERFORMANCE METRICS:

- Total Analysis Time: 100352.07s
- Data Loading: 1.52s
- Spatial Indexing: 3.32s
- Conflict Detection: 289.22s
- 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

13 critical/high severity conflicts detected

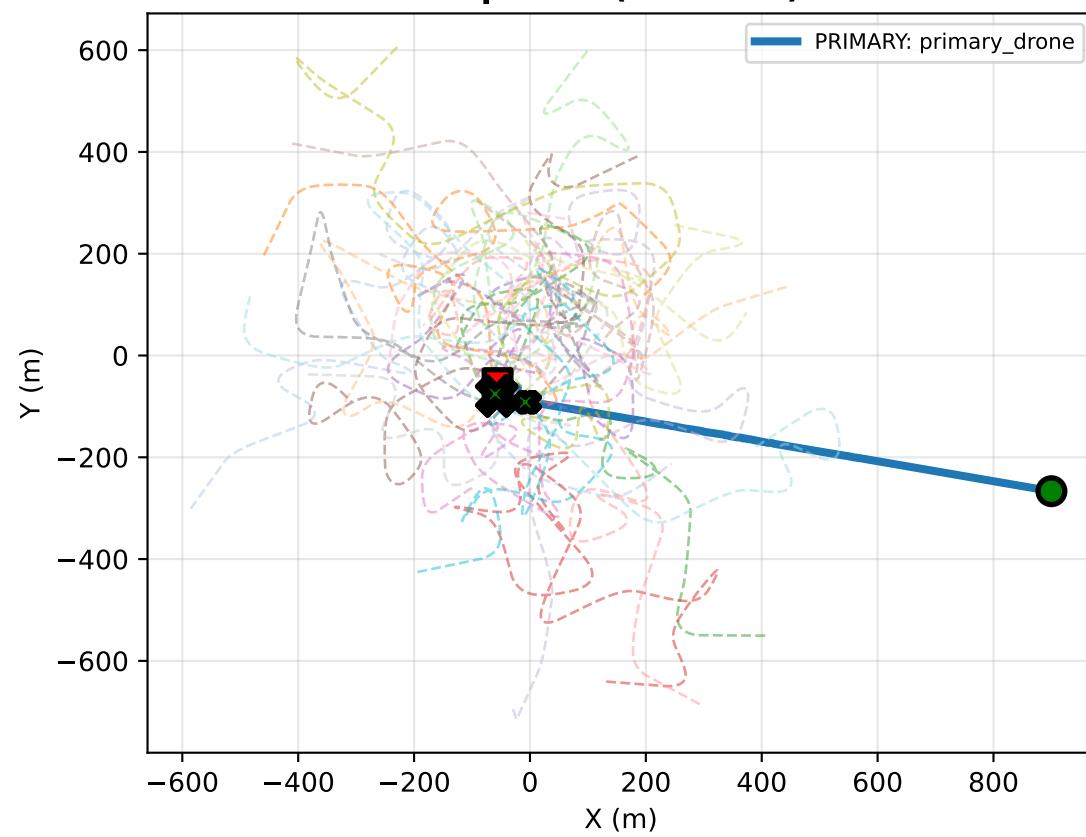
### ⚠️ MISSION REPLANNING REQUIRED

Recommend immediate trajectory adjustment

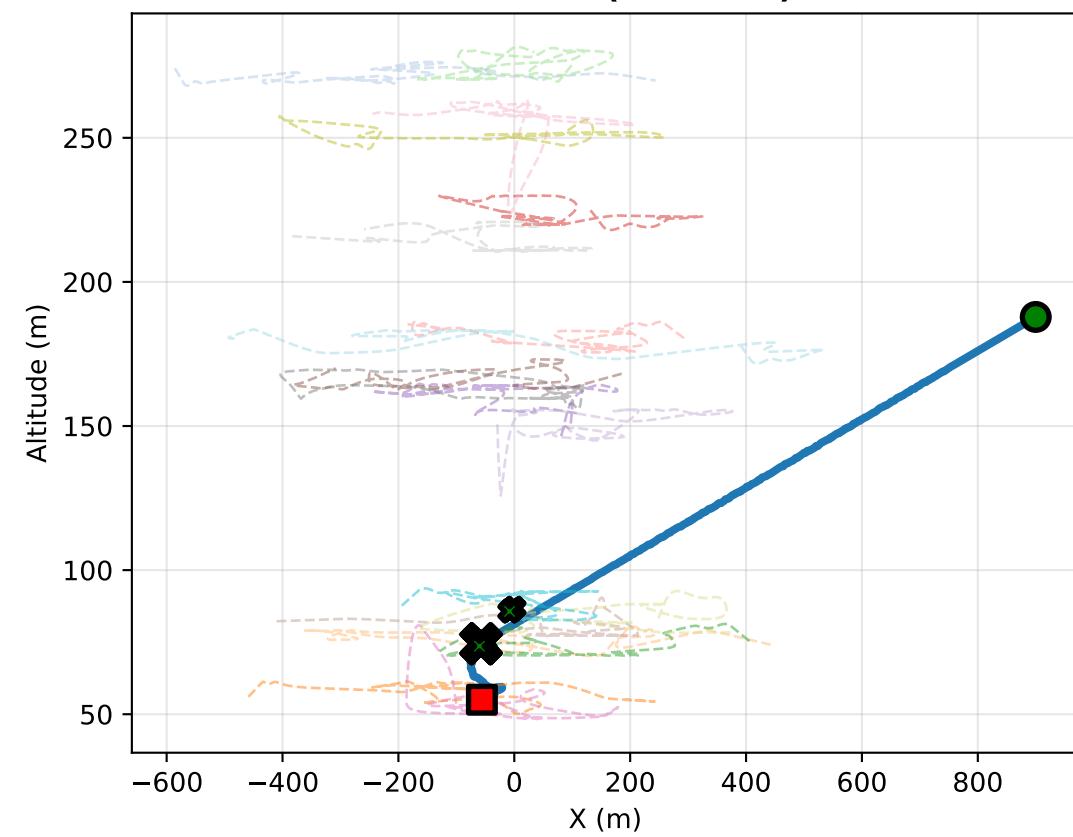
## =====COMPREHENSIVE ANALYSIS SUMMARY=====

# 2D TRAJECTORY ANALYSIS

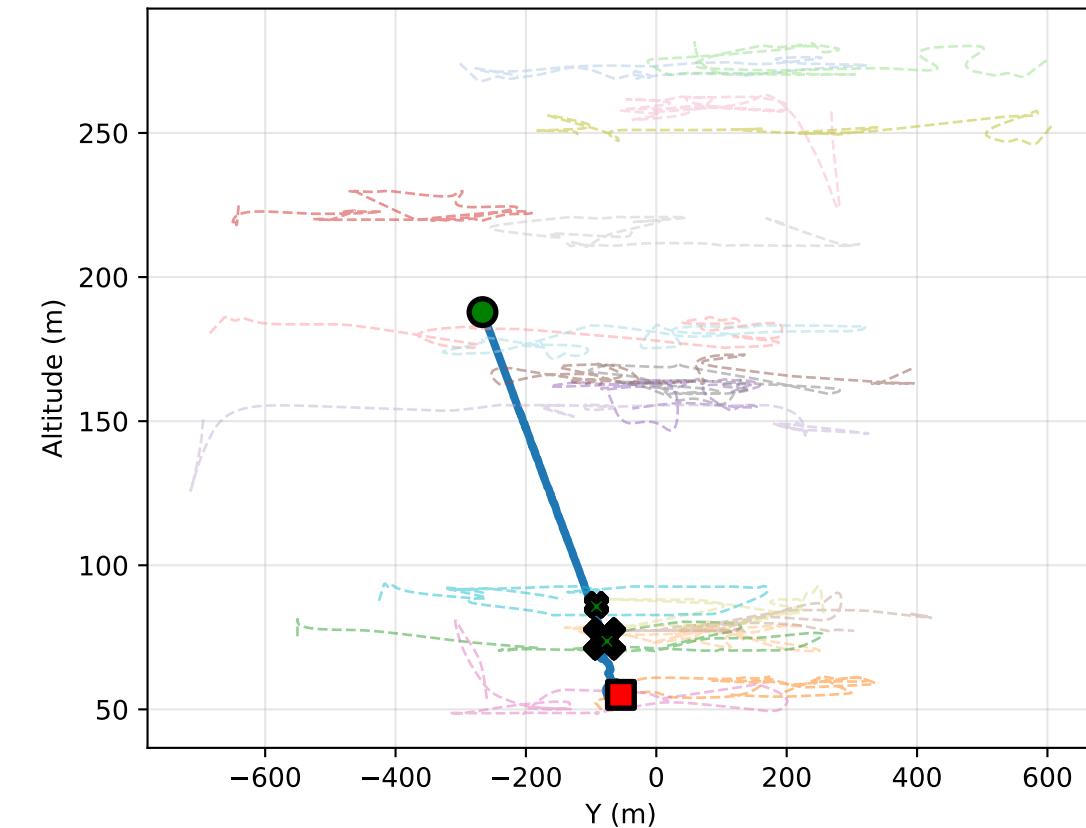
## Top View (XY Plane)



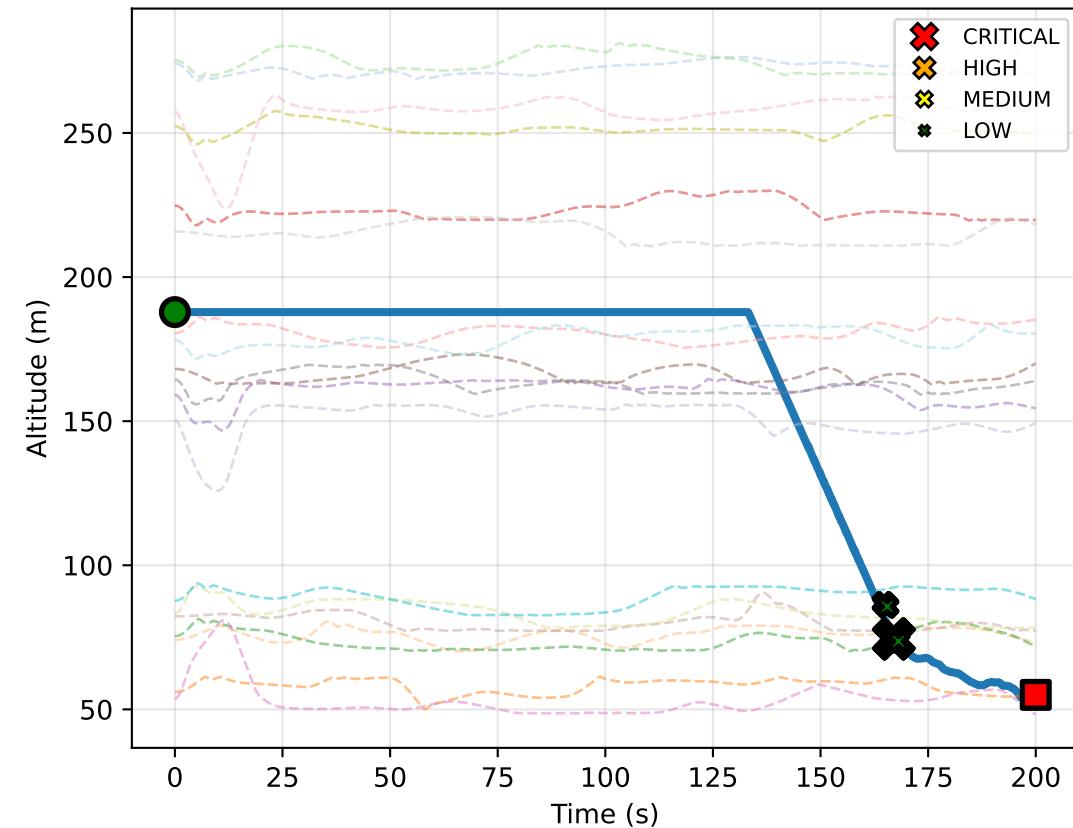
## Side View (XZ Plane)



## Front View (YZ Plane)



## Time-Altitude Profile

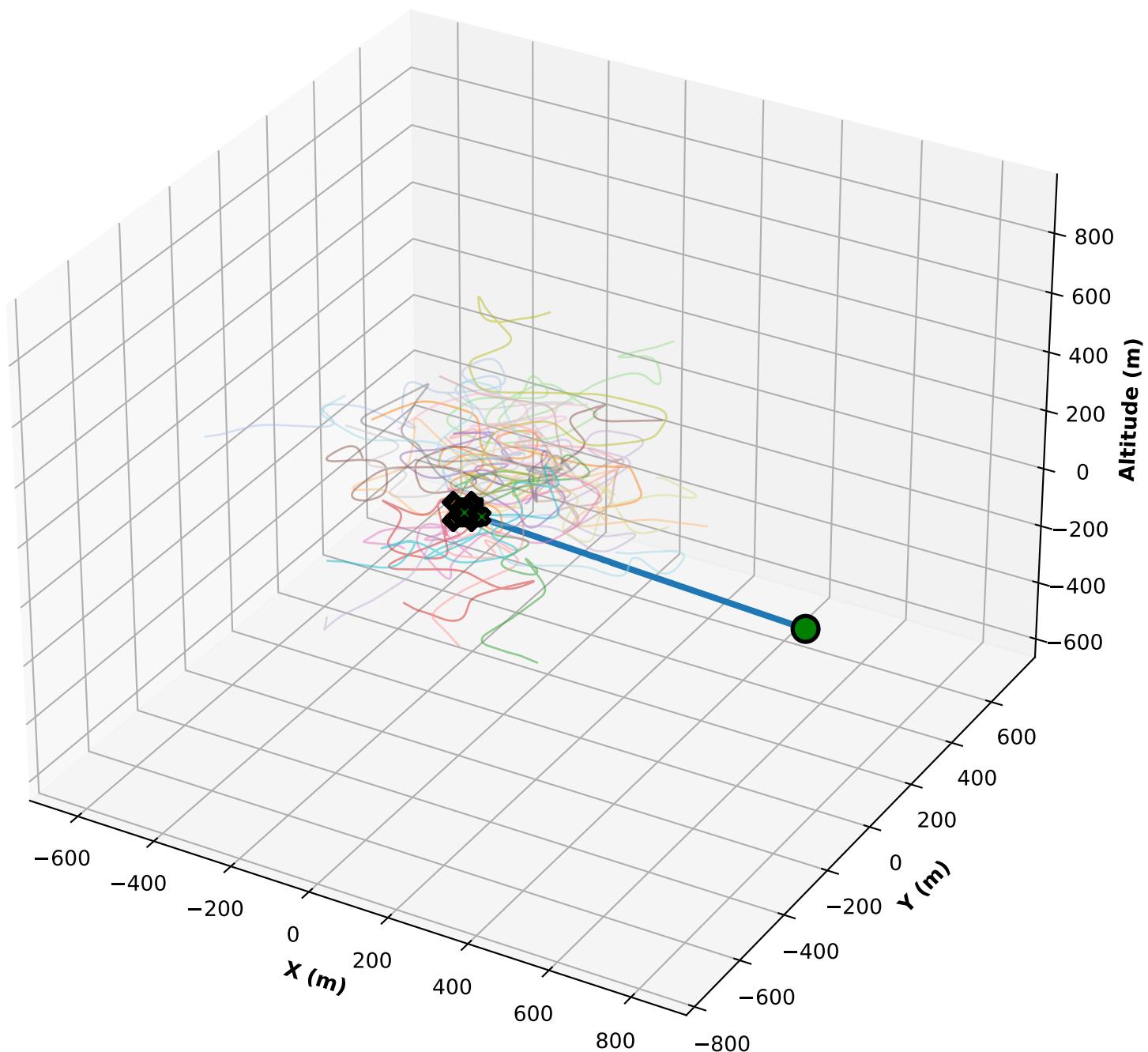


Legend:

- CRITICAL (Red X)
- HIGH (Yellow X)
- MEDIUM (Green X)
- LOW (Black asterisk)

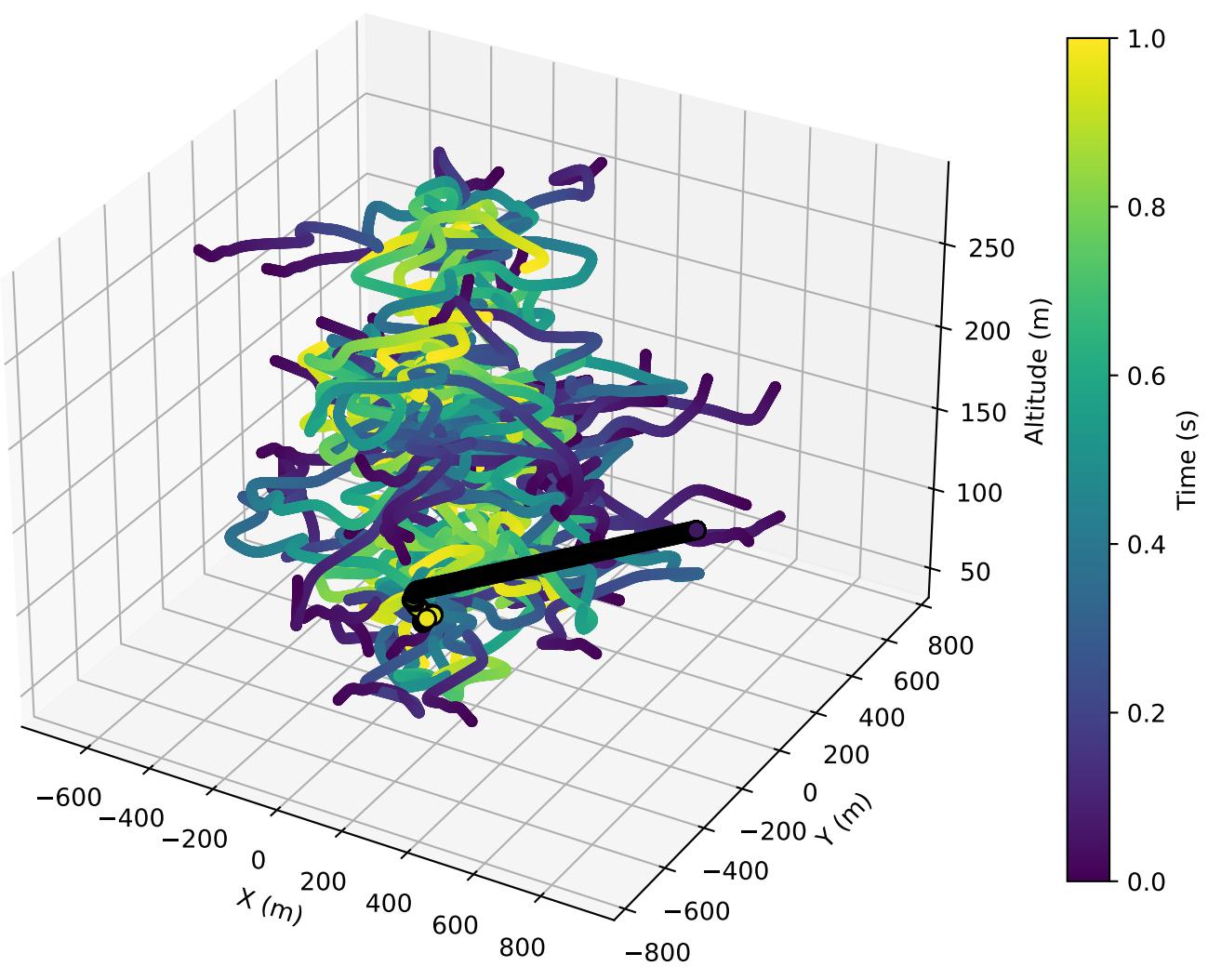
# 3D TRAJECTORY VISUALIZATION

PRIMARY: primary\_drone

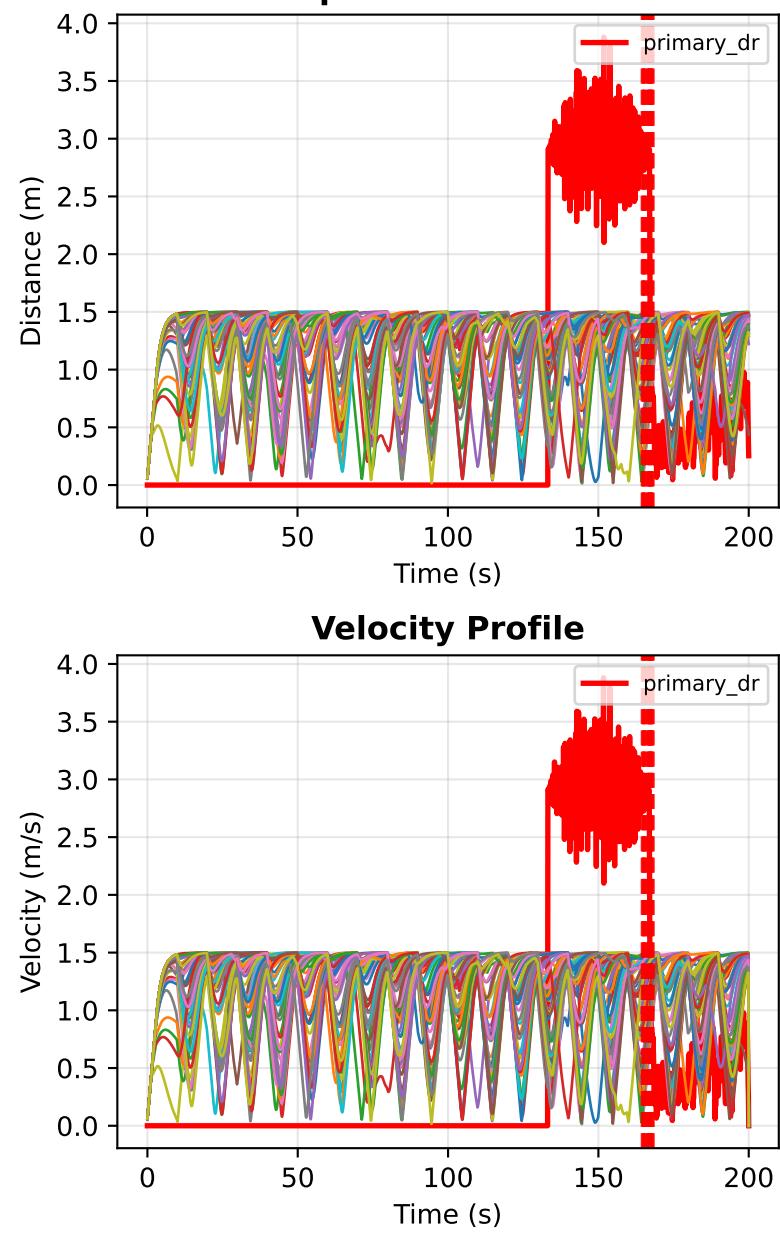


# 4D SPATIO-TEMPORAL ANALYSIS

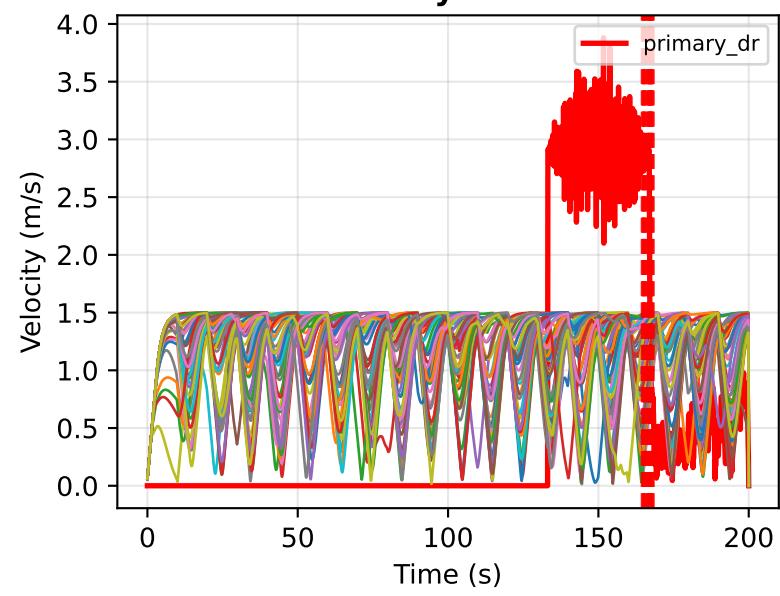
3D Trajectories (Time Gradient)



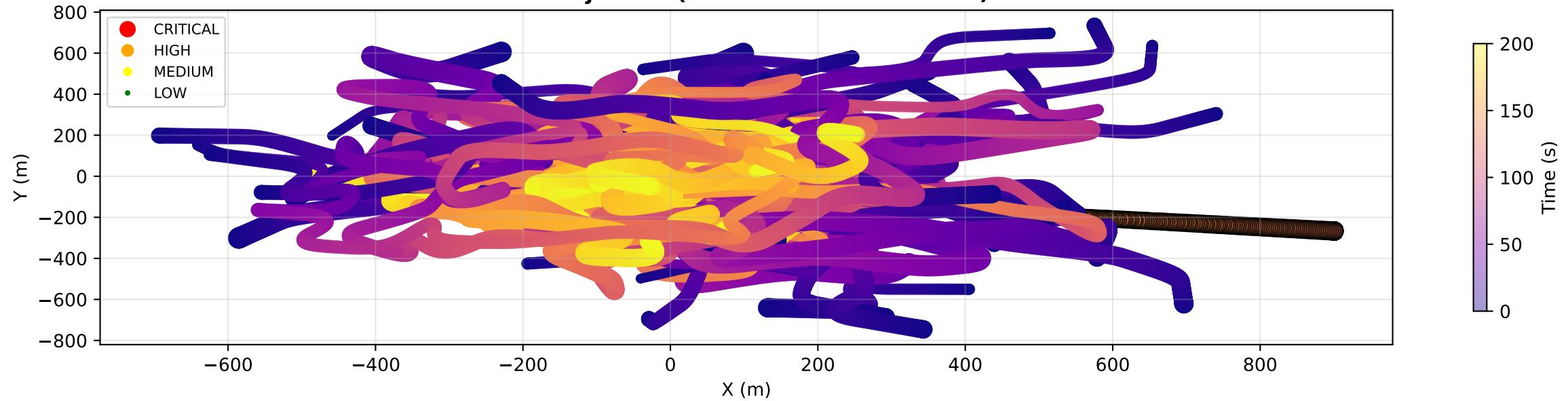
Separation vs Time



Velocity Profile

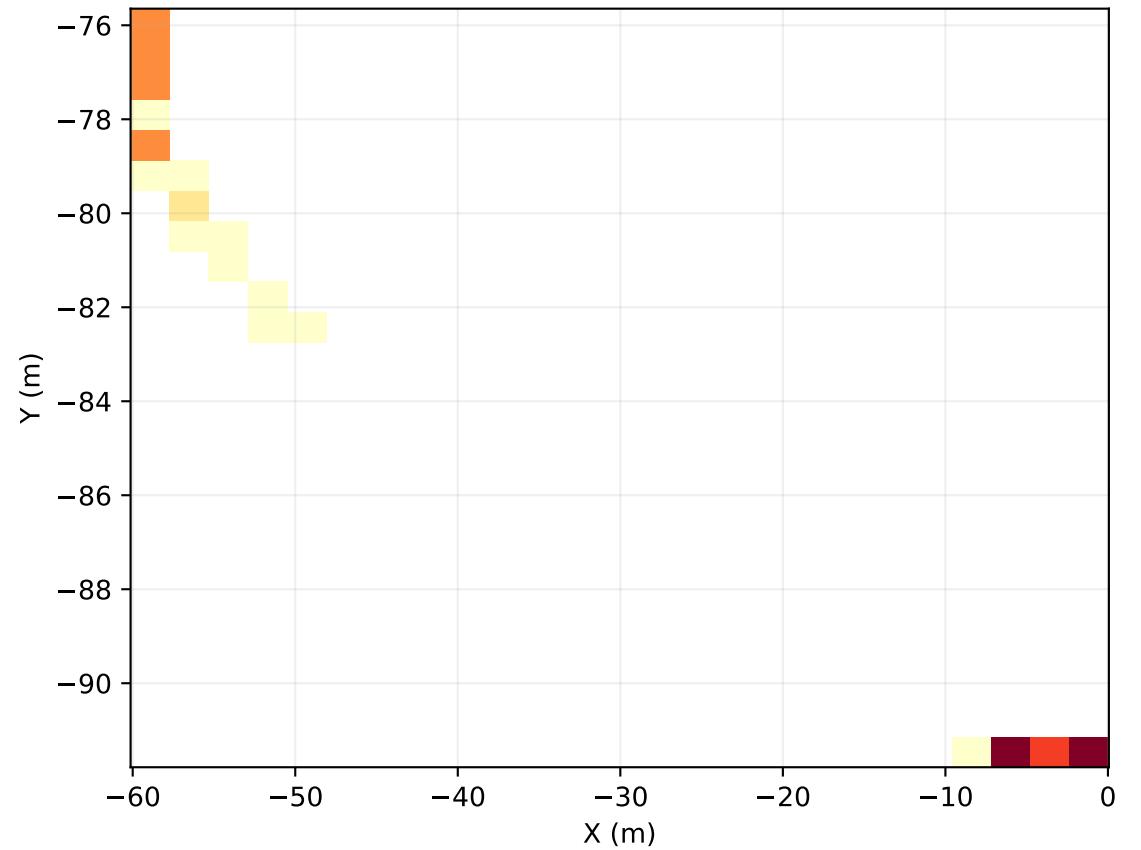


4D Projection (XY with Time & Altitude)

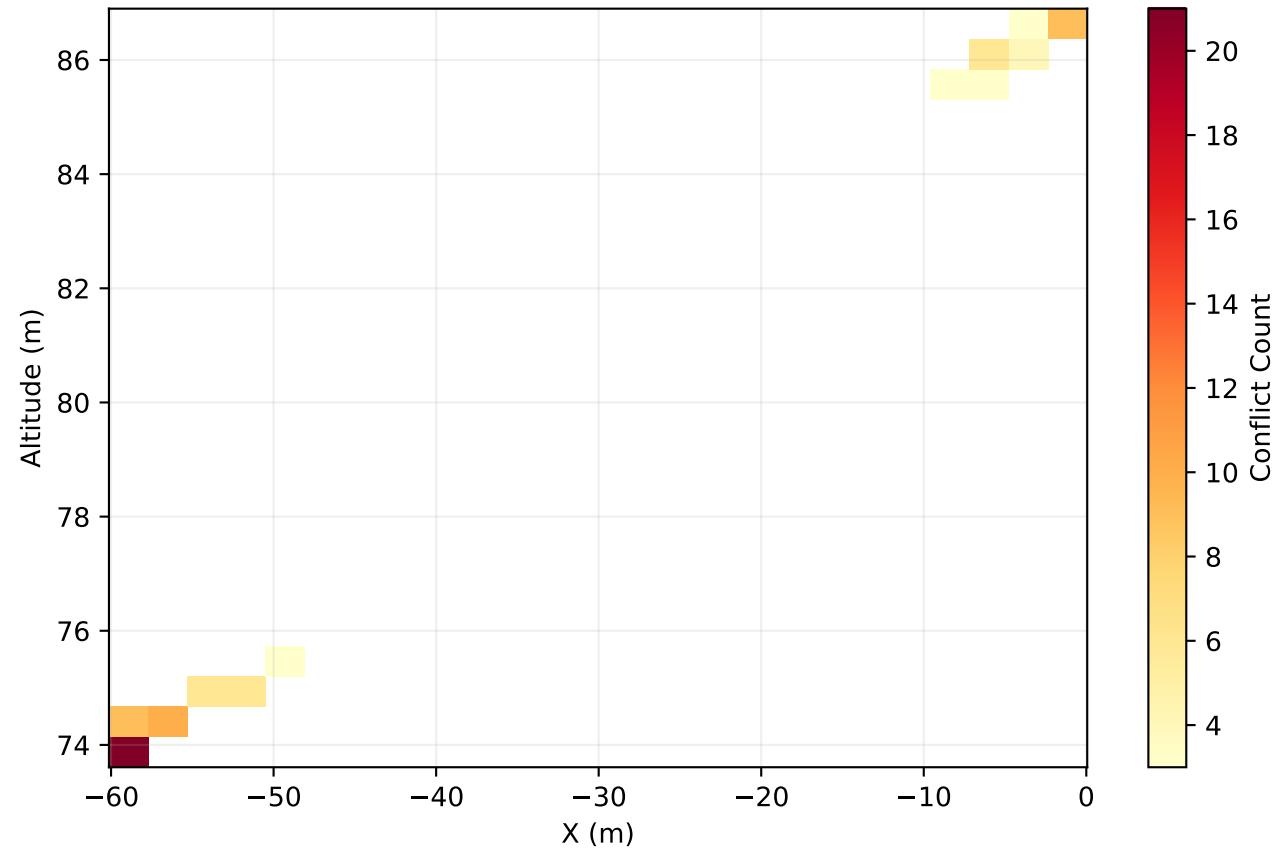


# CONFLICT DENSITY ANALYSIS

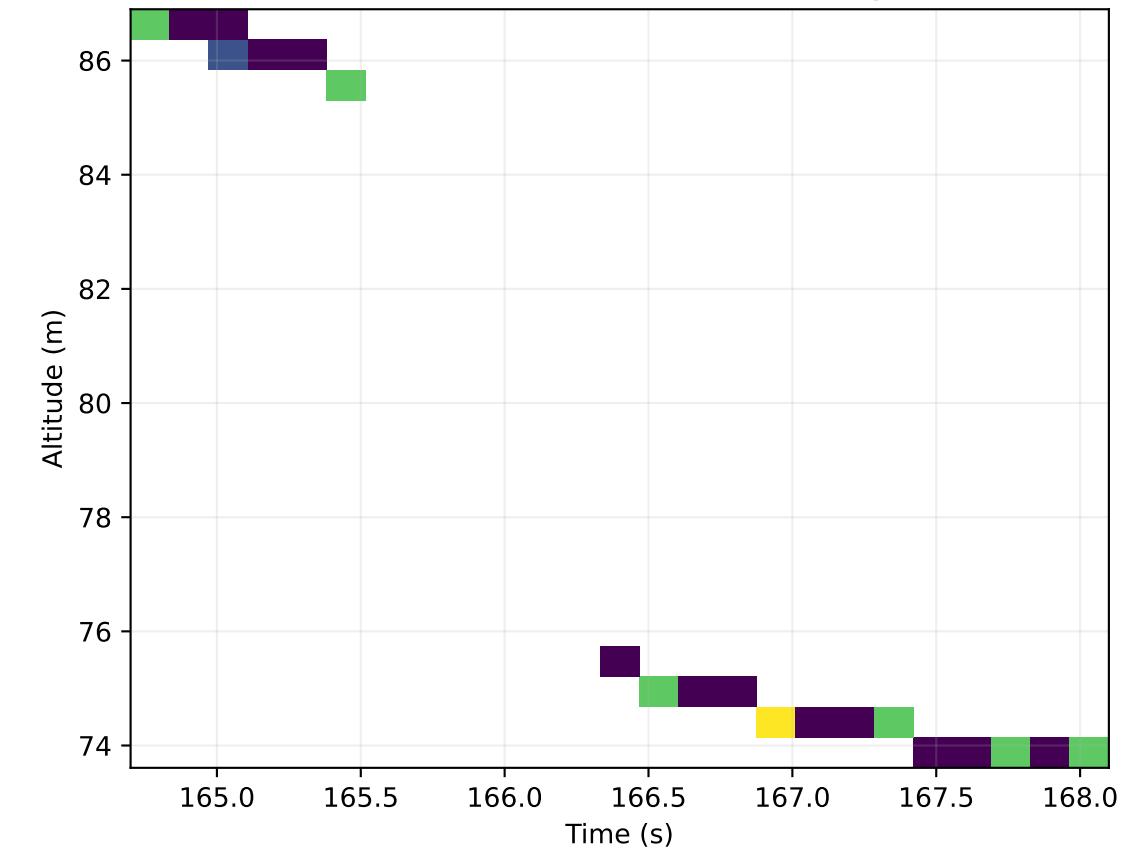
XY Plane Conflict Density



XZ Plane Conflict Density



Time-Altitude Conflict Density



Conflict Severity Distribution

