

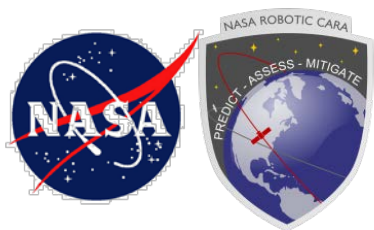
Conjunction Assessment Risk Analysis



NASA CARA Metrics

September 2019

Benjamin Moody
NASA CARA Operations



CARA Robotic Mission Set

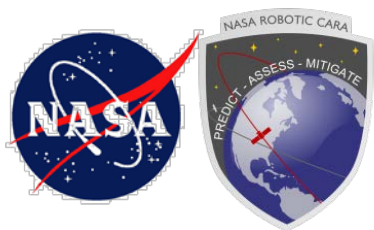
Orbital Regime	Definition	Number of Satellites
LEO #1	Perigee ≤ 500 km & Eccentricity < 0.25	6
LEO #2	$500 \text{ km} < \text{Perigee} \leq 750 \text{ km}$ & Eccentricity < 0.25	39
LEO #3	$750 \text{ km} < \text{Perigee} \leq 1200 \text{ km}$ & Eccentricity < 0.25	13
LEO #4	$1200 \text{ km} < \text{Perigee} \leq 2000 \text{ km}$ & Eccentricity < 0.25	3
MEO	$600 \text{ min} < \text{Period} < 800 \text{ min}$ & Eccentricity < 0.25	0
GEO	$1300 \text{ min} < \text{Period} < 1800 \text{ min}$ & Ecc < 0.25 & Inc $< 35^\circ$	11
HEO	Eccentricity > 0.25	9

Recent Additions (1)

- GPIM (June 2019)

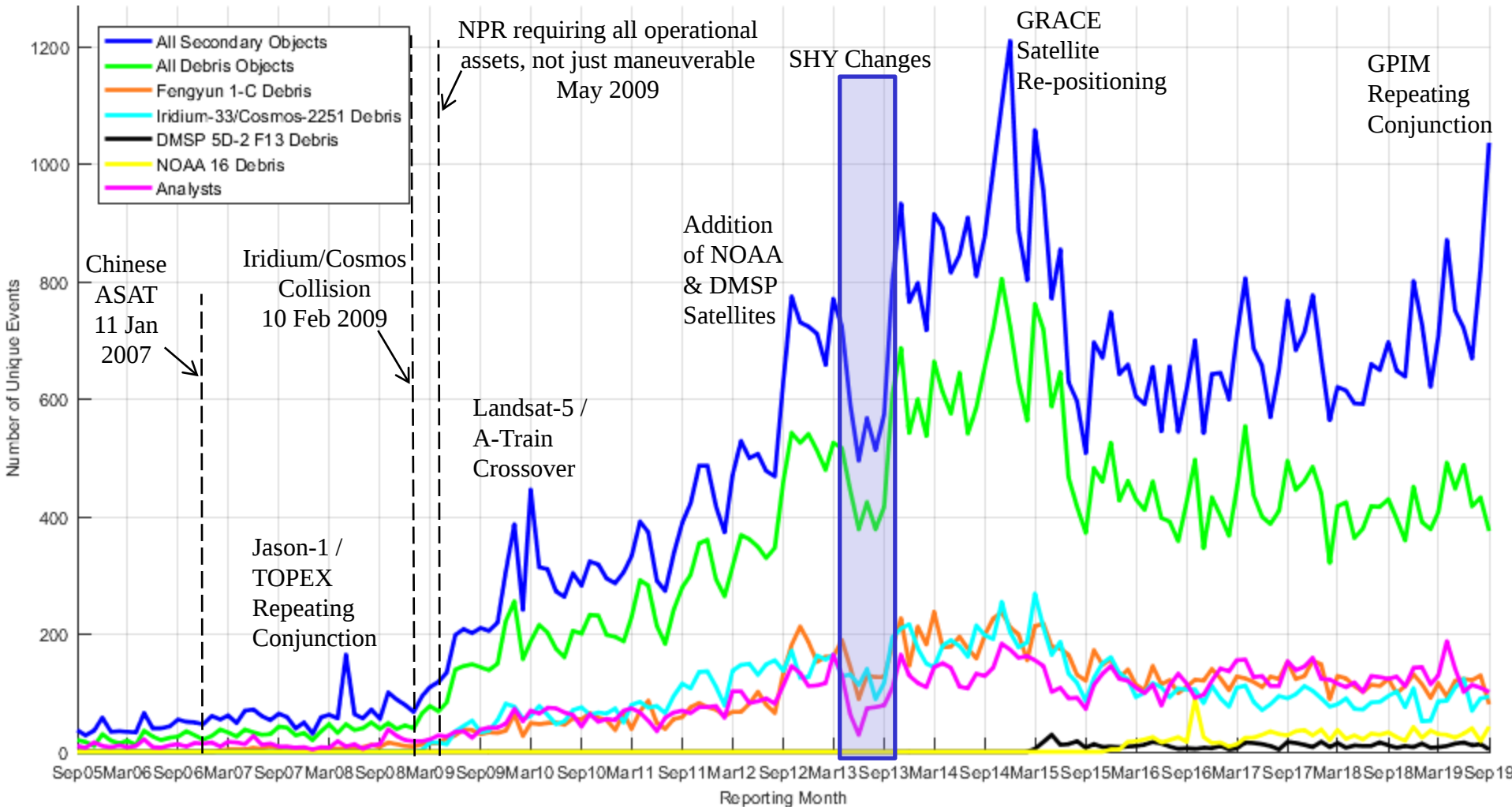
Recent Removals (1)

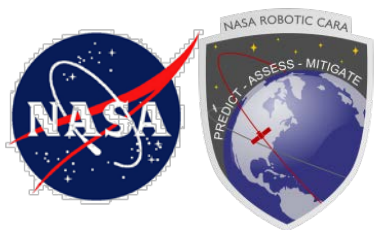
- RBSP-B



Debris Environment Metrics

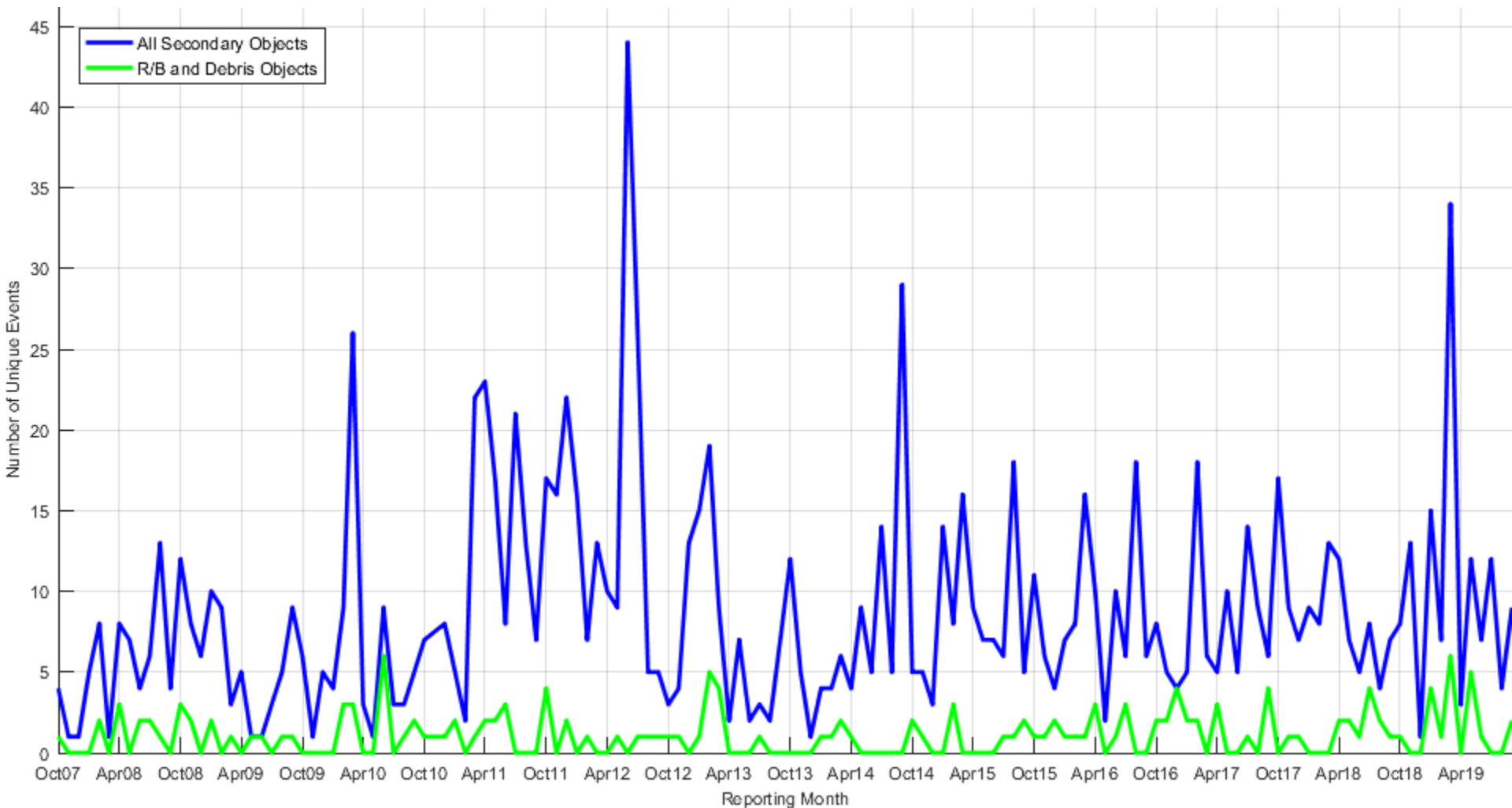
Unique Events within 0.5x5x5-km Volume by Object Type, LEO

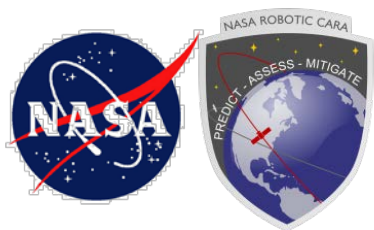




Debris Environment Metrics

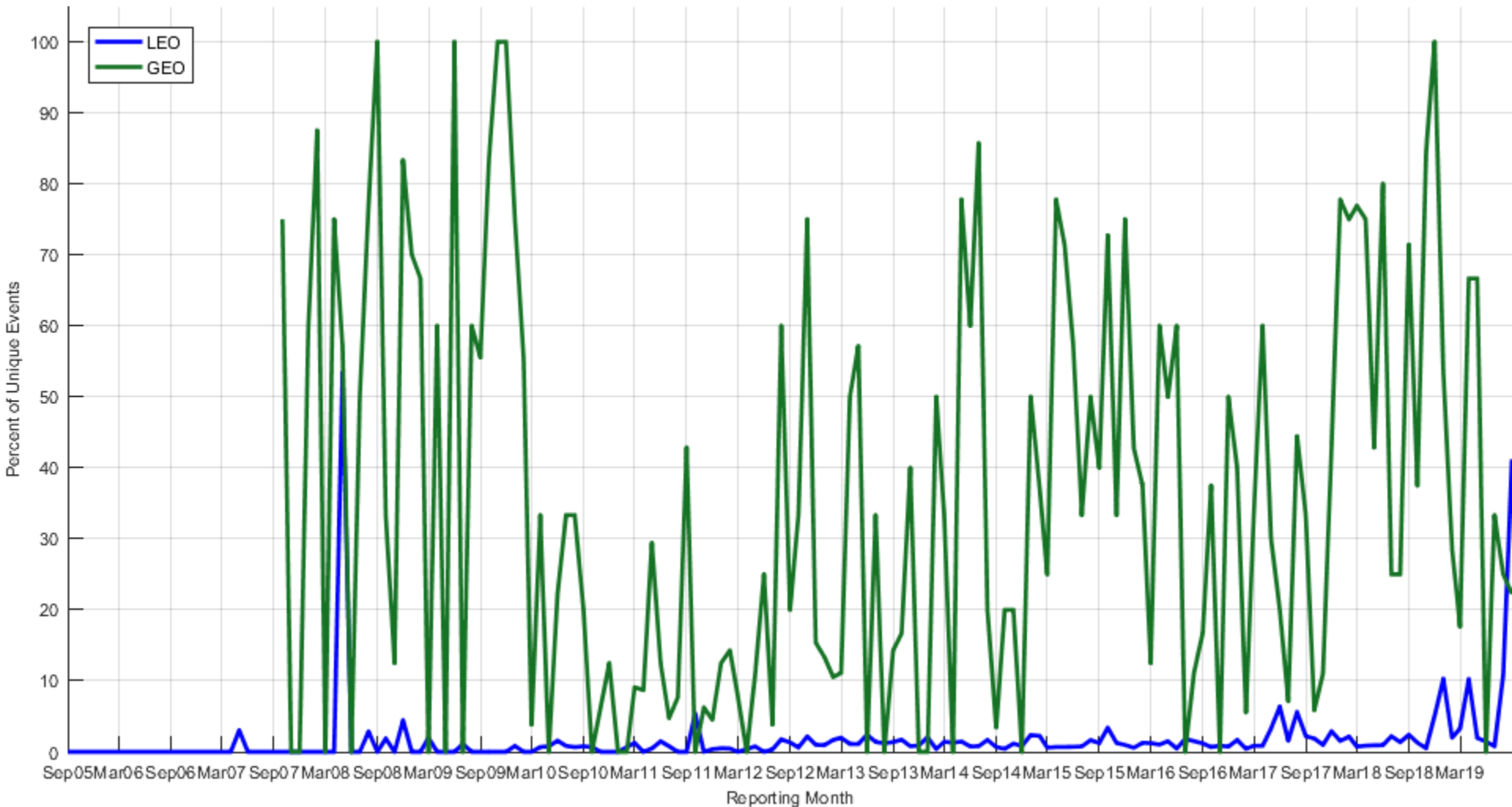
Unique Events with 15-km Spherical Volume by Object Type, GEO

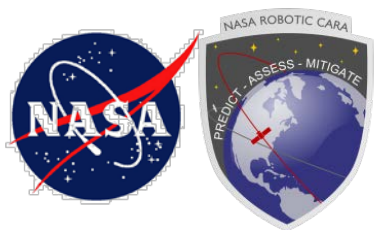




Debris Environment Metrics

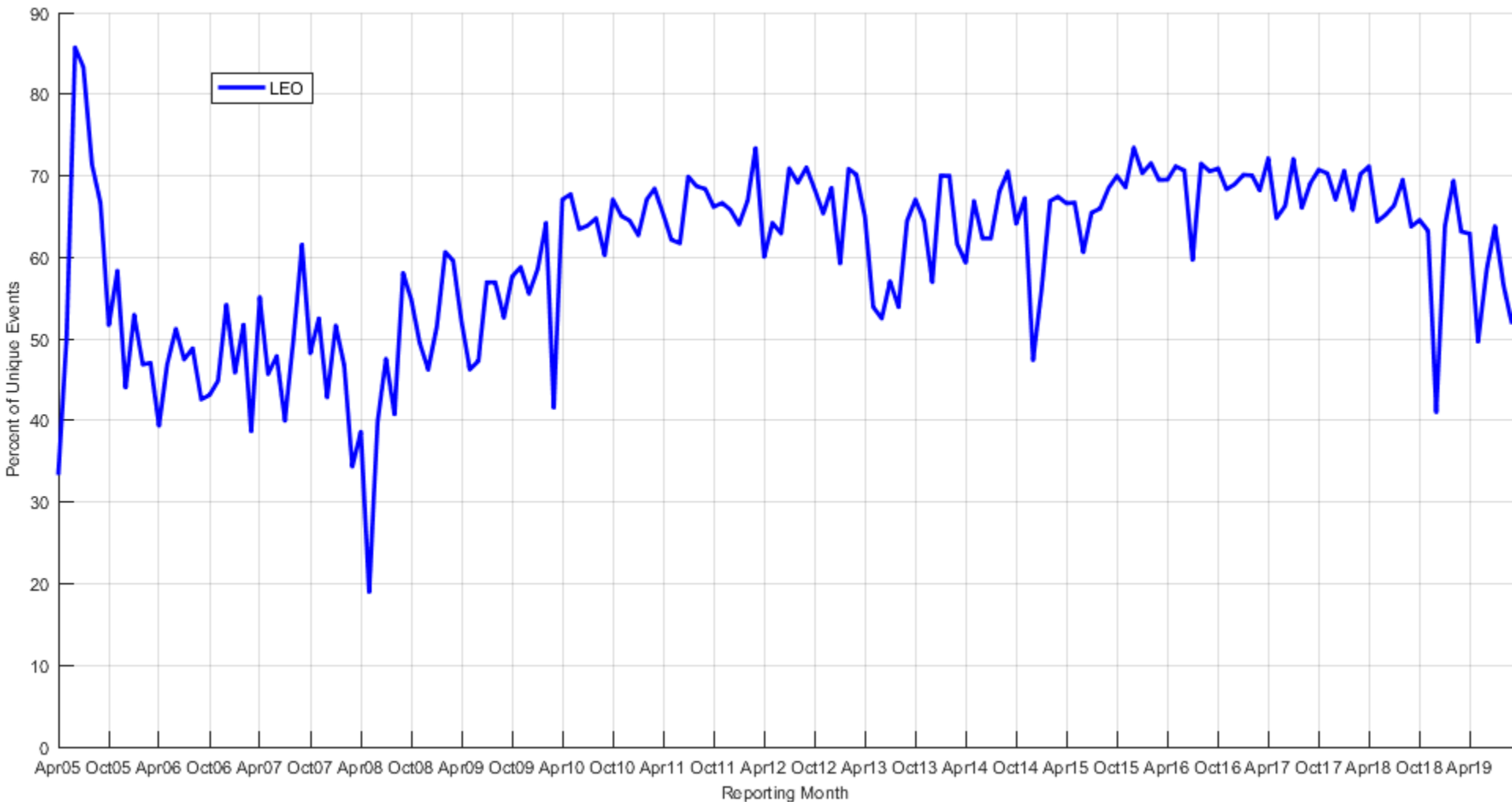
Conjunctions Events with “Low” Relative Velocity (< 500 m/s), LEO & GEO

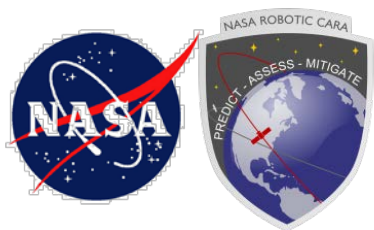




Debris Environment Metrics

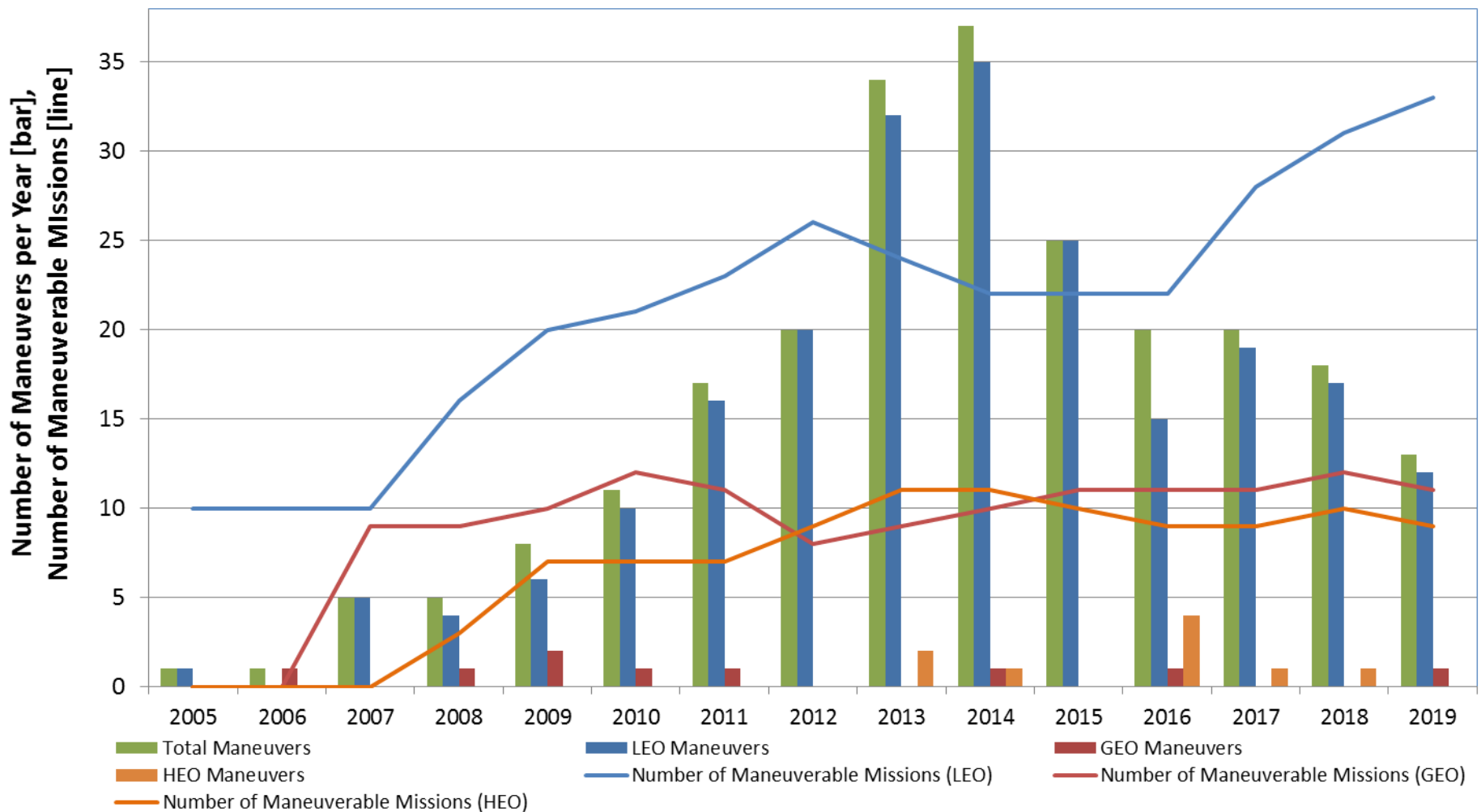
Conjunctions with Small RCS ($\text{RCS} < 0.02 \text{ m}^2$) Objects, LEO

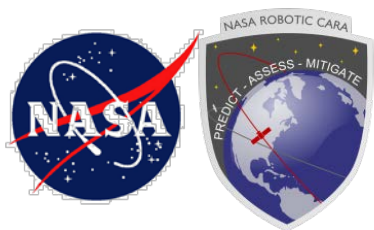




Workload Metrics

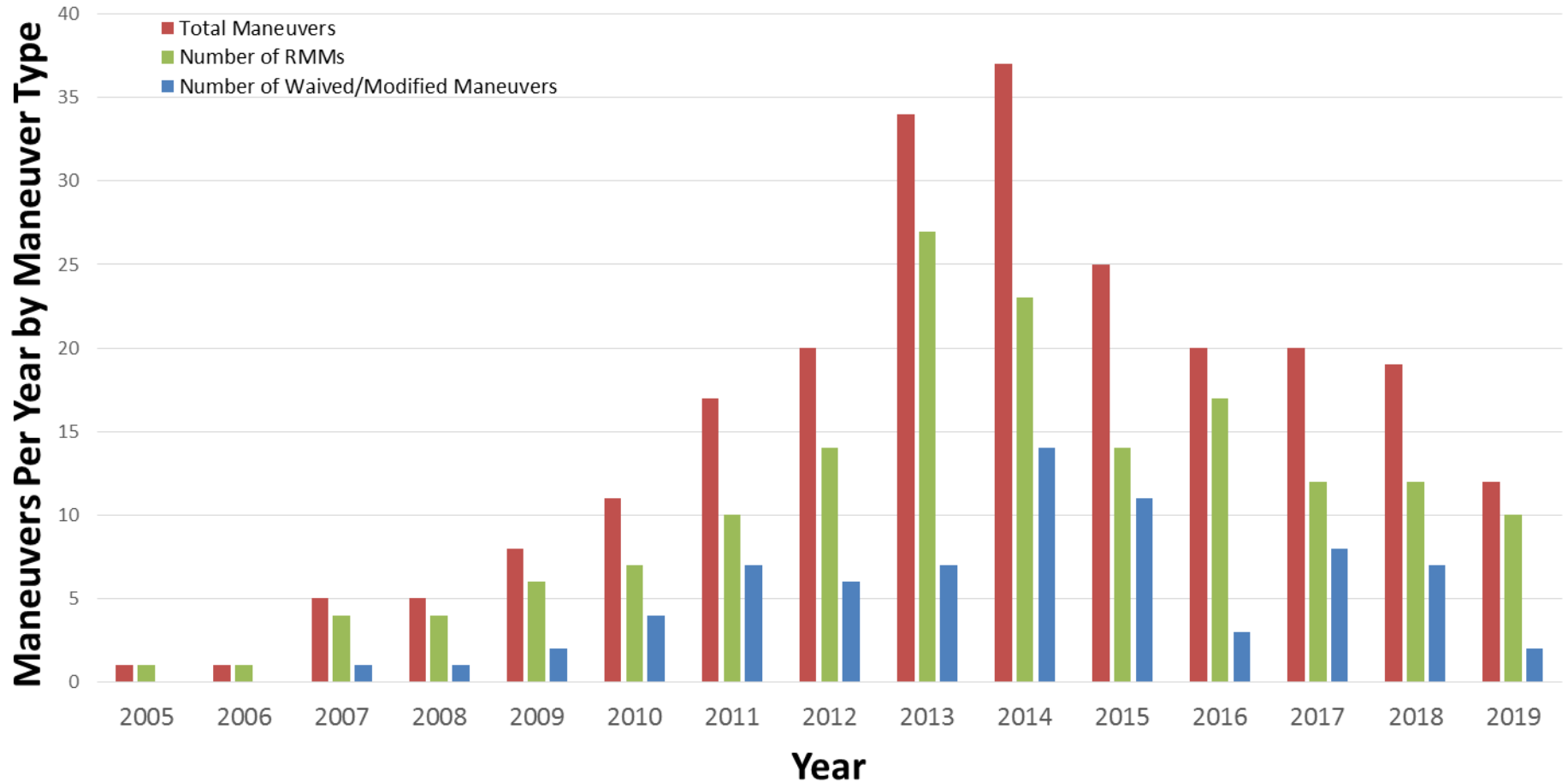
Annual Maneuvers Performed

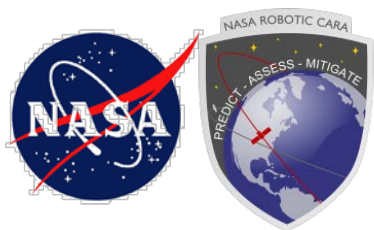




Workload Metrics

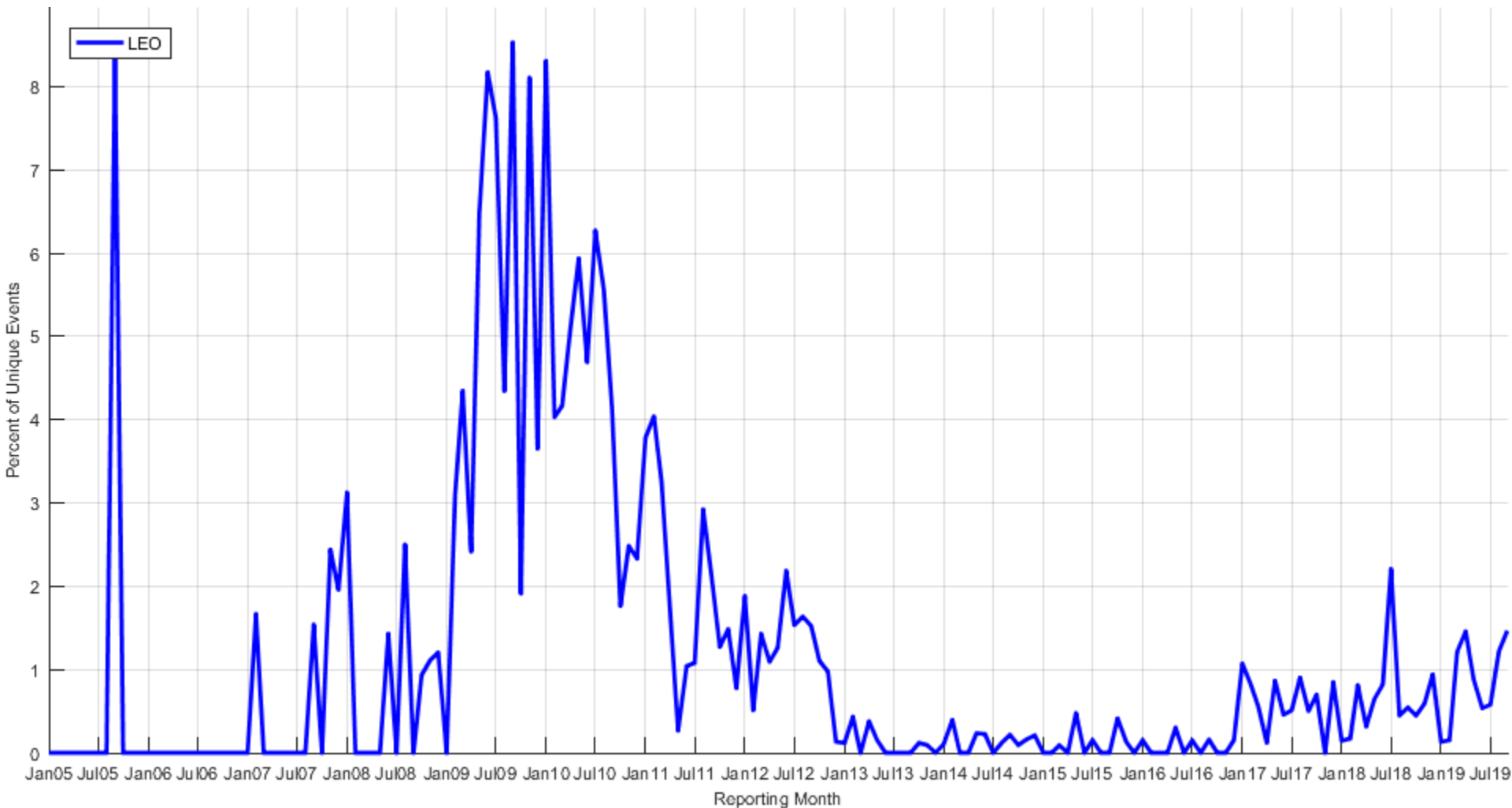
Annual Maneuvers Performed by Maneuver Type

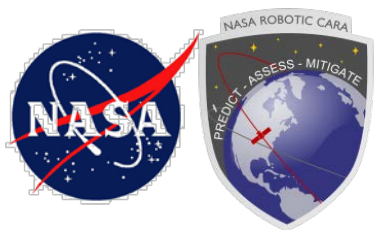




SSN Performance Metrics

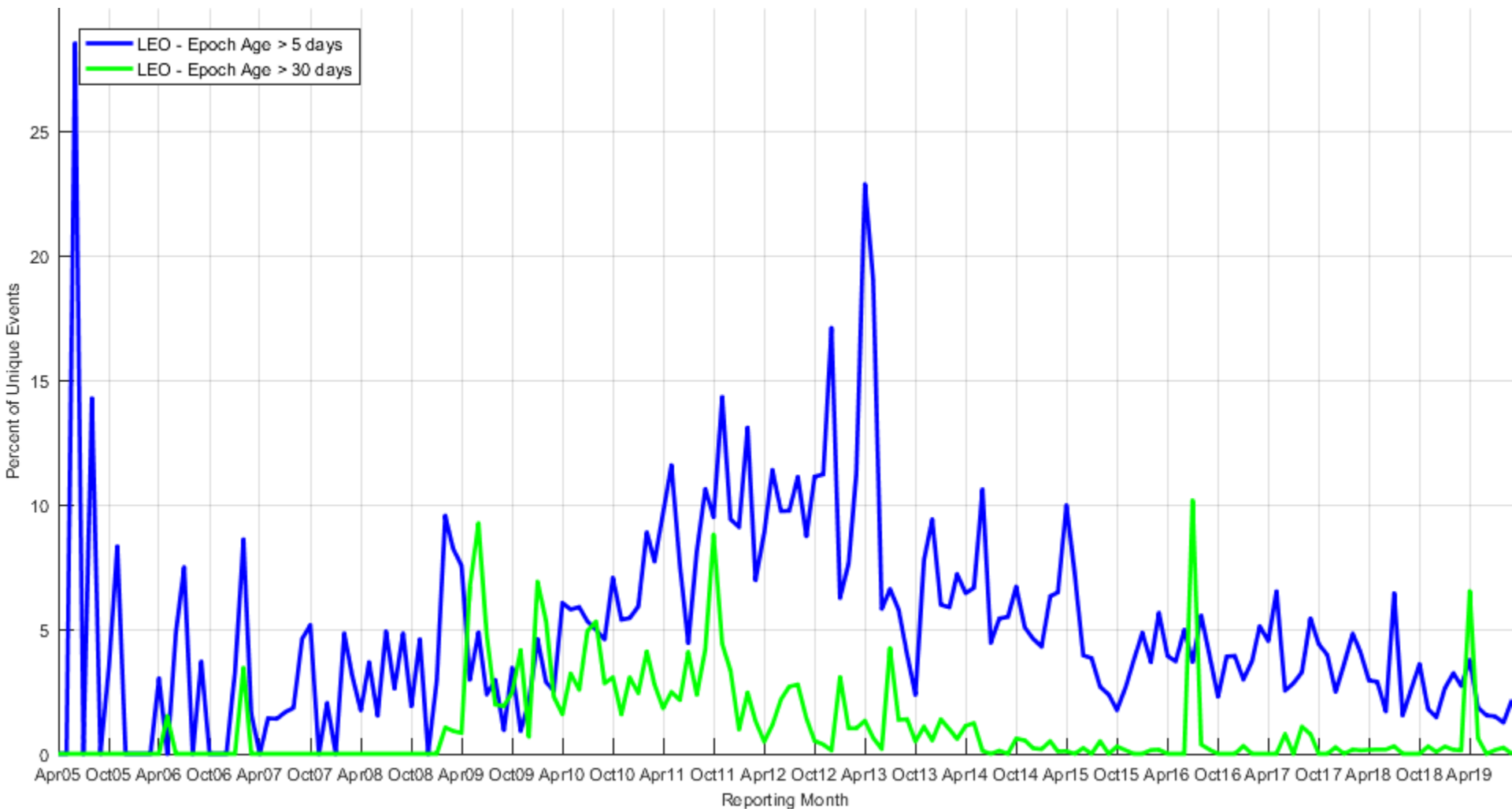
Conjunctions Events with Default Covariance, LEO

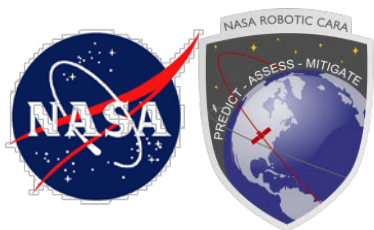




SSN Performance Metrics

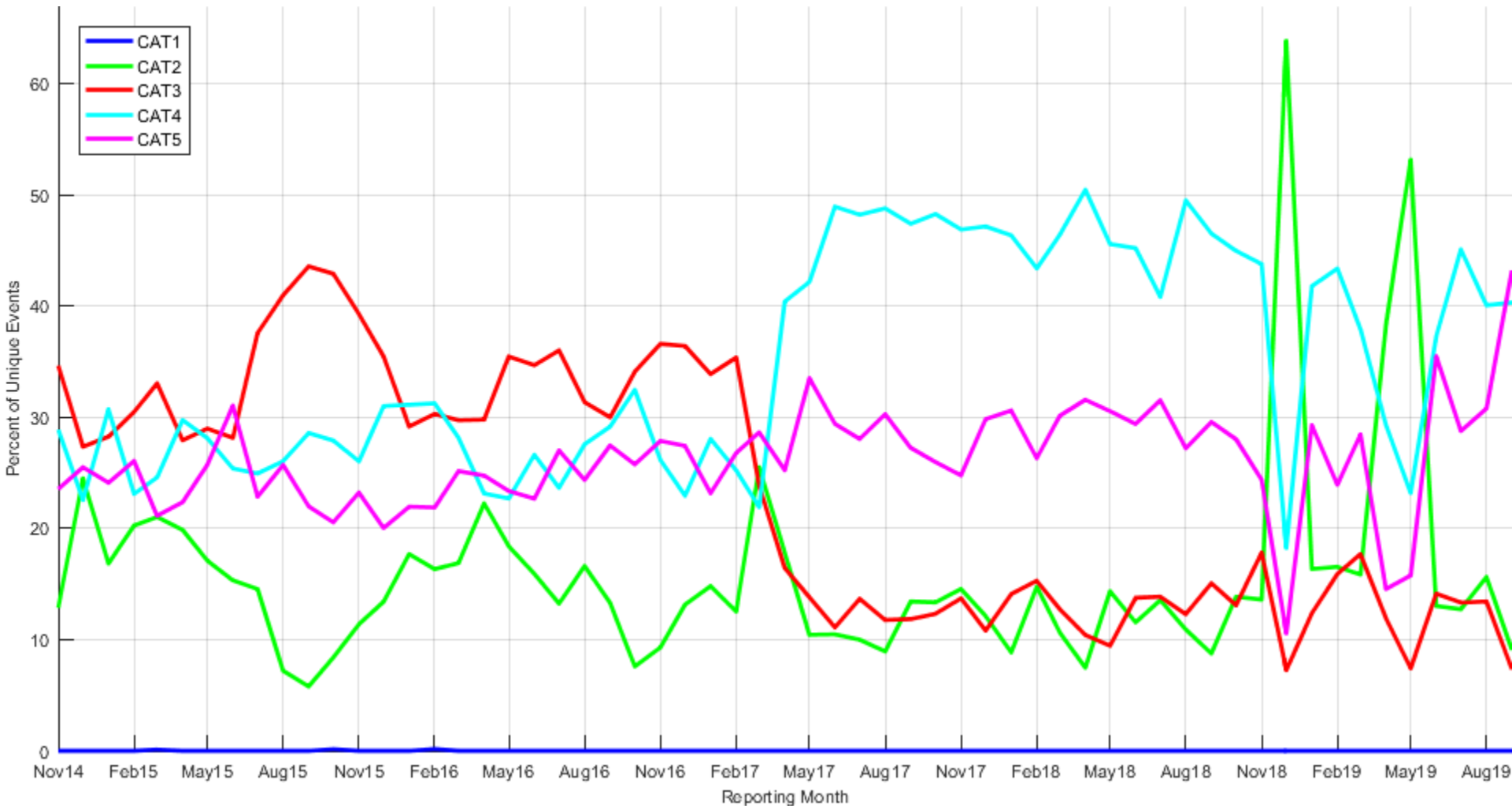
Conjunctions with Objects having Older Epoch Ages, LEO

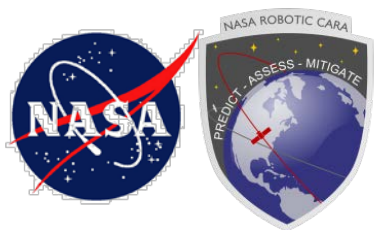




SSN Performance Metrics

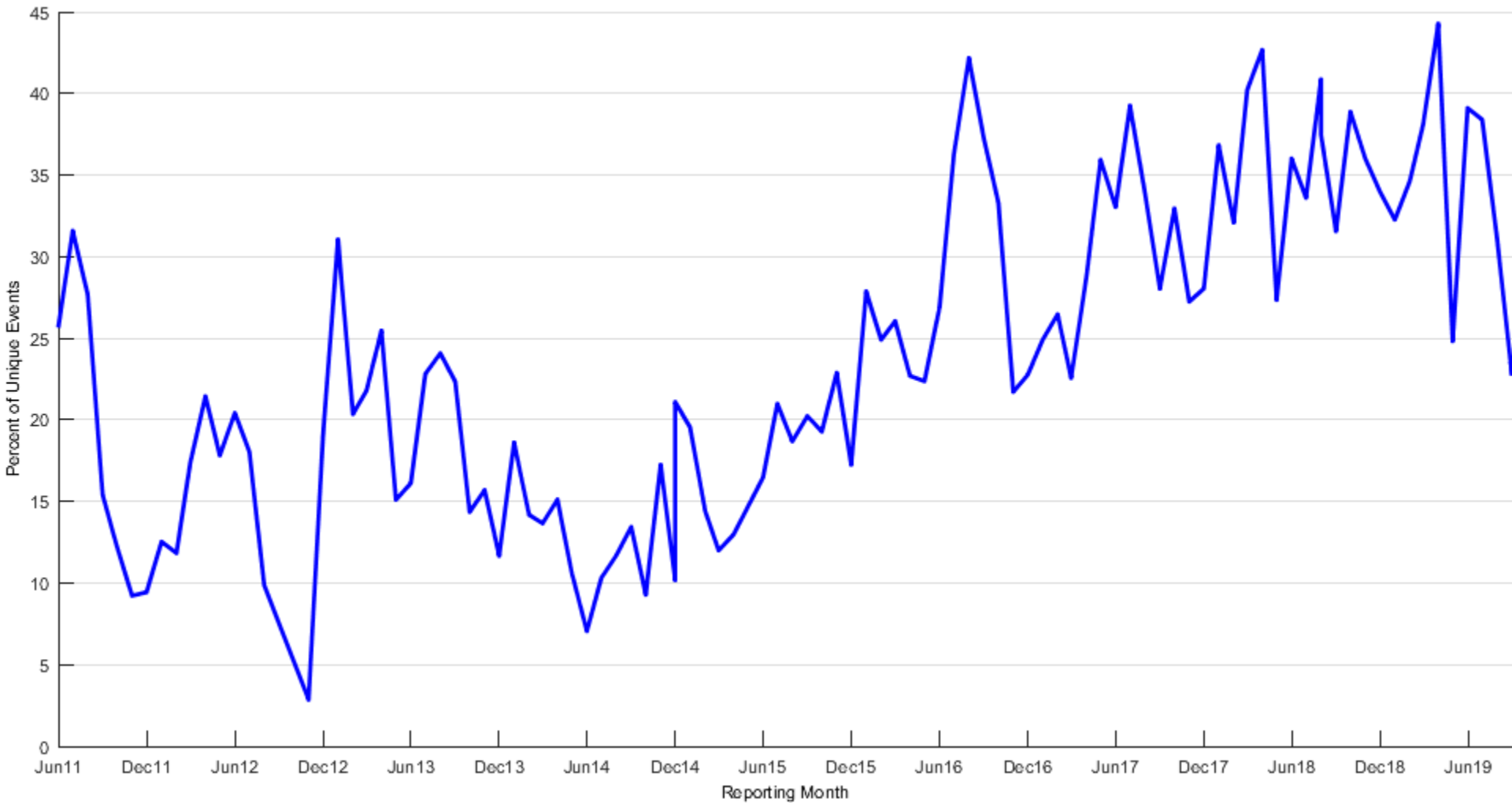
Fraction of Highest Tasking Category Achieved during Event, LEO

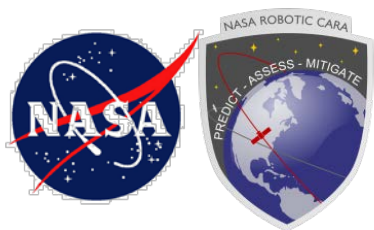




SSN Performance Metrics

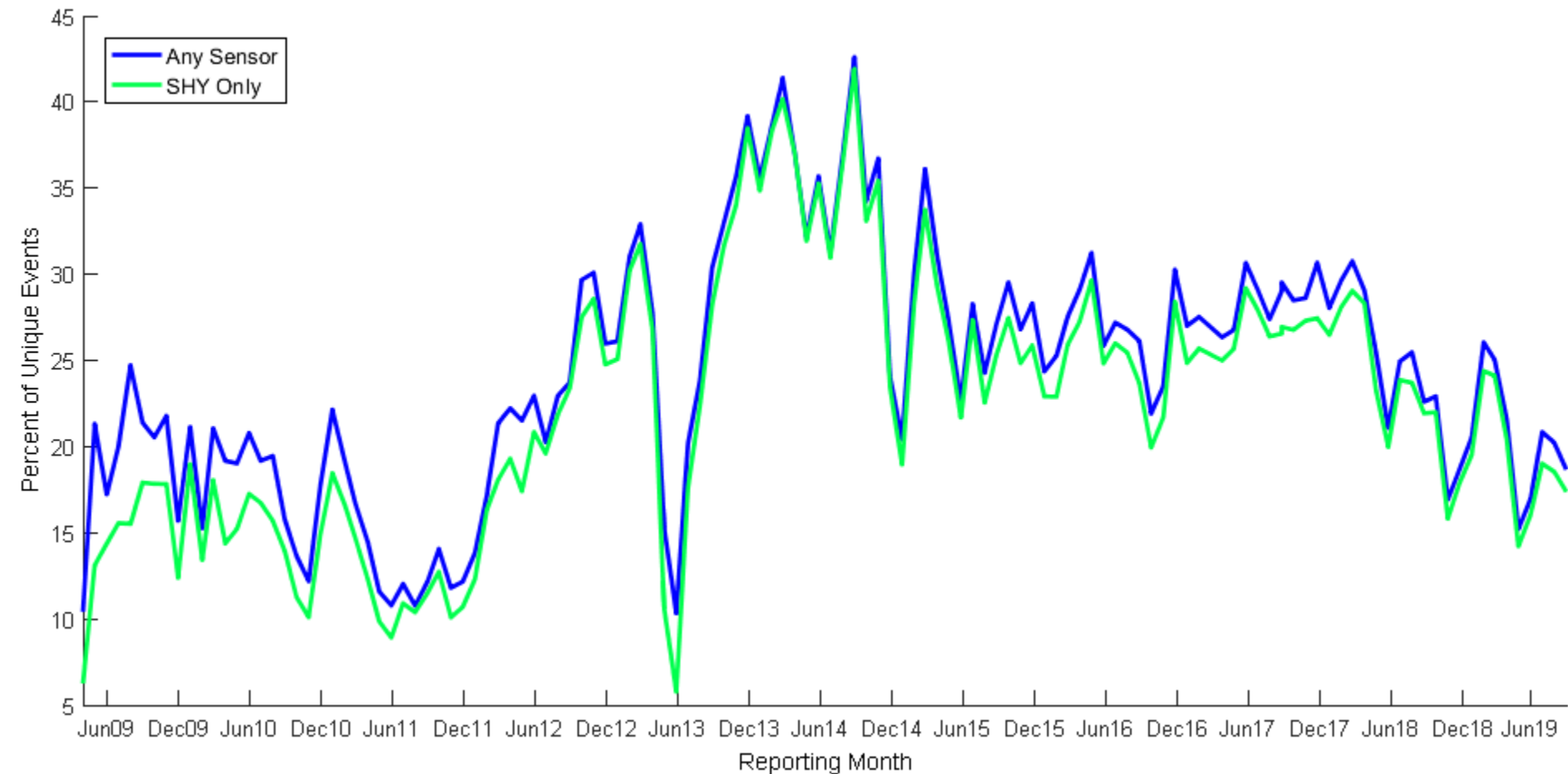
Percent of Events with Realized Tasking CAT Increase on Secondary, LEO

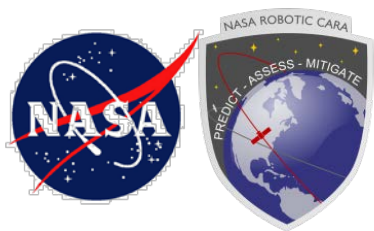




Specialty Metrics

Single-Sensor Tracked Conjunction Events, LEO





QUESTIONS?