

# *Monitoring Raptor Movements with Satellite Telemetry & Avian Radar Systems: An Evaluation for Synchronicity*



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- **Aeroecology**
- **Advancements in satellite telemetry**
- **Avian radar systems**
- **Interpretation of information remains 'challenging'**

*Can we use one remote sensing technology to assess the performance of another remote sensing technology?*



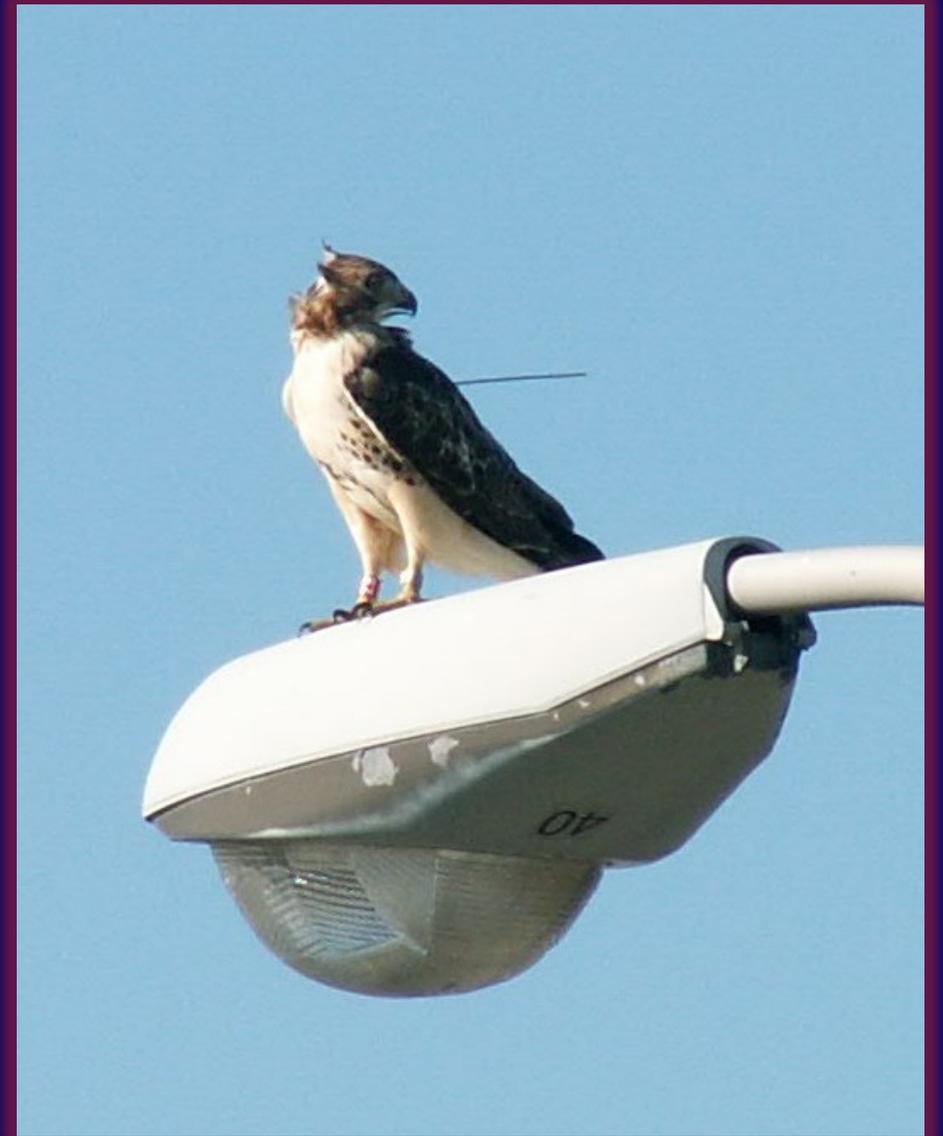
**Wildlife Services**

Protecting People ♦ Protecting Agriculture ♦ Protecting Wildlife

## ***Study Objectives:***

- (1) Investigate the ability of 3 avian radar systems to track red-tailed hawks at large airport**
- (2) Determine which variables influenced the radars' ability to track these avian targets**

# *Satellite Telemetry*



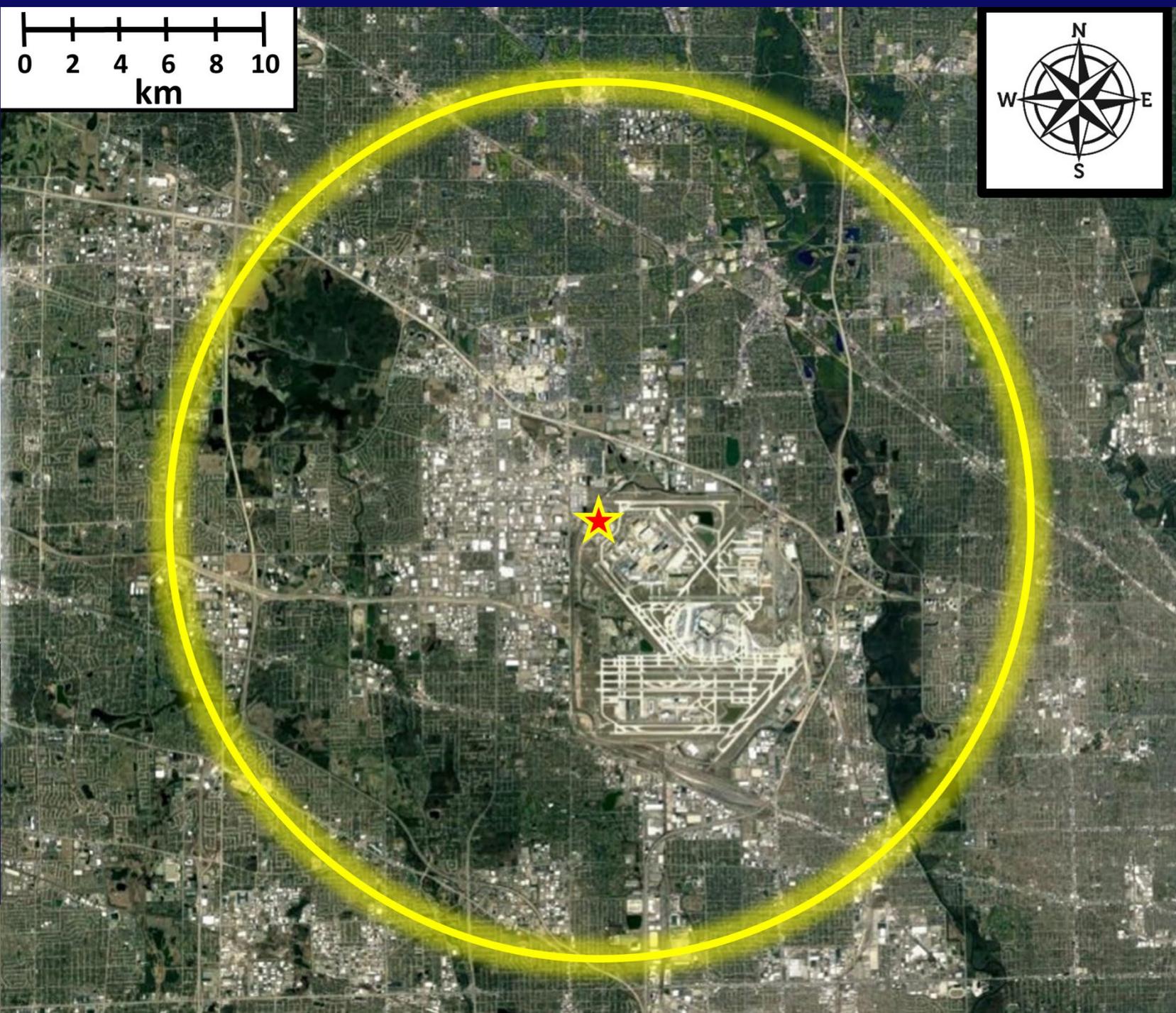
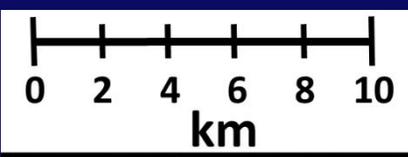
# *Avian Radar Systems*

➤ **AR 1**

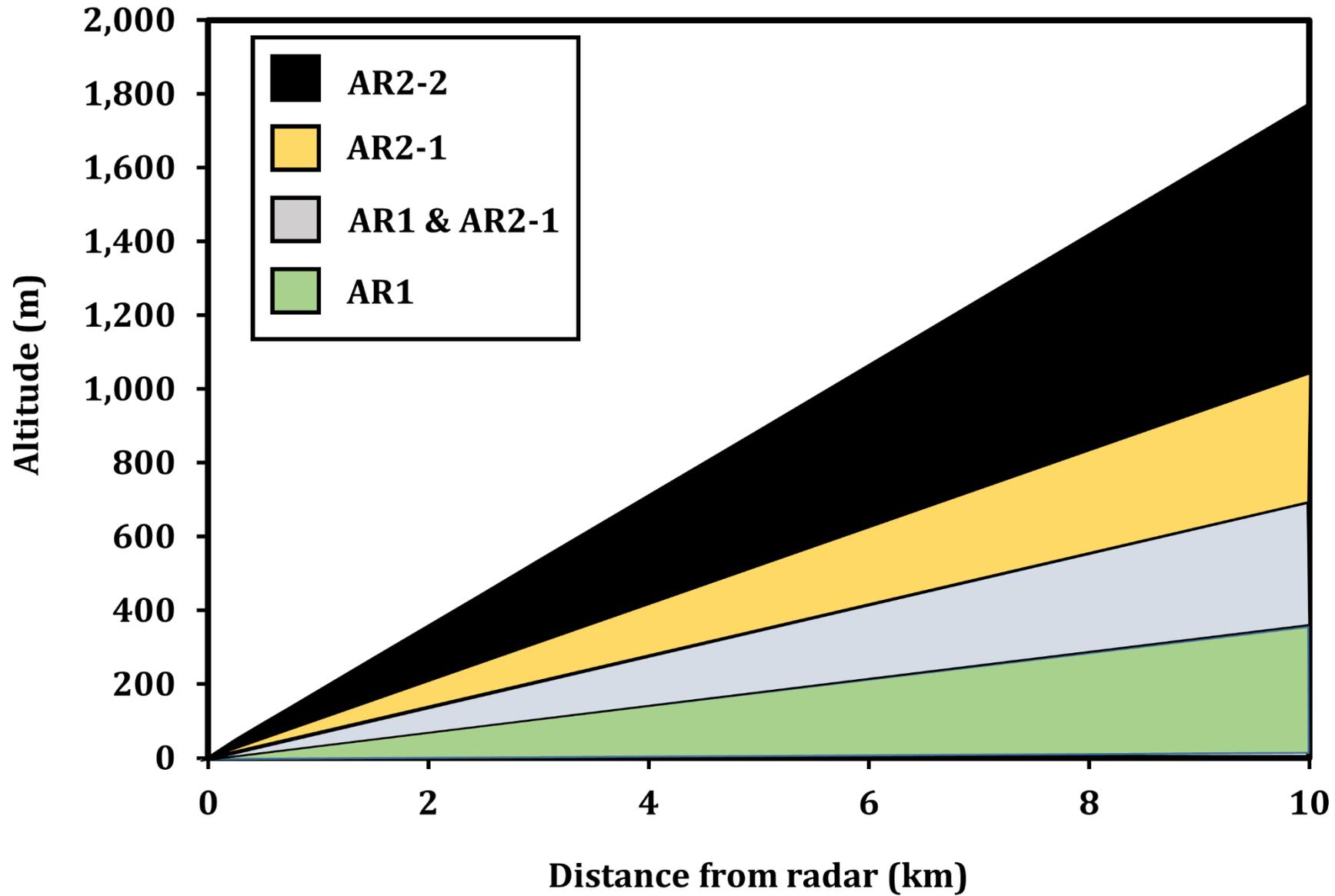
➤ **AR 2-1**

➤ **AR 2-2**





**Wildlife Services**



# *RTHA Locations 'Visible' to Radars*

<b>AR 1</b>	<b>AR 2-1</b>	<b>AR 2-2</b>	<b>All 3 Radars</b>
<b>1,643</b>	<b>292</b>	<b>43</b>	<b>1,977</b>
<b>(83%)</b>	<b>(15%)</b>	<b>(2%)</b>	

Chicago O'Hare International Airport  
Observation Time: 2010-09-01 02:00:00 GMT  
Unique ID: 1  
Time Allowance: +/- 10 sec  
Range Tolerance: +/- 105.75 m  
Azimuth Tolerance: +/- 4.4334 deg  
Transponder Alt: 15m  
NOAA Precipitation: N/A in



- Description
- Radar Location
  - △ Track 11457
  - Transponder Position
  - + Validated Update(s)

# Determine factors that influenced the radars' ability to track RTHA

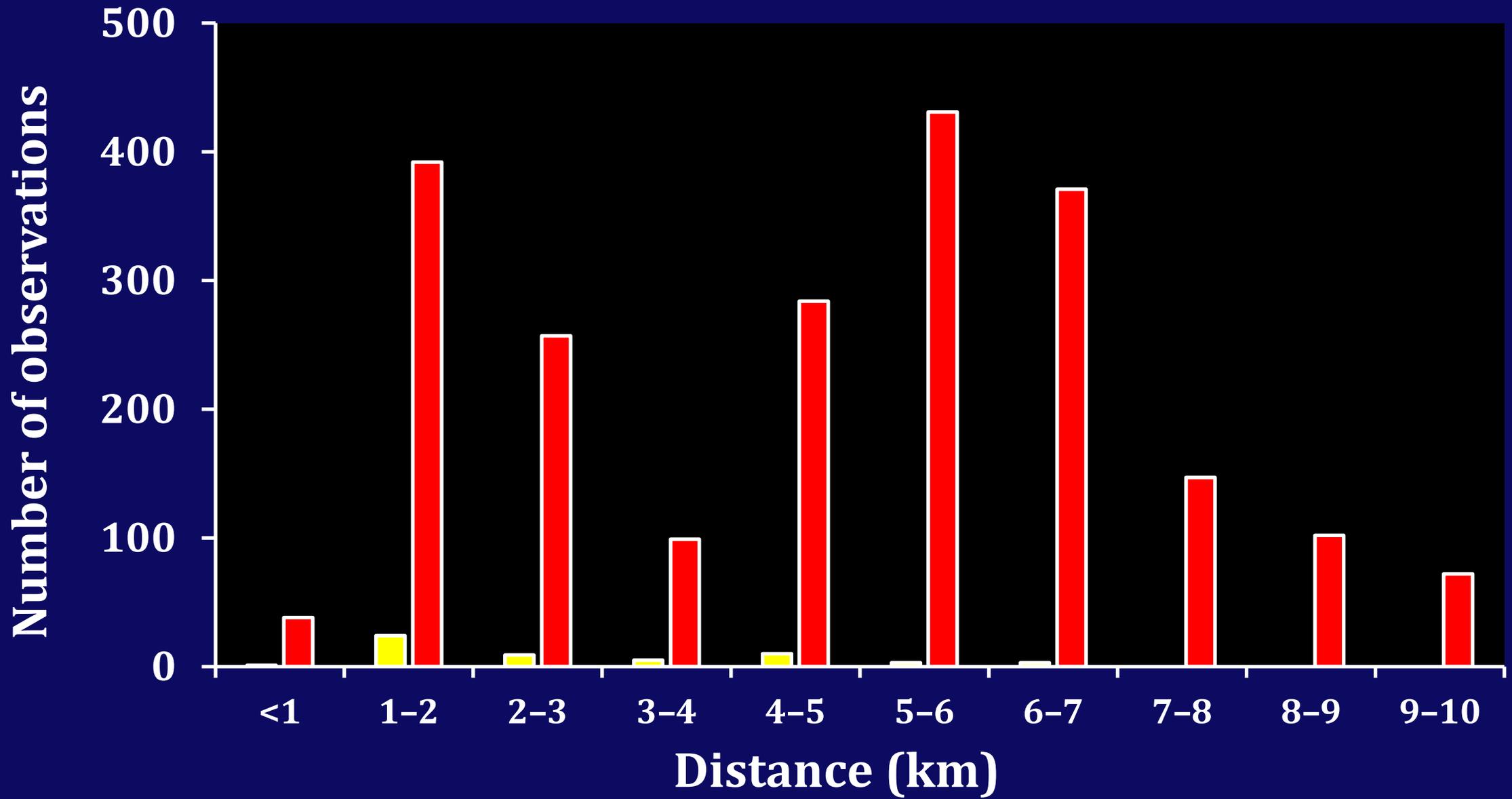
## *Factors included:*

- Altitude (m)
- Distance (km)
- Angle (degrees)
- Ambient air temperature ( $^{\circ}\text{C}$ )

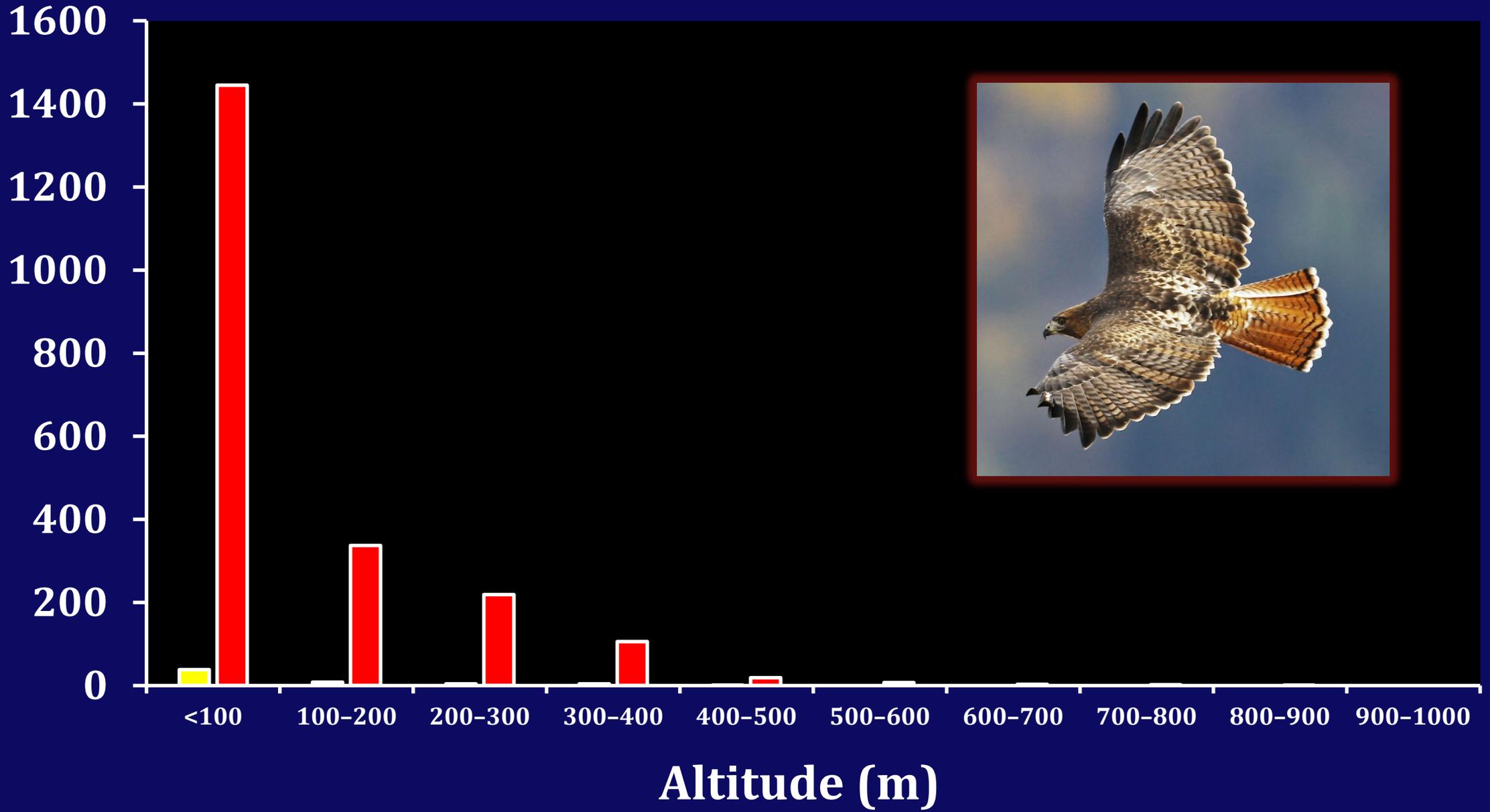


# Results

AR1	AR2-1	AR2-2	All 3 Radars
36	9	7	51
2.2%	3.1%	16.7%	2.6%

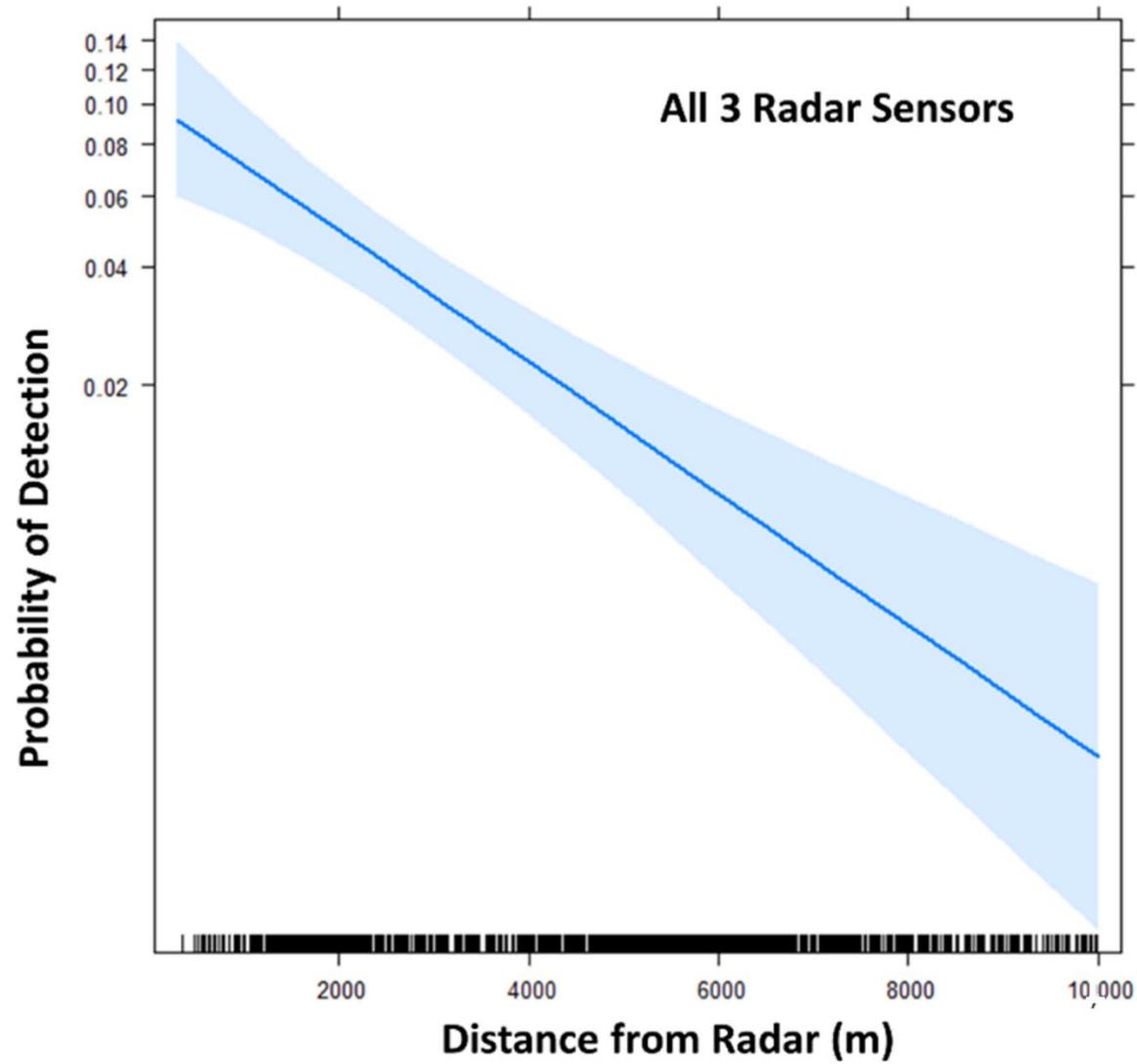


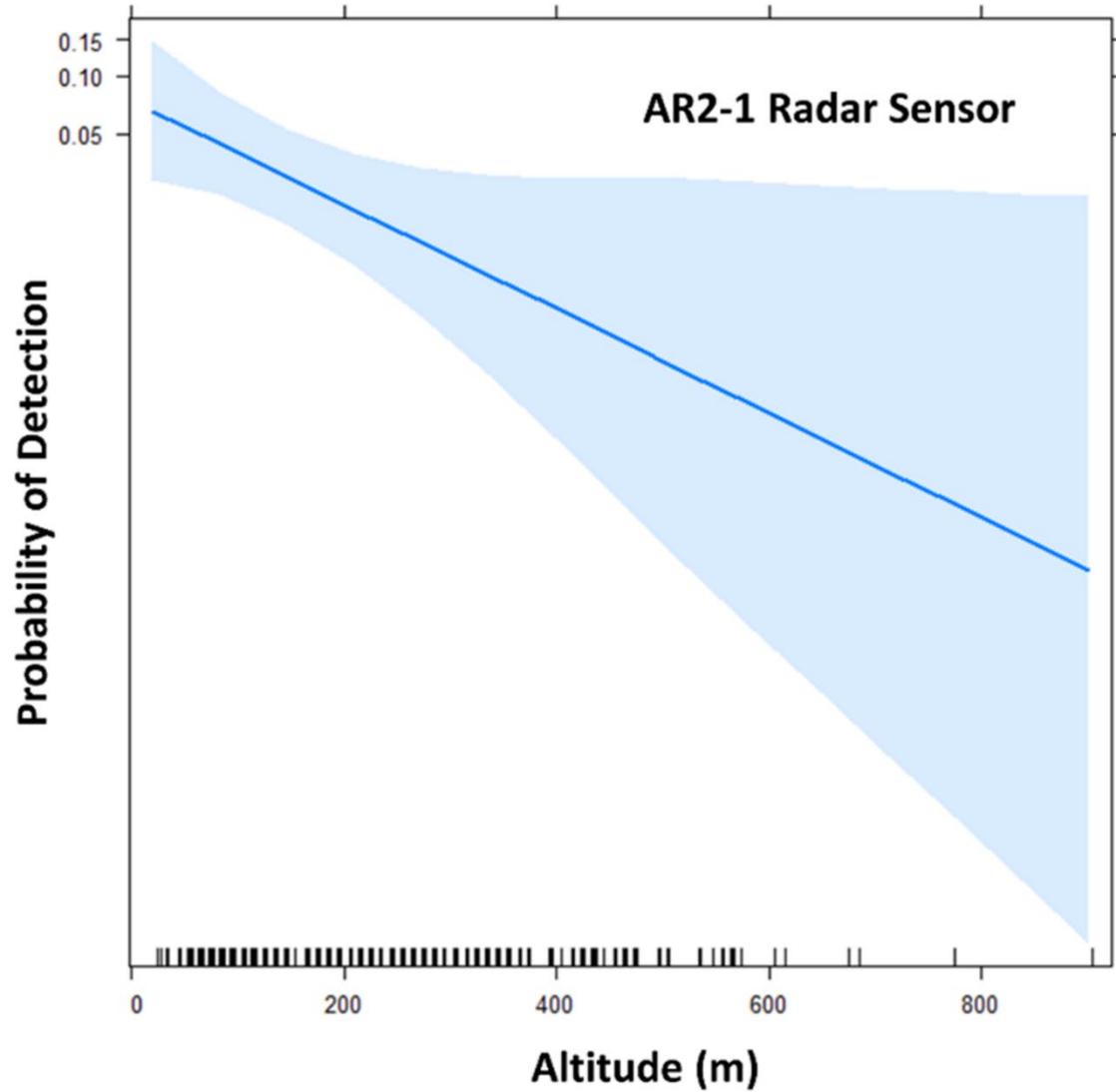
Number of observations

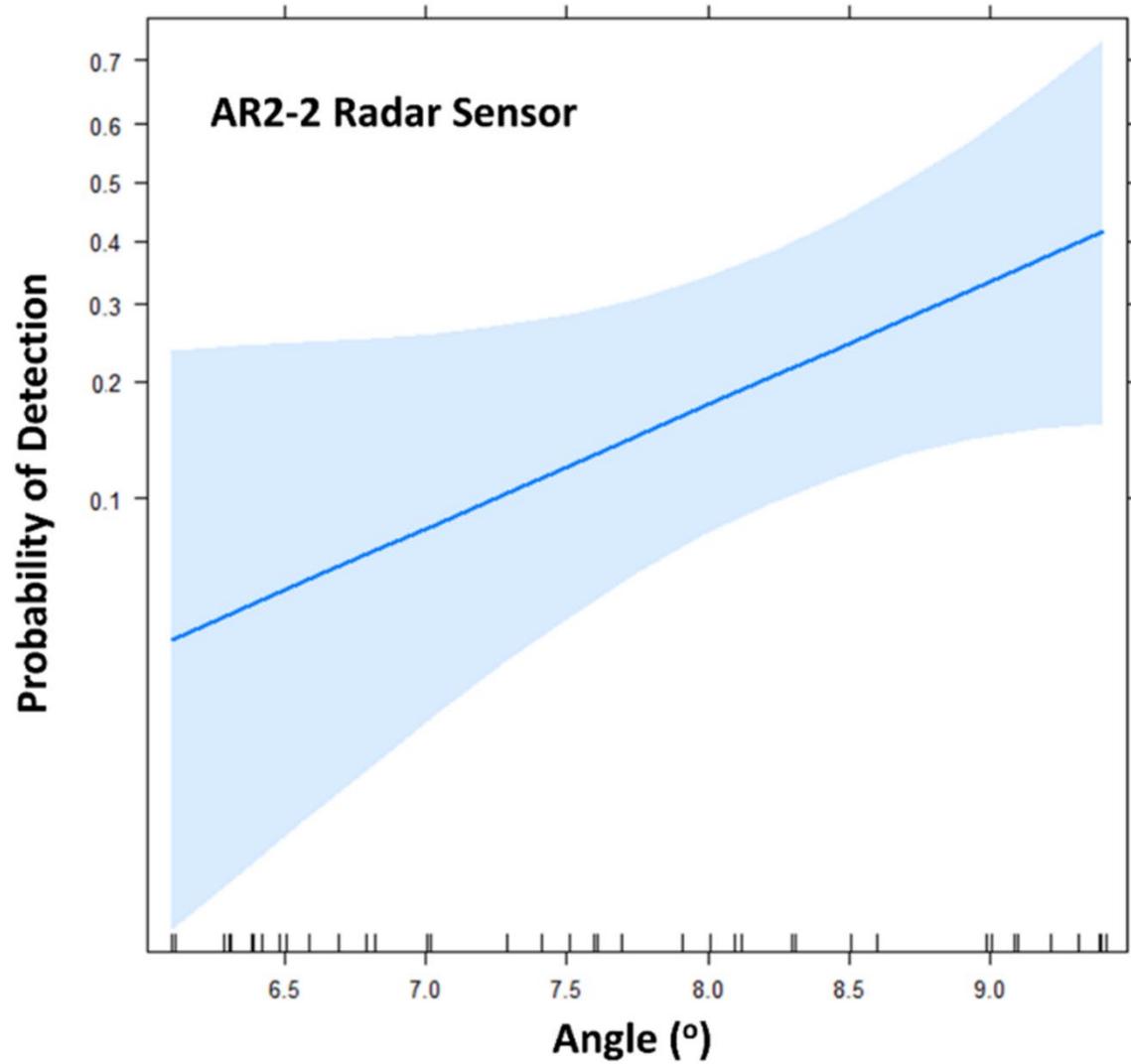


Parameter	Estimate	SE	LCL	UCL
<b>AR1 radar unit</b>				
Intercept	-1.56	0.70	-2.93	-0.19
Distance	<-0.001	<0.001	<-0.001	<-0.001
<b>AR2-1 radar unit</b>				
Intercept	-2.16	0.62	-3.70	-0.62
Distance	<-0.001	<0.001	<-0.001	<-0.001
Altitude	-0.01	0.01	-0.02	0.00
<b>AR2-2 radar unit</b>				
Intercept	-7.54	3.41	-14.22	-0.86
Angle	0.85	0.53	-0.19	1.90
<b>All radars combined</b>				
Intercept	-2.12	0.27	-3.14	-1.10
Distance	<-0.001	<0.001	<-0.001	<-0.001

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<b>All radars combined</b>				
Intercept	-2.12	0.27	-3.14	-1.10
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## *In Summary.....*

- **Overall, the synchronization rate was *low***
- **Distance of the target (bird) from the radar influenced radar performance**
- **Our findings were consistent with other studies**
- **Novel method for evaluating radar performance**



Technical Note

# Monitoring Raptor Movements with Satellite Telemetry and Avian Radar Systems: An Evaluation for Synchronicity

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