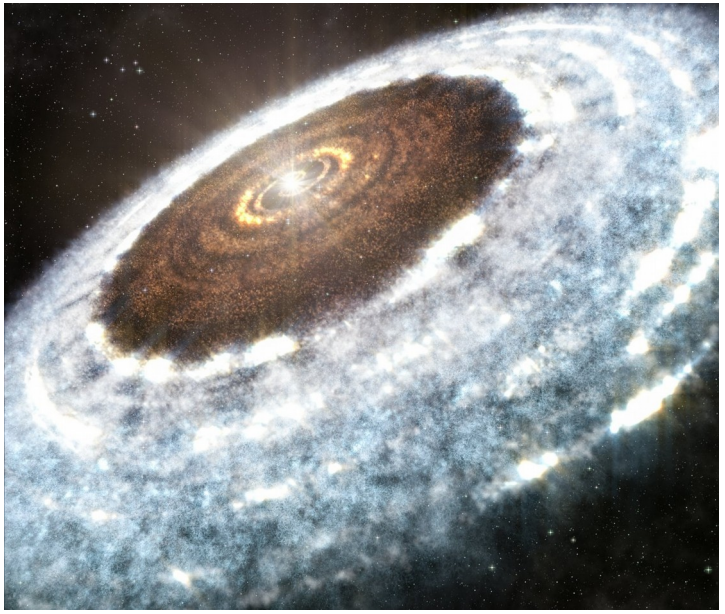
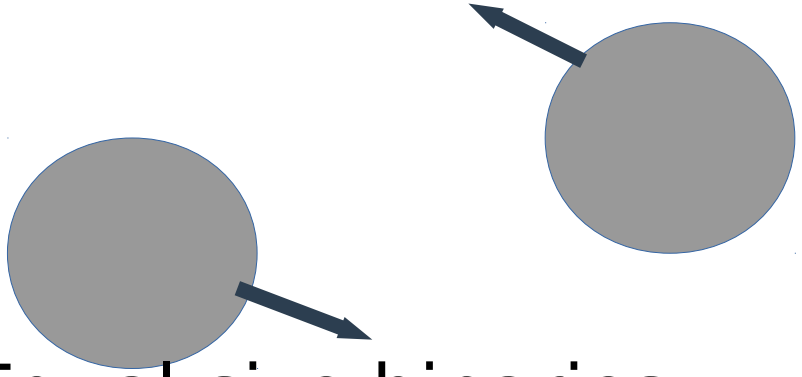
Tight and contact binaries from occultations

Rodrigo Leiva
Southwest Research Institute
Boulder, CO

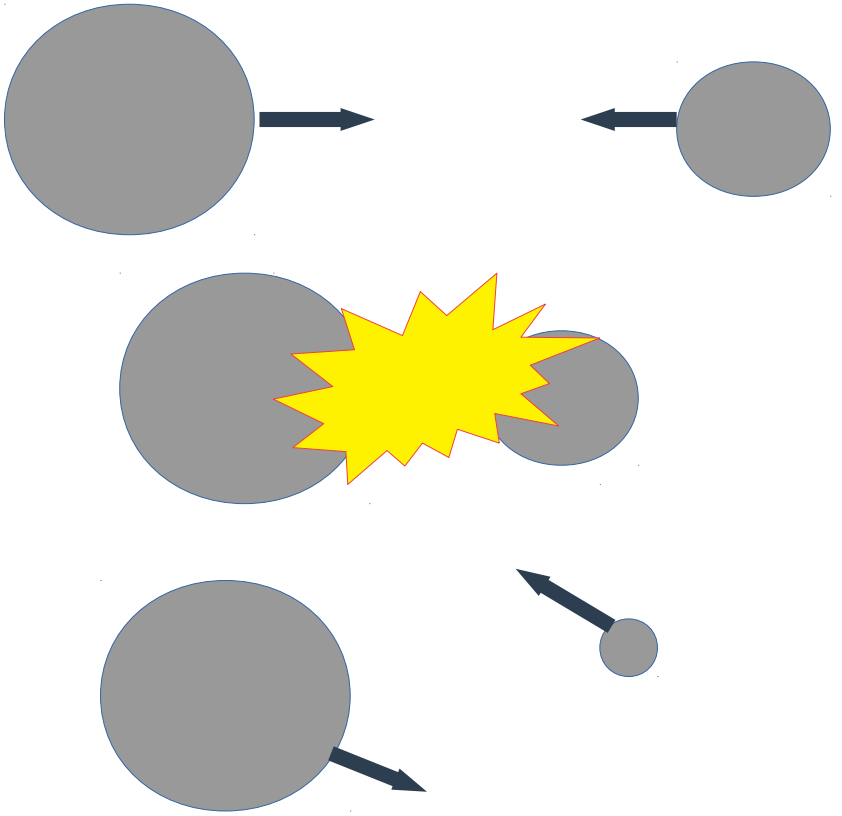
38th European Symposium on Occultation Projects (ESOP)
Paris – 2019

- **Binary TNOS**
- The RECON network
- A binary (and others) with RECON
- Future plans





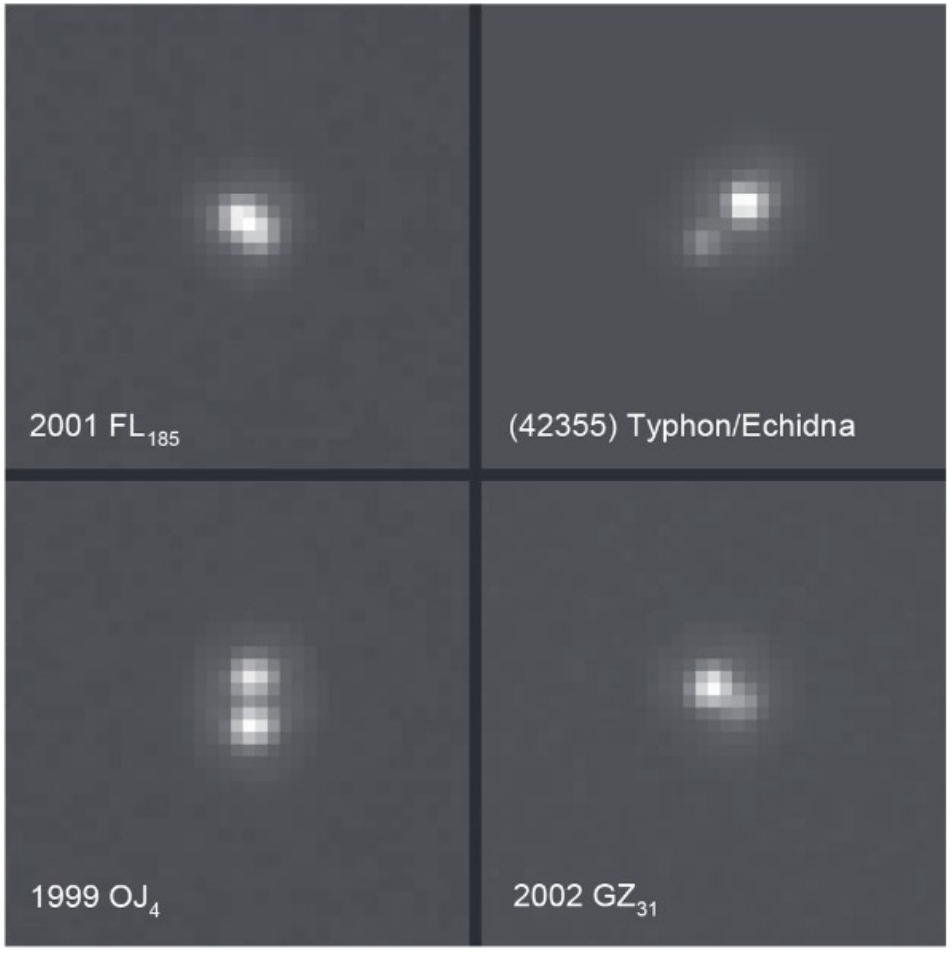
Equal-size binaries

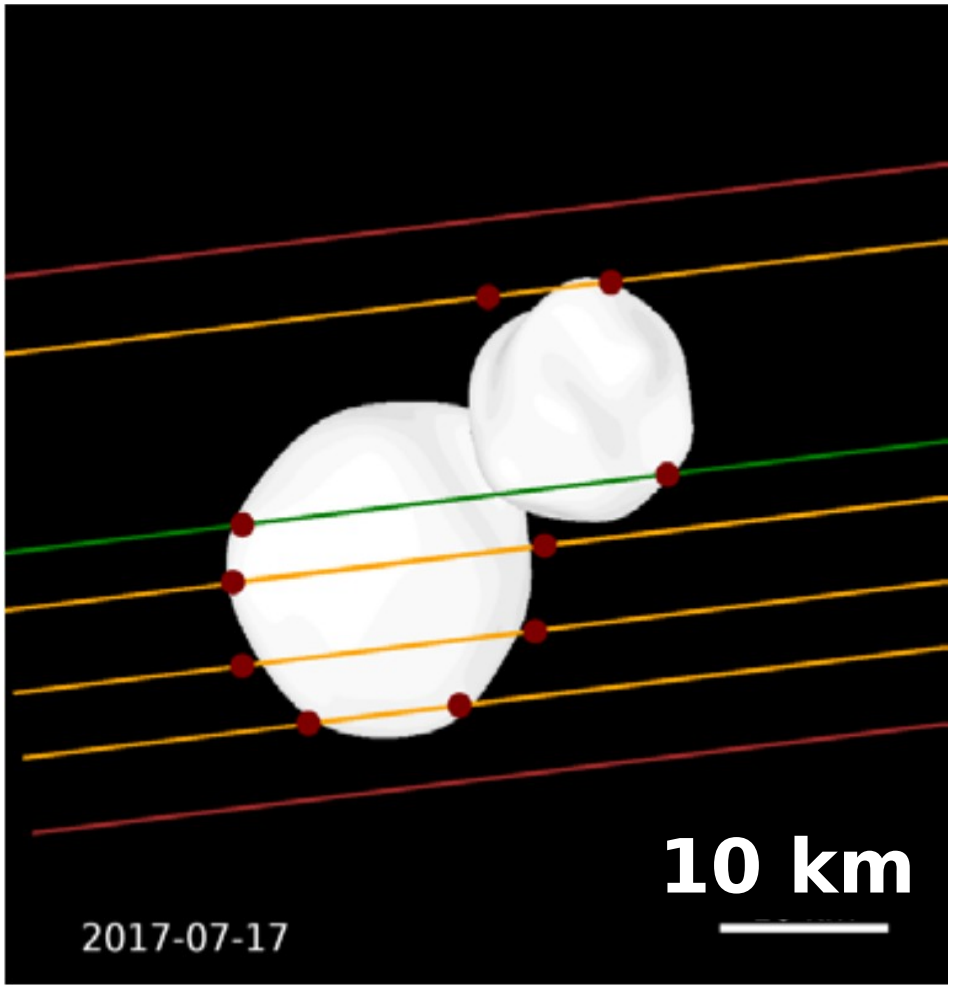


Large objects with small satellites.

Known binaries have been discovered from direct imaging: Hubble telescope.

Limited by the spatial resolution → separated by more than ~1000 km





Occultations showed that it was **a contact binary,** before the New Horizons spacecraft encounter.

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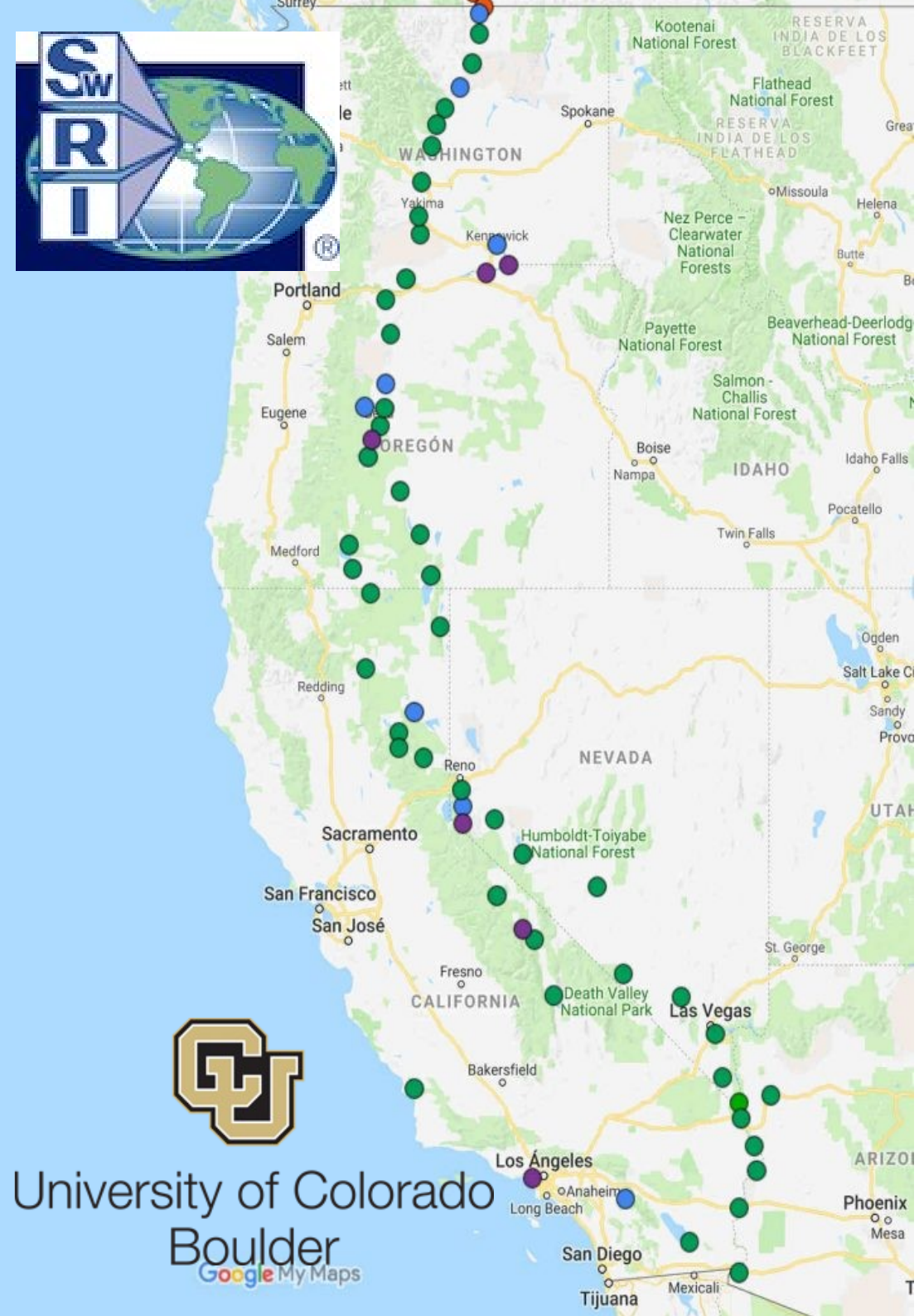
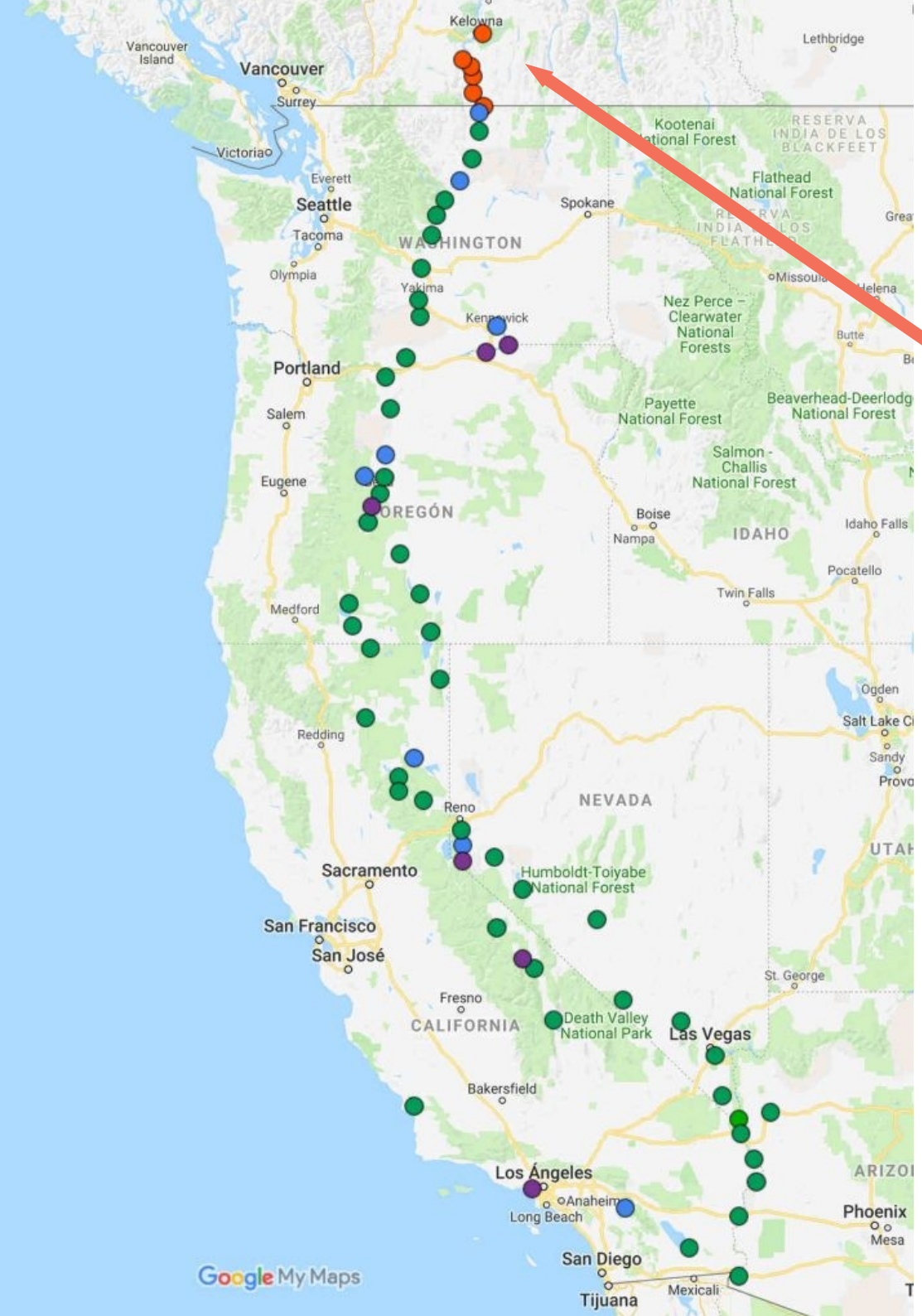


RECON

Research and
Education
Collaborative
Occultation
Network

PIs:
Dr. Marc Buie, SwRI
Dr. John Keller, CU

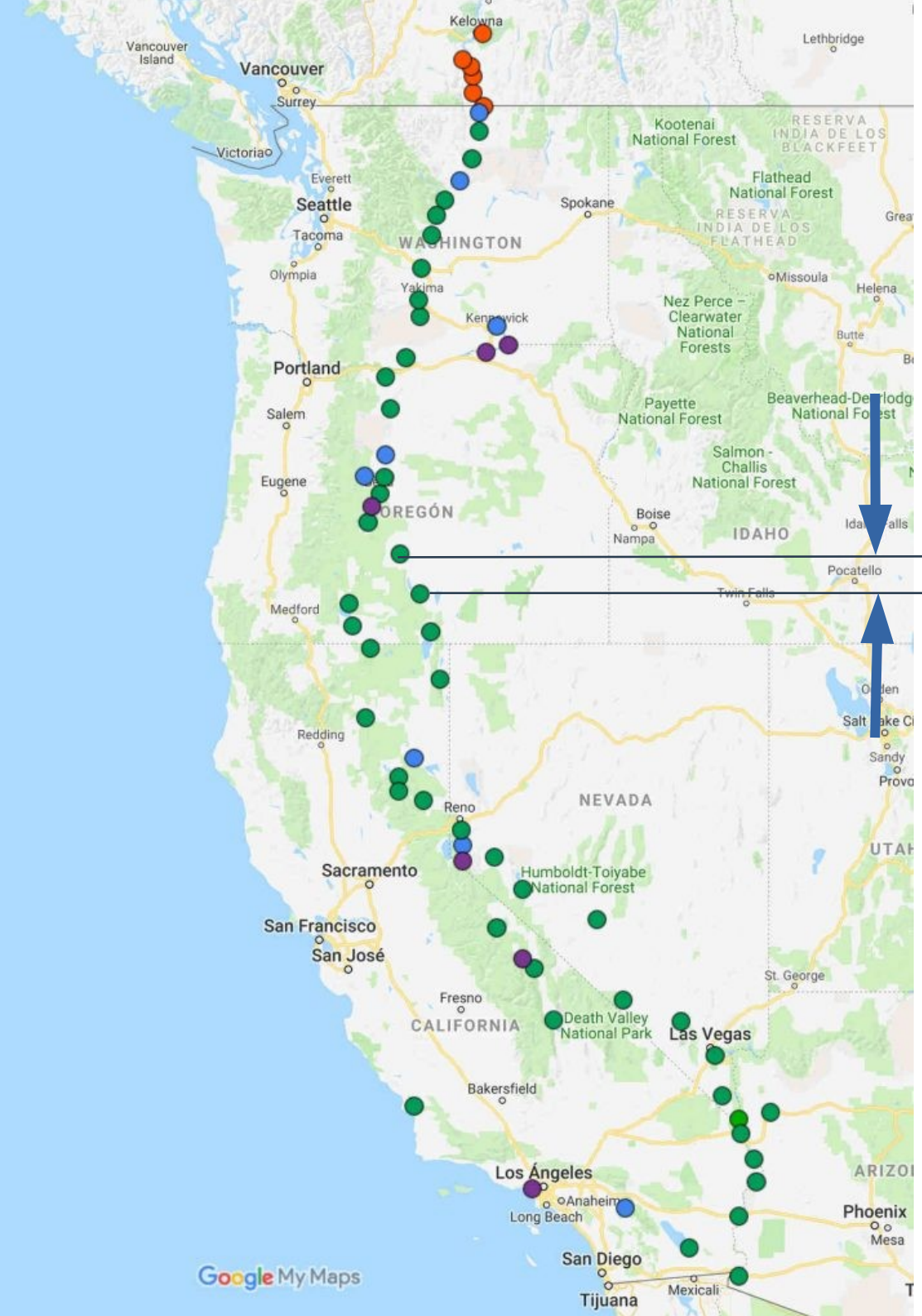


CanCON

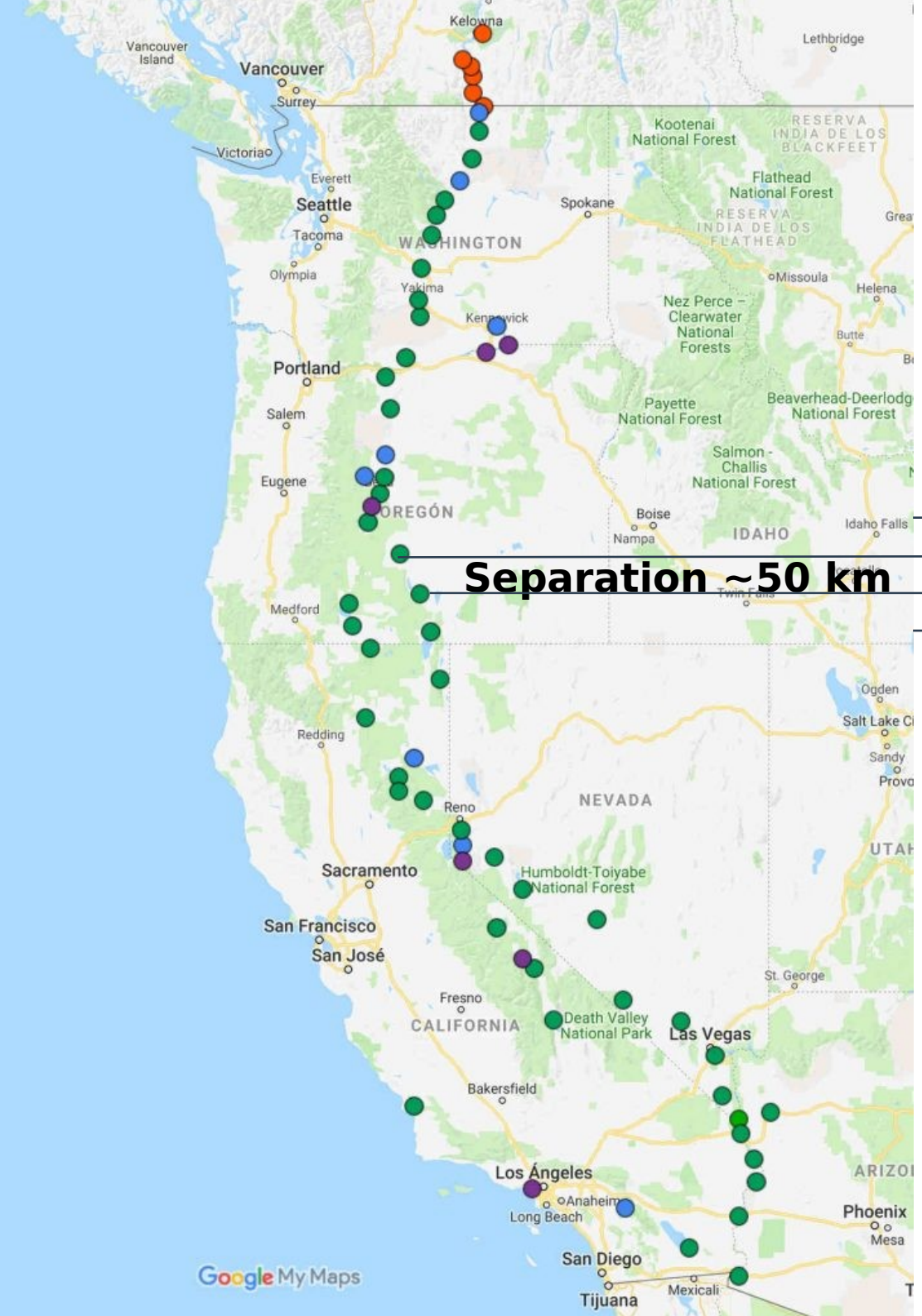
Dr. JJ Kavelaars

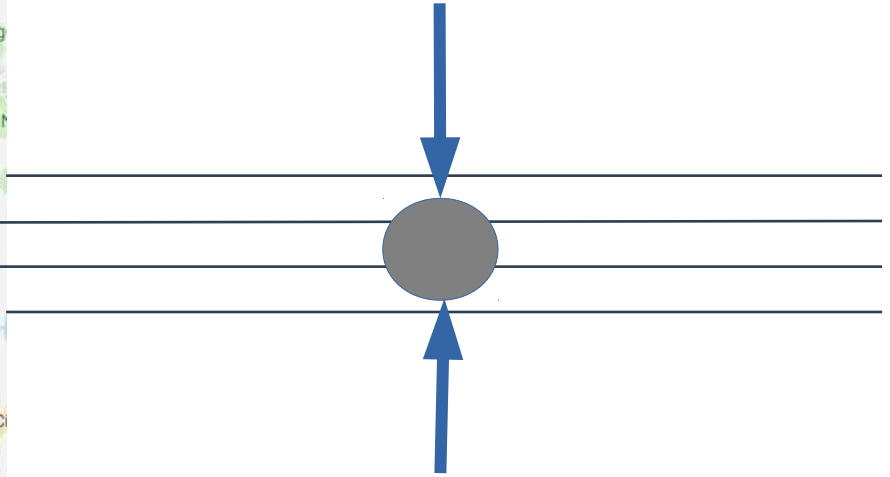
Dr. Terry Bridges

Research and
Education
Collaborative
Occultation
Network

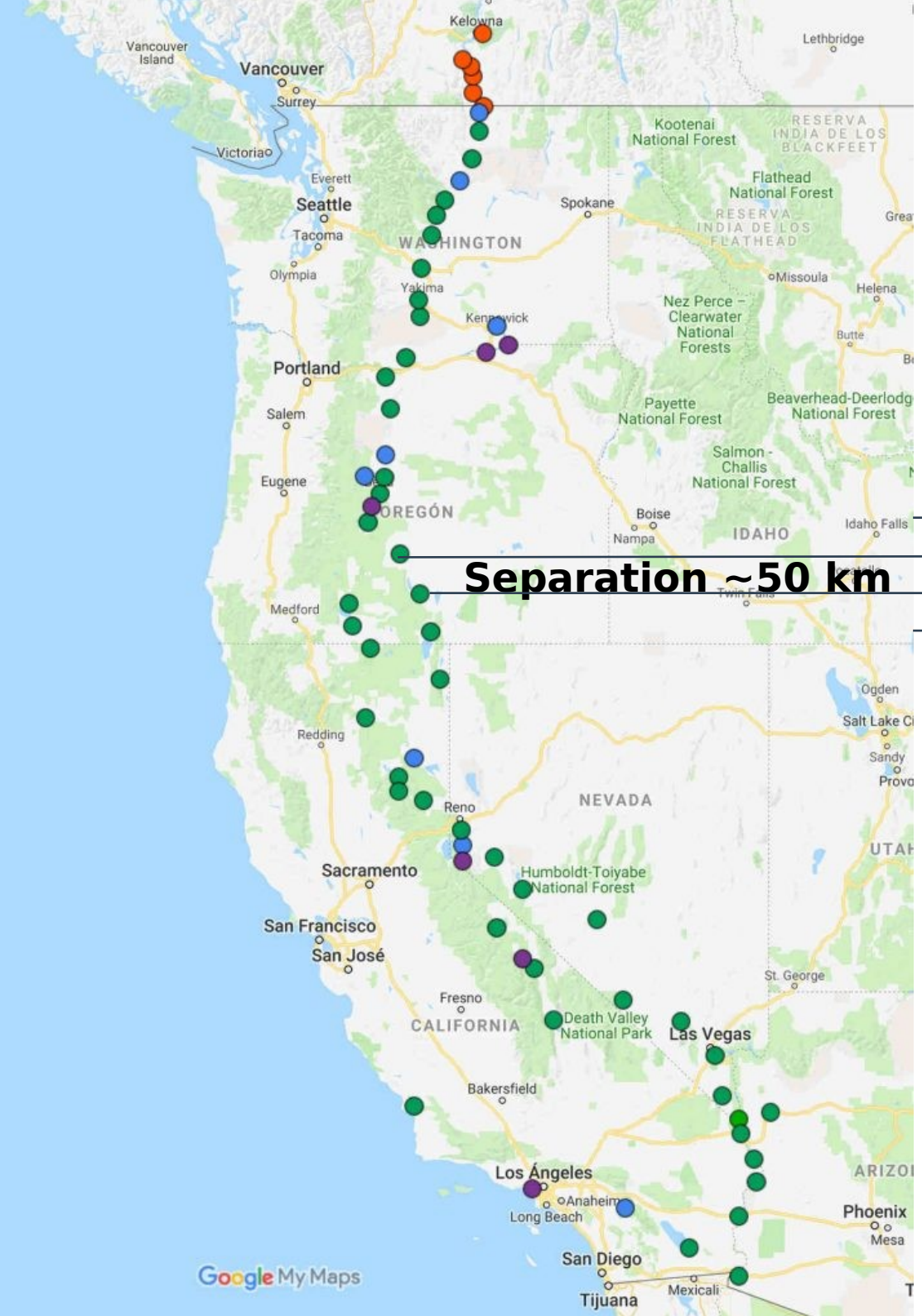


Separation ~50 km

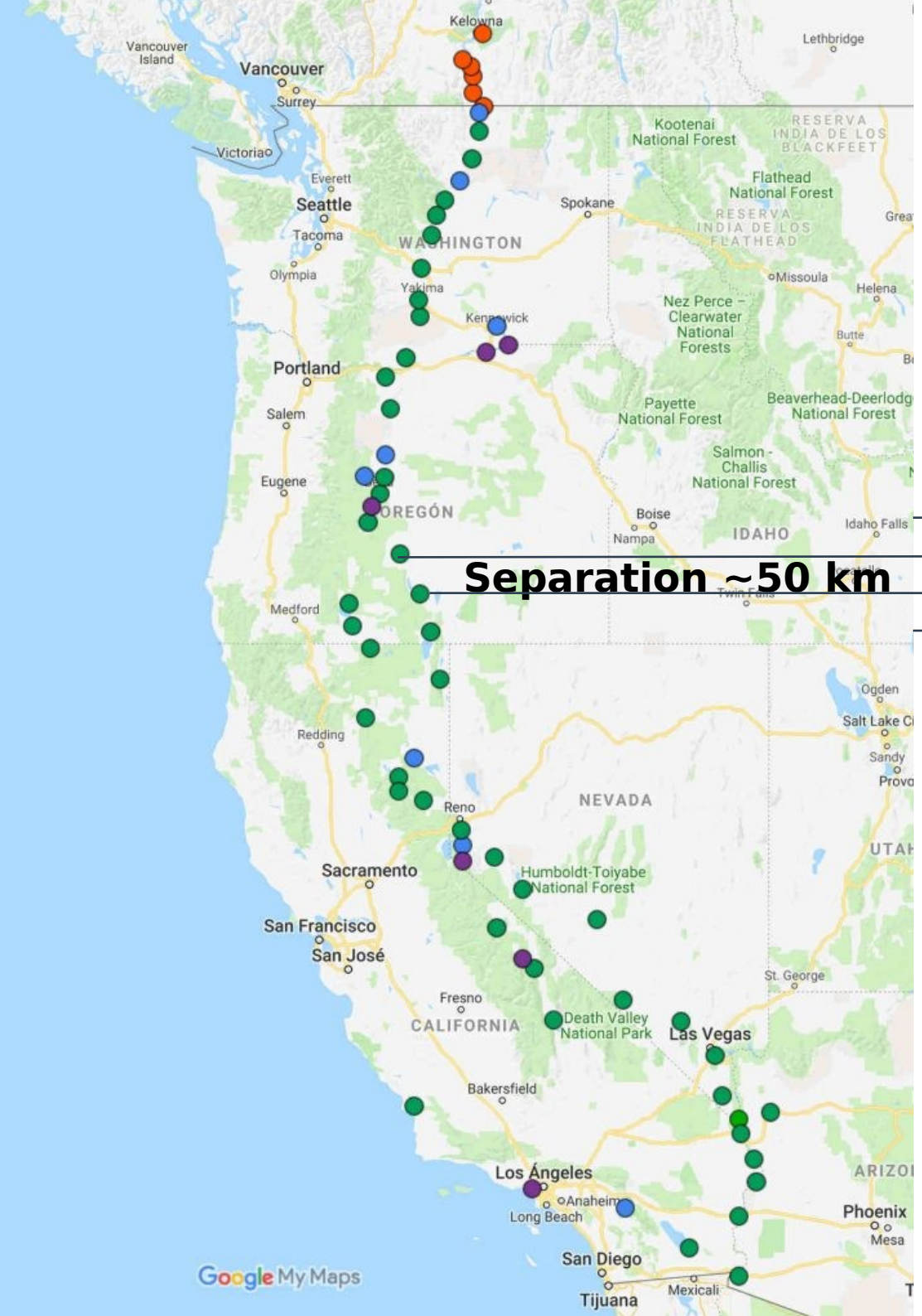




To measure objects with
Diameter > 100 km



Tight binaries
and
contact binaries



Tight binaries
and
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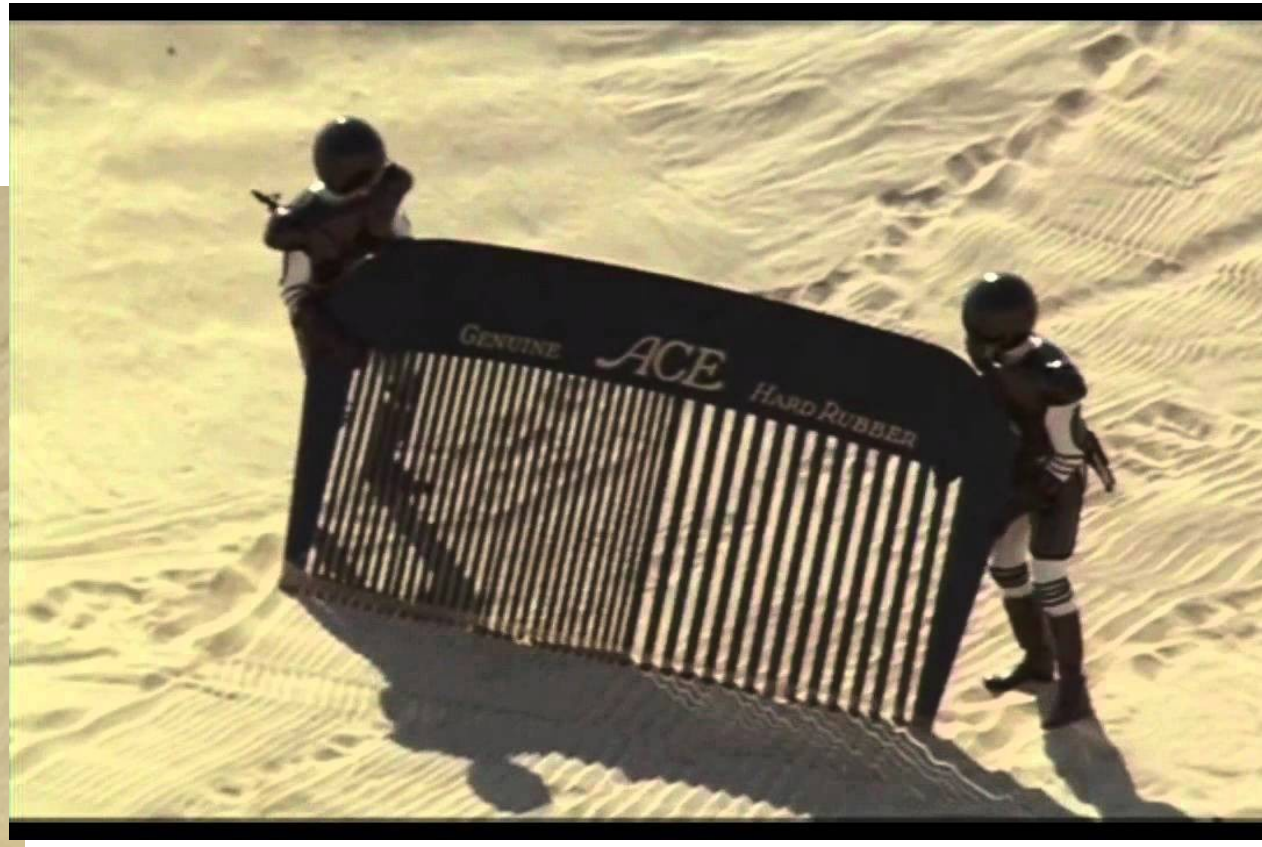
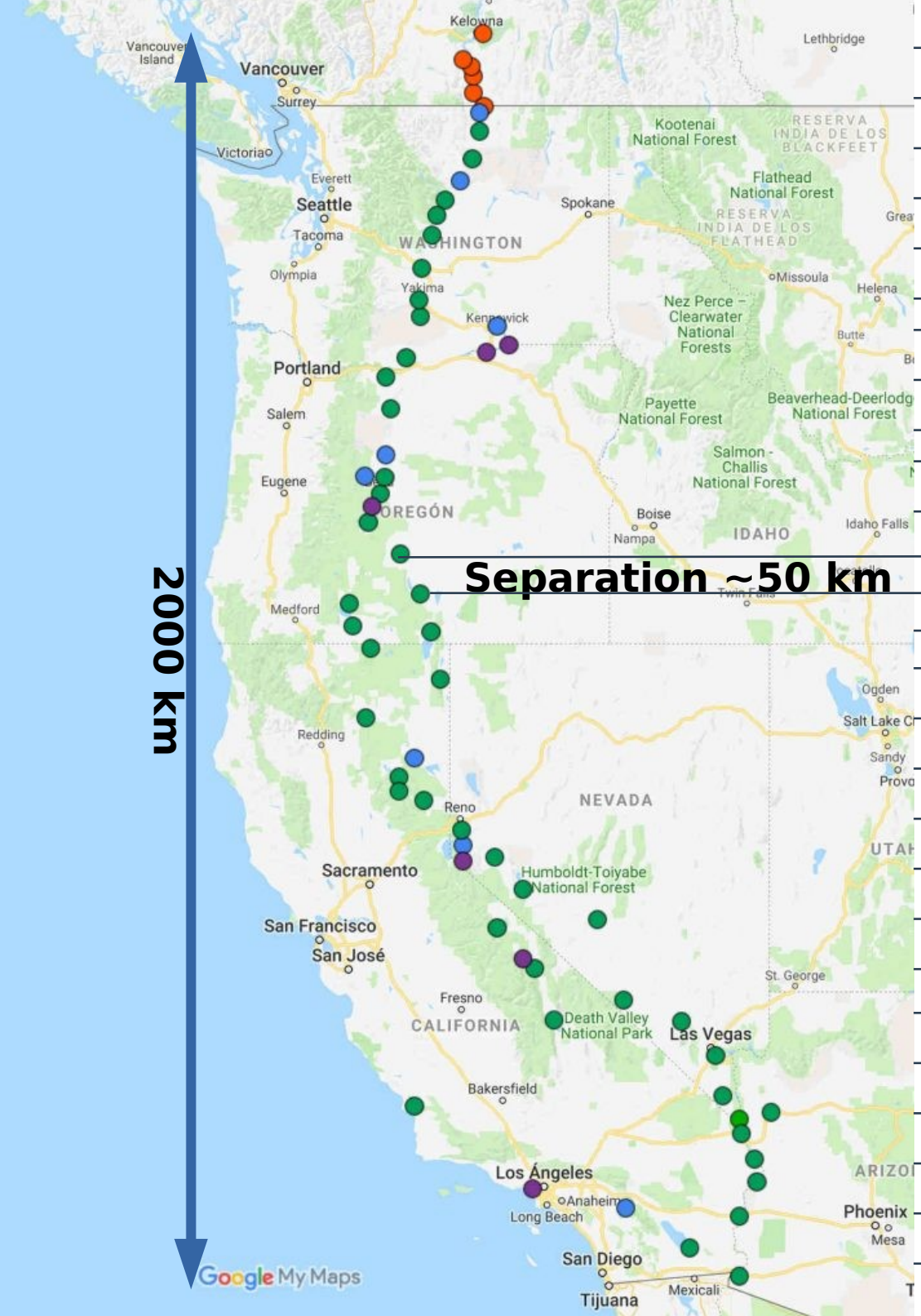
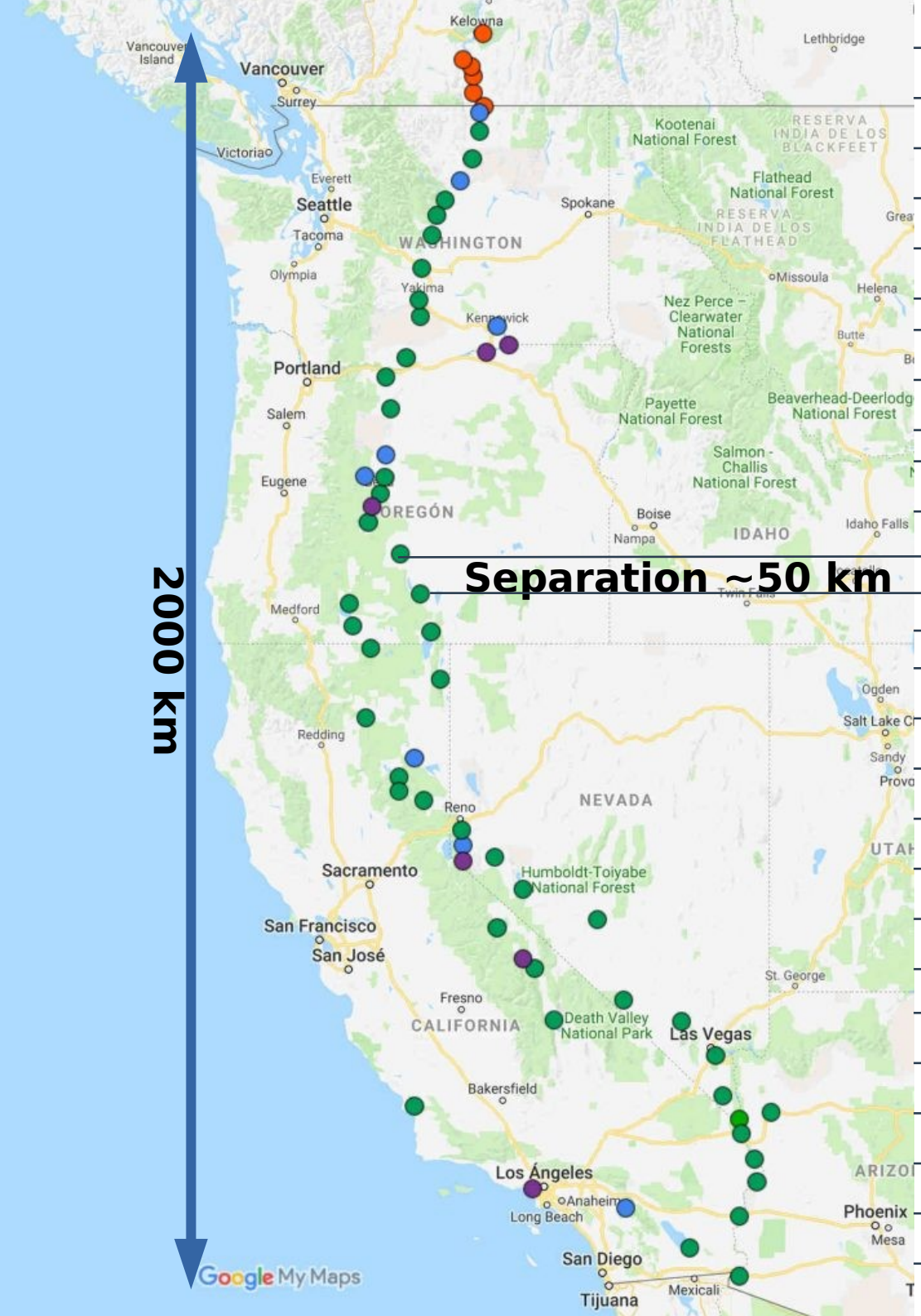
Low uncertainty Occultations (eg. Lucky Star)



Decent uncertainty Occultations (RECON)


2000 km
Separation ~50 km
Kelowna
Vancouver
Surrey
Victoria
Seattle
Tacoma
Olympia
Everett
Spokane
WASHINGTON
Yakima
Kennewick
Portland
Salem
Eugene
OREGÓN
Medford
Redding
Reno
NEVADA
Sacramento
San Francisco
San José
Fresno
CALIFORNIA
Bakersfield
Los Ángeles
Anaheim
Long Beach
San Diego
Tijuana
Mexicali
Las Vegas
Death Valley National Park
Humboldt-Toiyabe National Forest
Kootenai National Forest
Flathead National Forest
Nez Perce – Clearwater National Forests
Payette National Forest
Salmon - Challis National Forest
Beaverhead-Deerlodg National Forest
Missoula
Helena
Butte
Boise
Nampa
IDAHO
Idaho Falls
Twin Falls
Lethbridge
Ogden
Salt Lake C
Sandy
Provo
UTAH
St. George
ARIZO
Phoenix
Mesa
Google My Maps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Payette National Forest
Salmon - Challis National Forest
Beaverhead-Deerlodg National Forest
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- **A binary (and others) with RECON**
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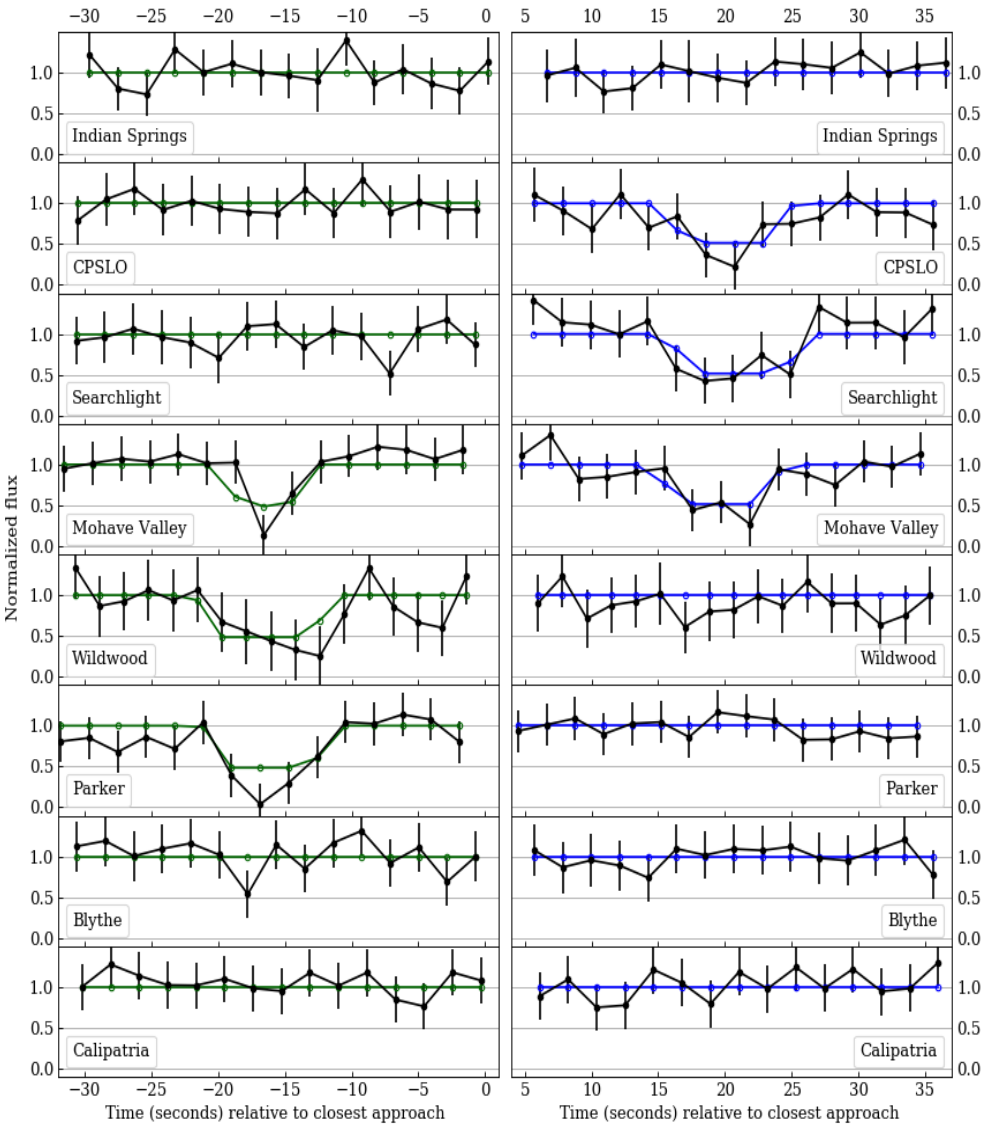
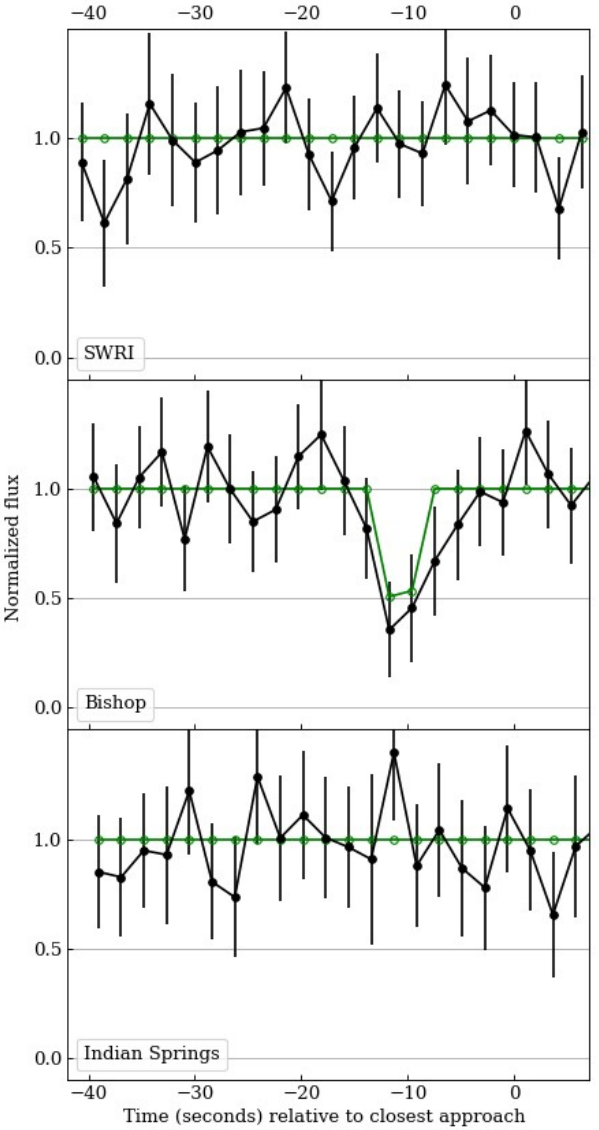
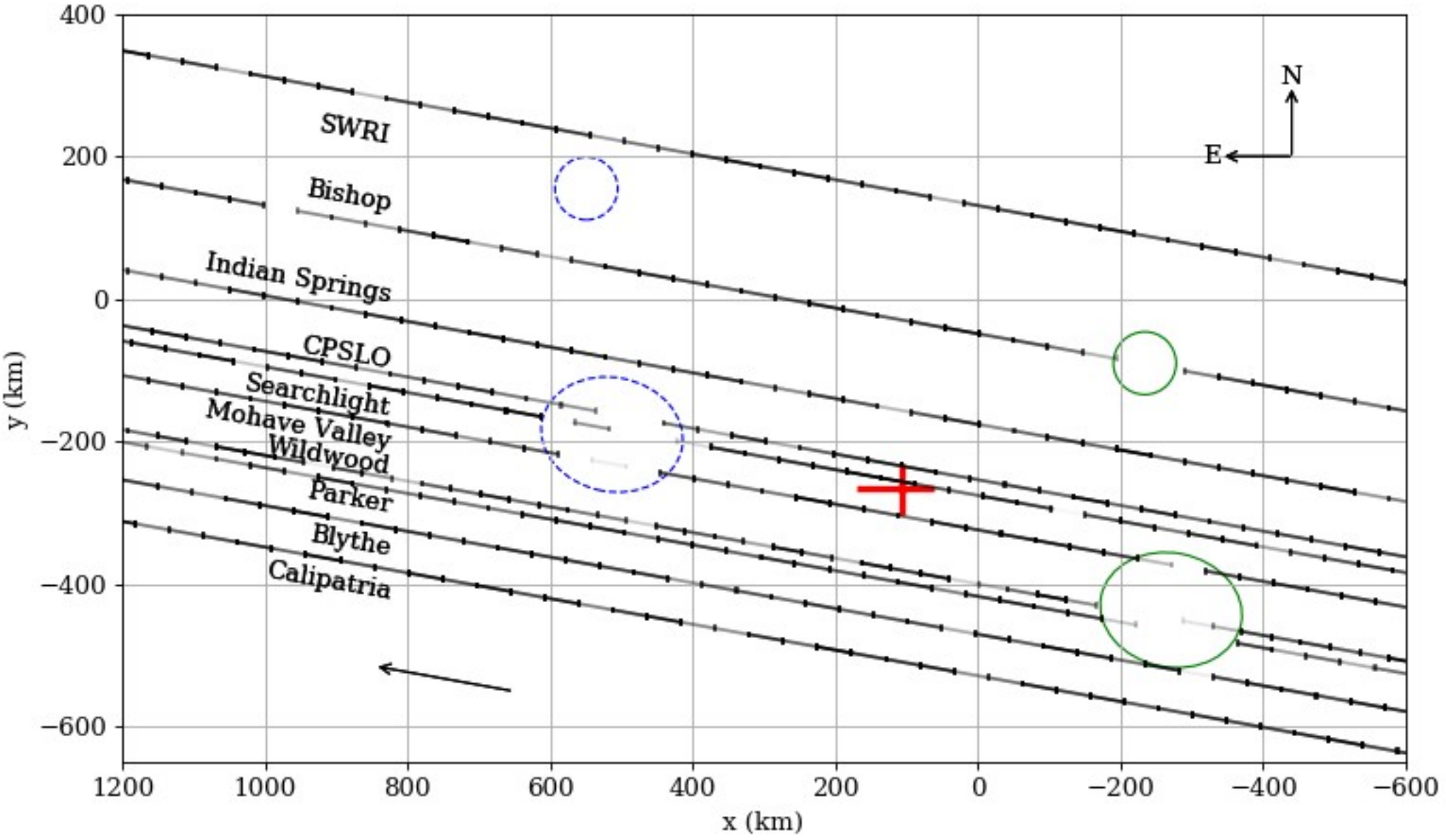
Plutino (523764) 2014 WC510






SWRI
Bishop
Indian Springs
CPSLO
Searchlight
Mohave Valley
Wildwood
Parker
Blythe
Calipatria
N
E
400
200
0
−200
−400
−600
1200
1000
800
600
400
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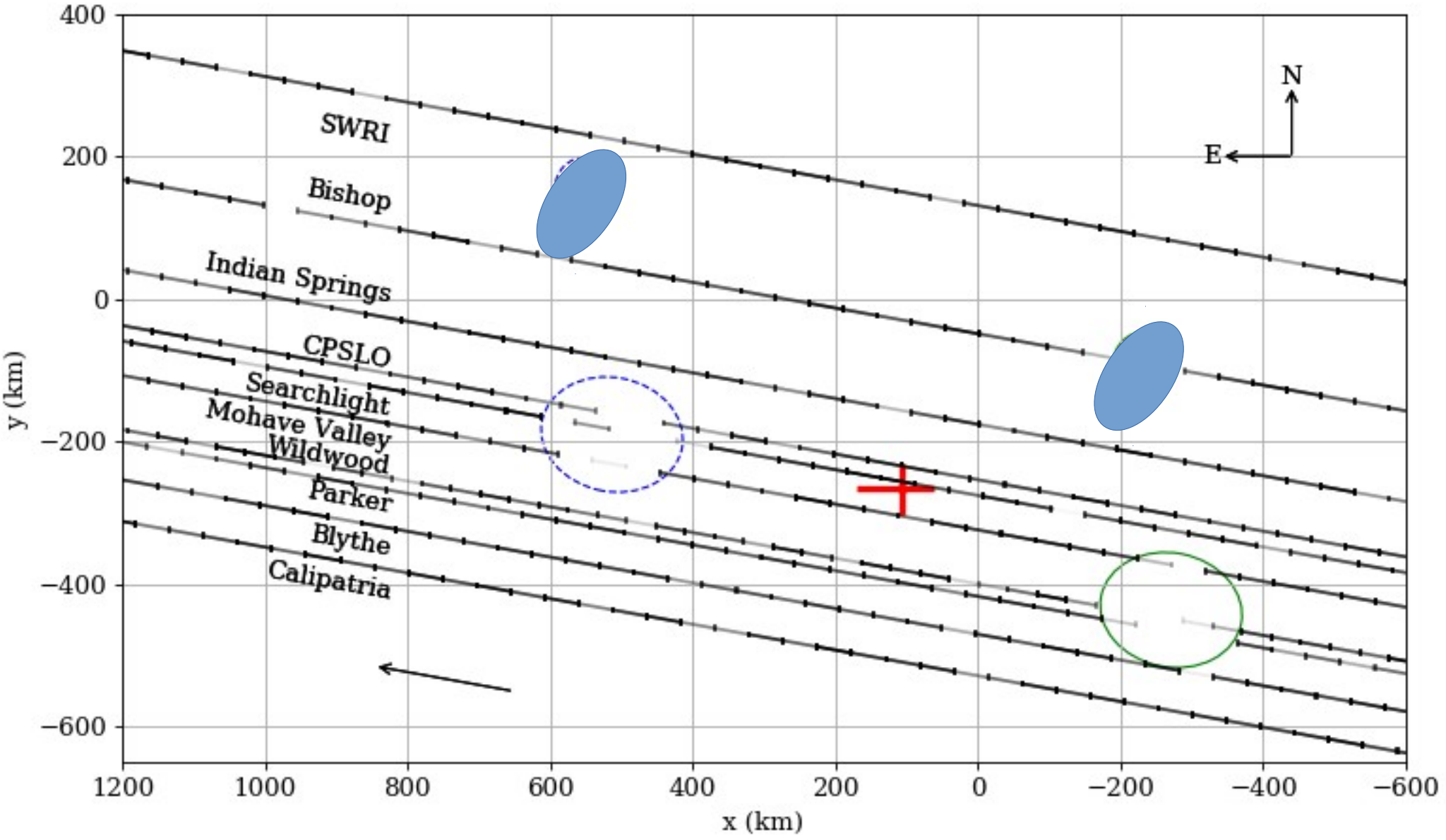
0
−200
−400
−600
y (km)
x (km)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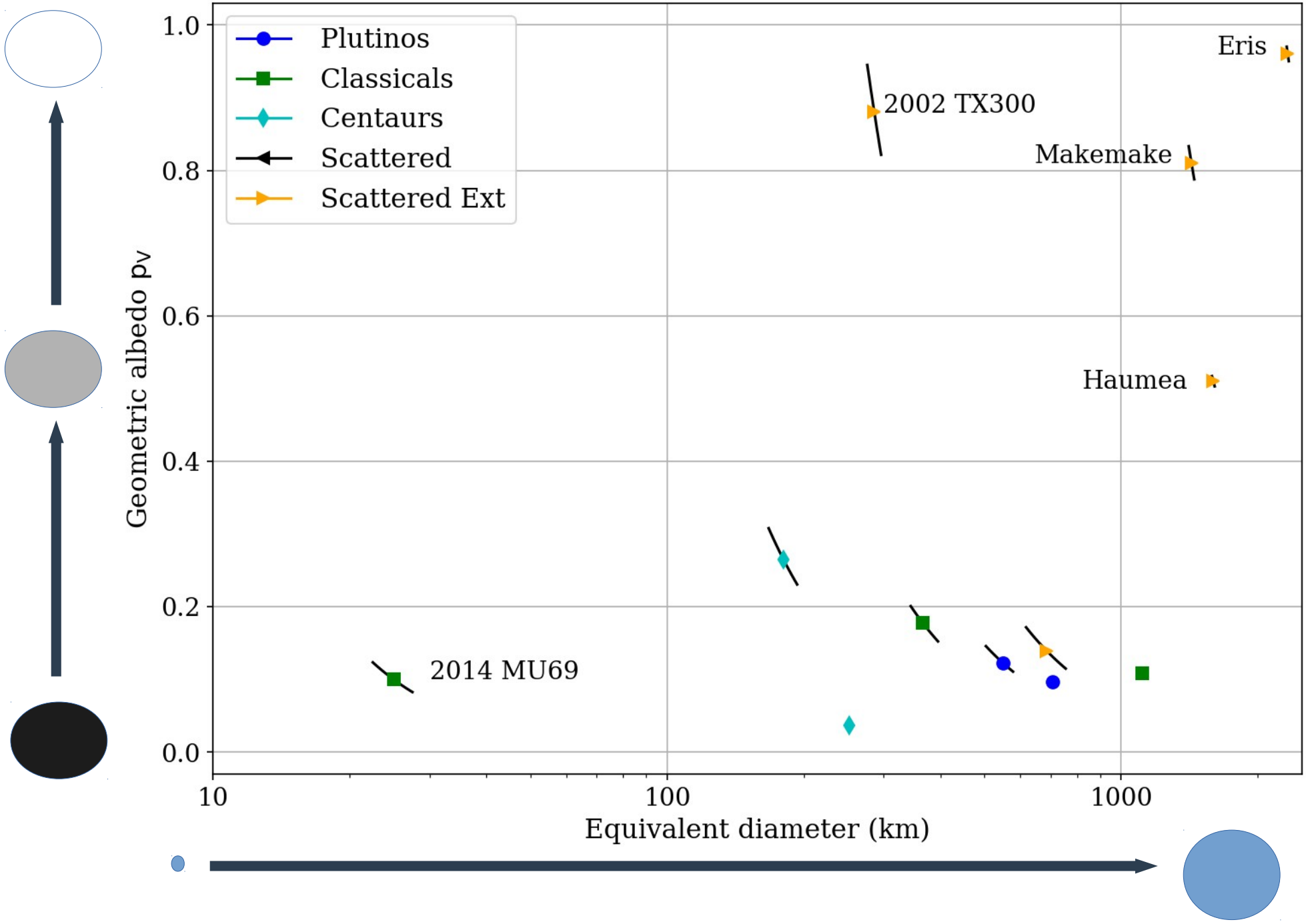
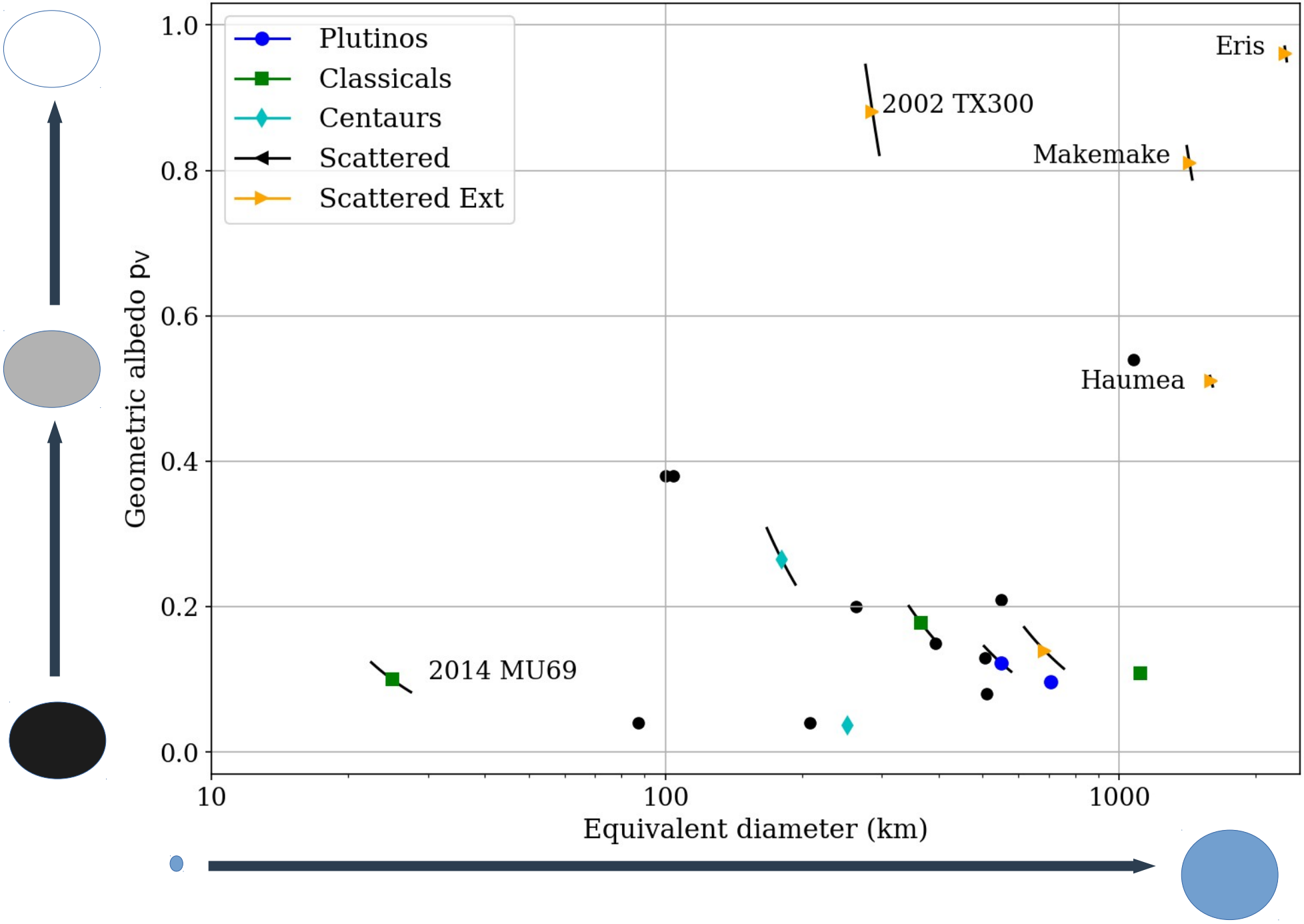

Plutinos
Classicals
Centaurs
Scattered
Scattered Ext
Eris
2002 TX300
Makemake
Haumea
2014 MU69
Geometric albedo pv
Equivalent diameter (km)
1.0
0.8
0.6
0.4
0.2
0.0
10
100
1000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Classicals
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2002 TX300
Makemake
Haumea
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Geometric albedo pv
Equivalent diameter (km)
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100
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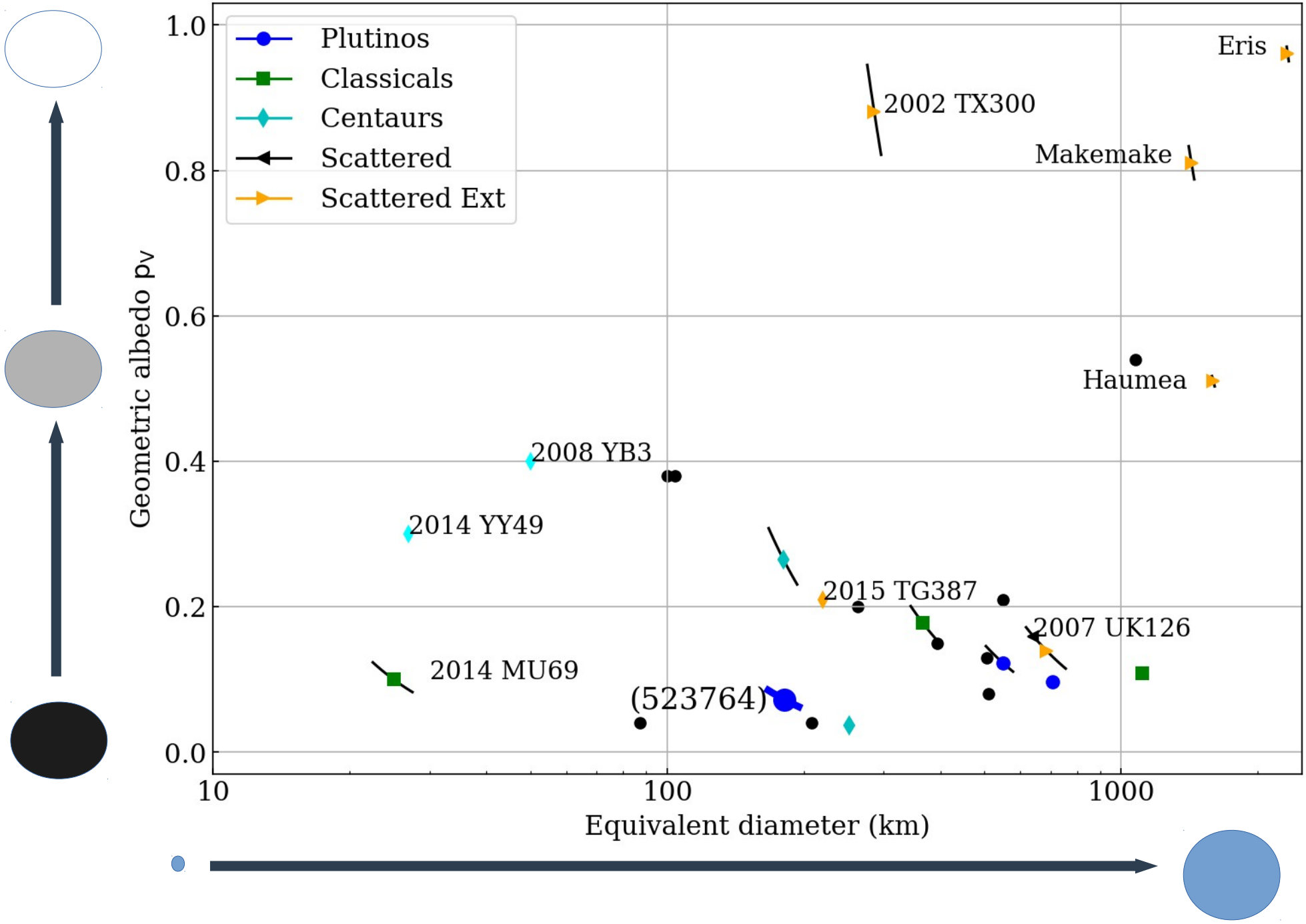

Plutinos
Classicals
Centaurs
Scattered
Scattered Ext
Eris
2002 TX300
Makemake
Haumea
2008 YB3
2014 YY49
2015 TG387
2007 UK126
2014 MU69
(523764)
1.0
0.8
0.6
0.4
0.2
0.0
Geometric albedo p_V
10
100
1000
Equivalent diameter (km)

- Binary TNOS: why we care?
- The RECON network
- A binary (and others) with RECON
- **Future plans**

Future plans: go robotic

RECON during the team meeting. March 2019.

University of Colorado Boulder

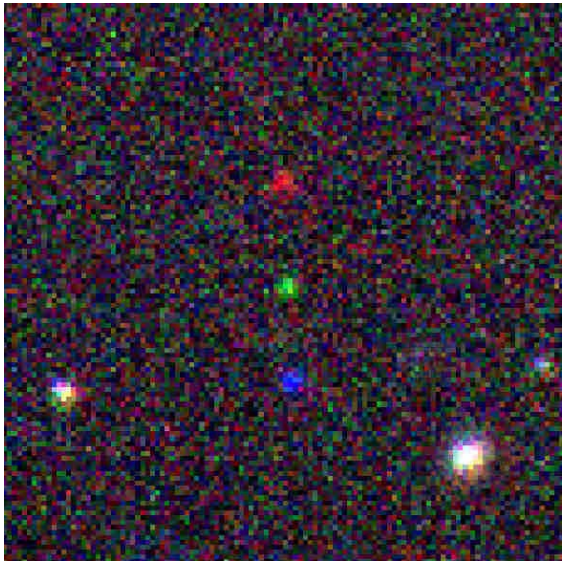
RECON

SwRI

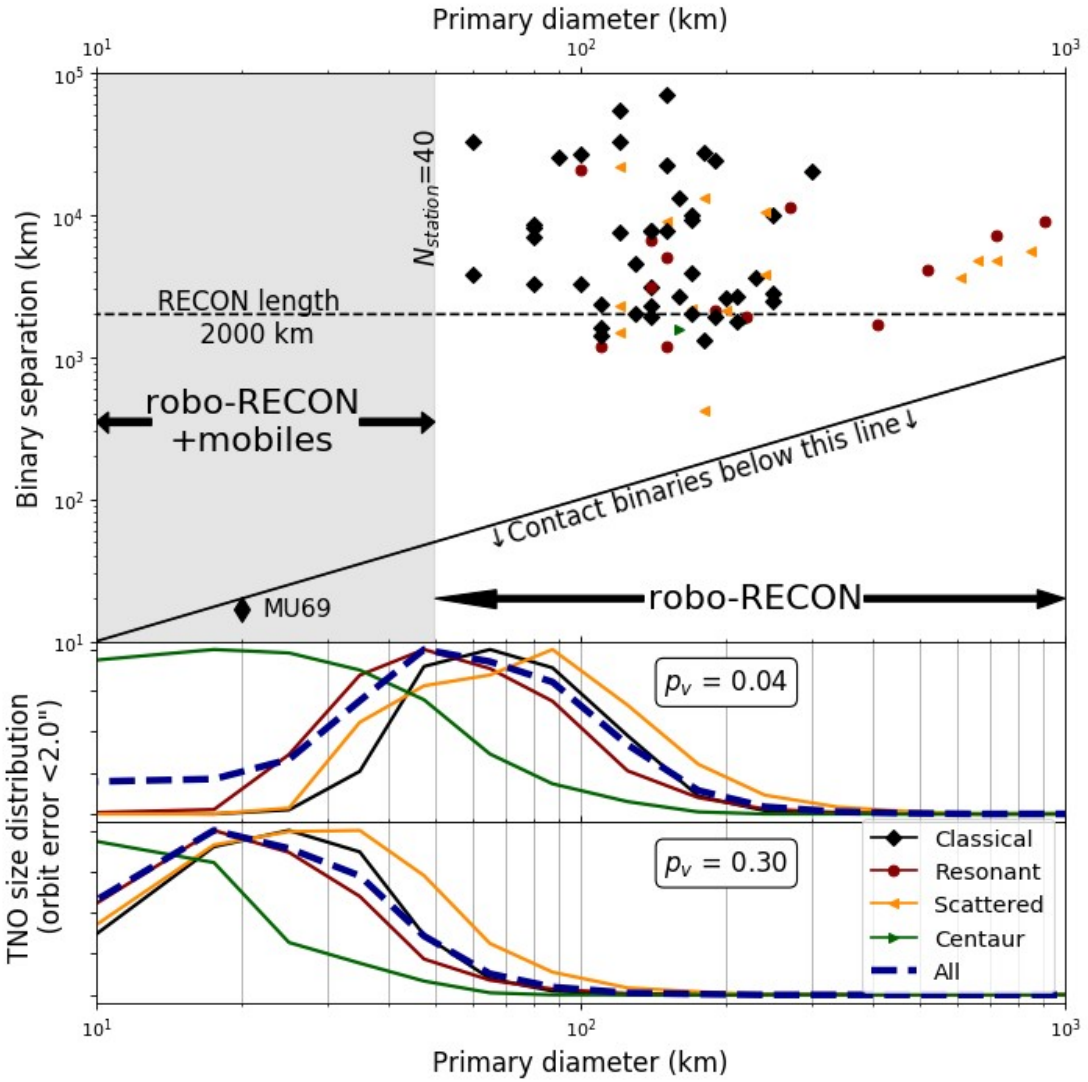
RECON and collaborators astrometry 2018-2019 stats

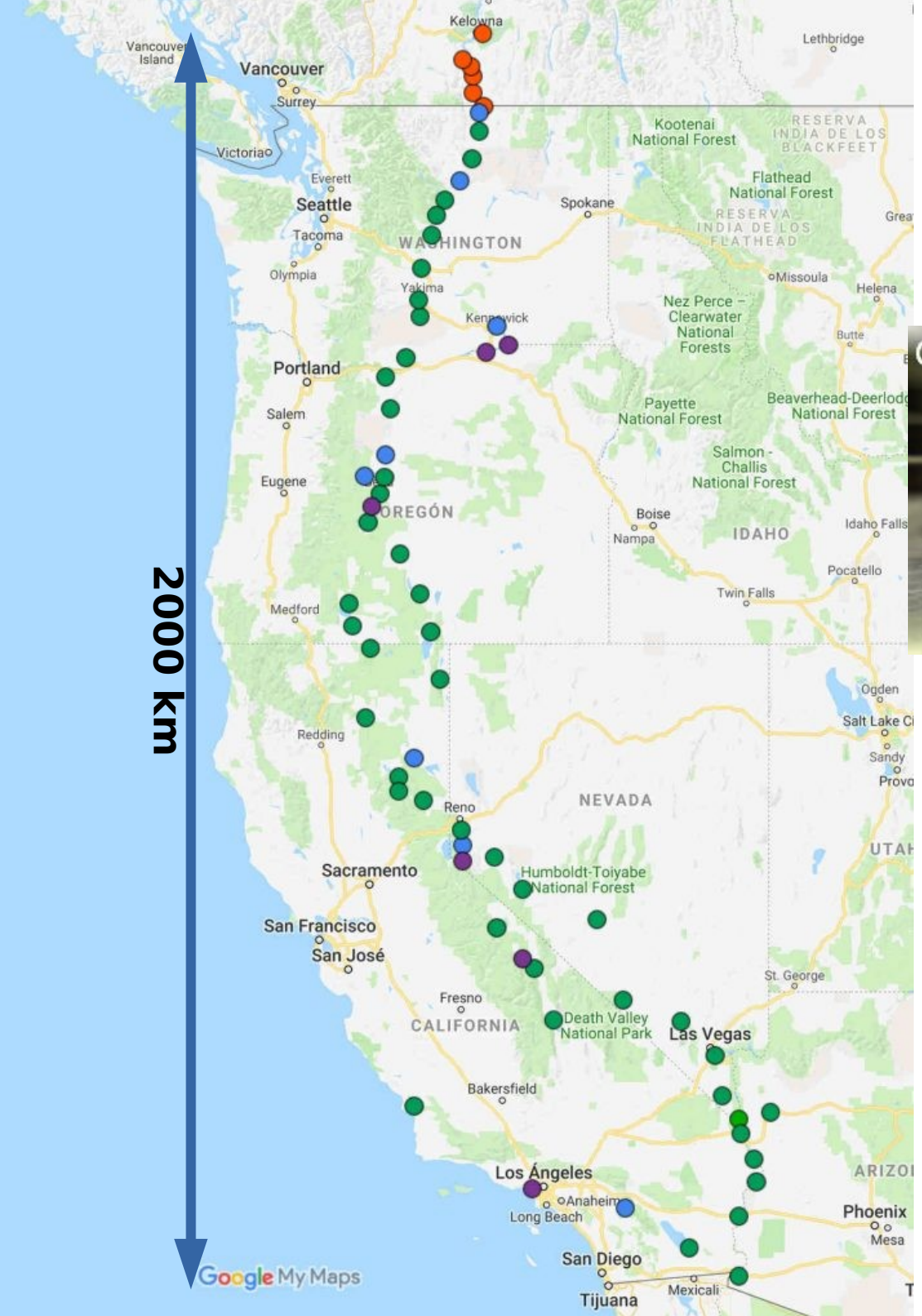
- **48/171 from APO**
- 38/139 from CFHT
- 47/103 from DCT

426/47252 from Pan-STARRS



Future plans: go robotic





Celestron CPC1100