Astrometric positions for the irregular satellites of the Giant Planets

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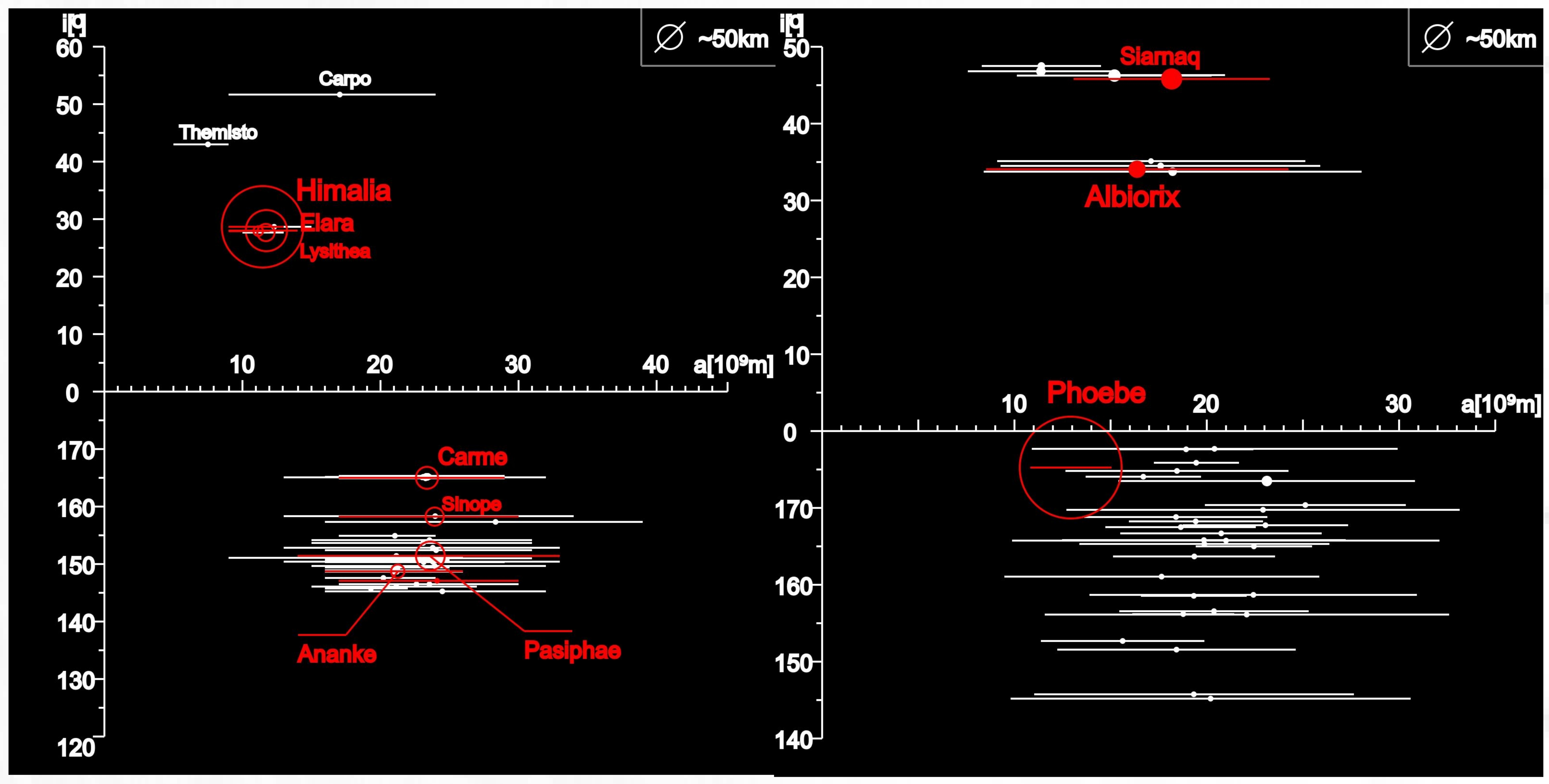
The irregular satellites of the giant planets, mainly from Jupiter and Saturn, are much smaller than the regular ones. They have irregular shapes and their orbits are more eccentric with larger semi-major axes. Some of them have retrograde orbits. Explaining their existence is an interesting study in orbital dynamics. It's generally accepted that, due to their orbital configuration, they were captured by their planets. Stellar occultations are a method that would allow us to know better their physical features (size, shape, density) since they are not visited, at the moment, by any spacecraft. But their orbits are known with little precision, which is bad to obtain a good prediction for an occultation.

Irregular Satellites of Jupiter e Saturn



In this work, we aimed at organizing and reducing CCD images of the Jovian and Saturnian Irregular Satellites observed at the Observatório do Pico dos Dias (1.60 and 0.6m telescopes), at the Observatoire Haute-Provence (1.2m telescope) and at ESO (2.2m telescope). The observational data from these three observatories comprise more than 100,000 images. The reduction of this considerable amount of images with the necessary accuracy in position was only possible with the use of PRAIA. First, we eliminate discrepant positions night by night using a sigma-clip procedure. Then, we analyze the differences between the observed and ephemeris positions of the satellites to better constrain the origin of systematic differences and properly provide corrections to the orbits of the satellites. The projection of the orbits on the sky, along with vectors representing systematic effects on positions (see graphic below), clearly shows how this work contribute to a better determination of the orbits of the satellites .

Database: comparison between OPD, OHP and ESO

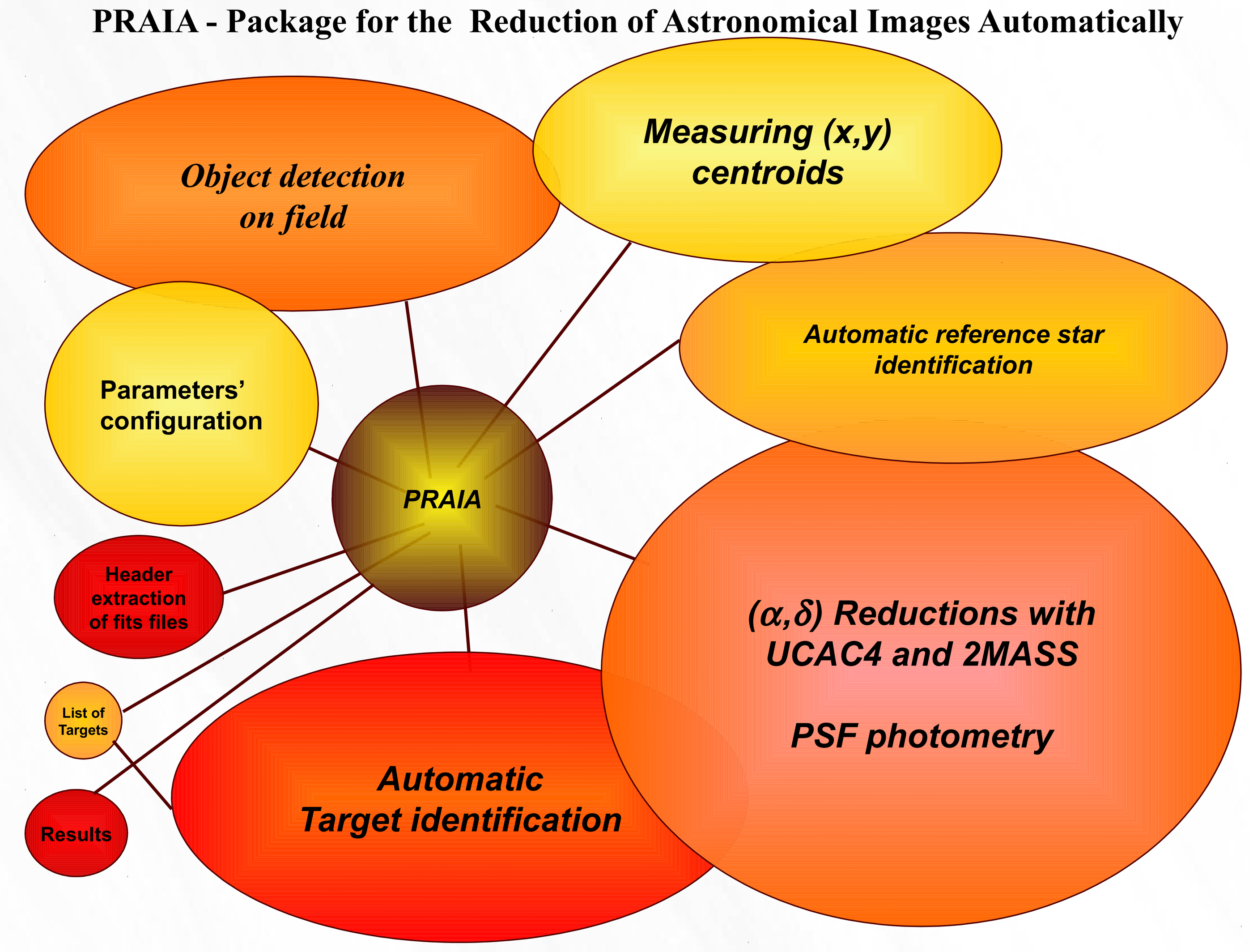
	OHP	OPD				ESO
Telescope	1.2m	1.6m	IAG (0,6m)	Zeiss (0,6m)	Total	2.2m
Images	27.963	30.380	50.240	7.979	88.599	1528
Nights	354	196	254	30	480	24
Filters	Clear	Clear, Methane, B, V, R, I				I
Period	1997 - 2008	1992-2012				2007-2009

Statistics by satellite/observatory

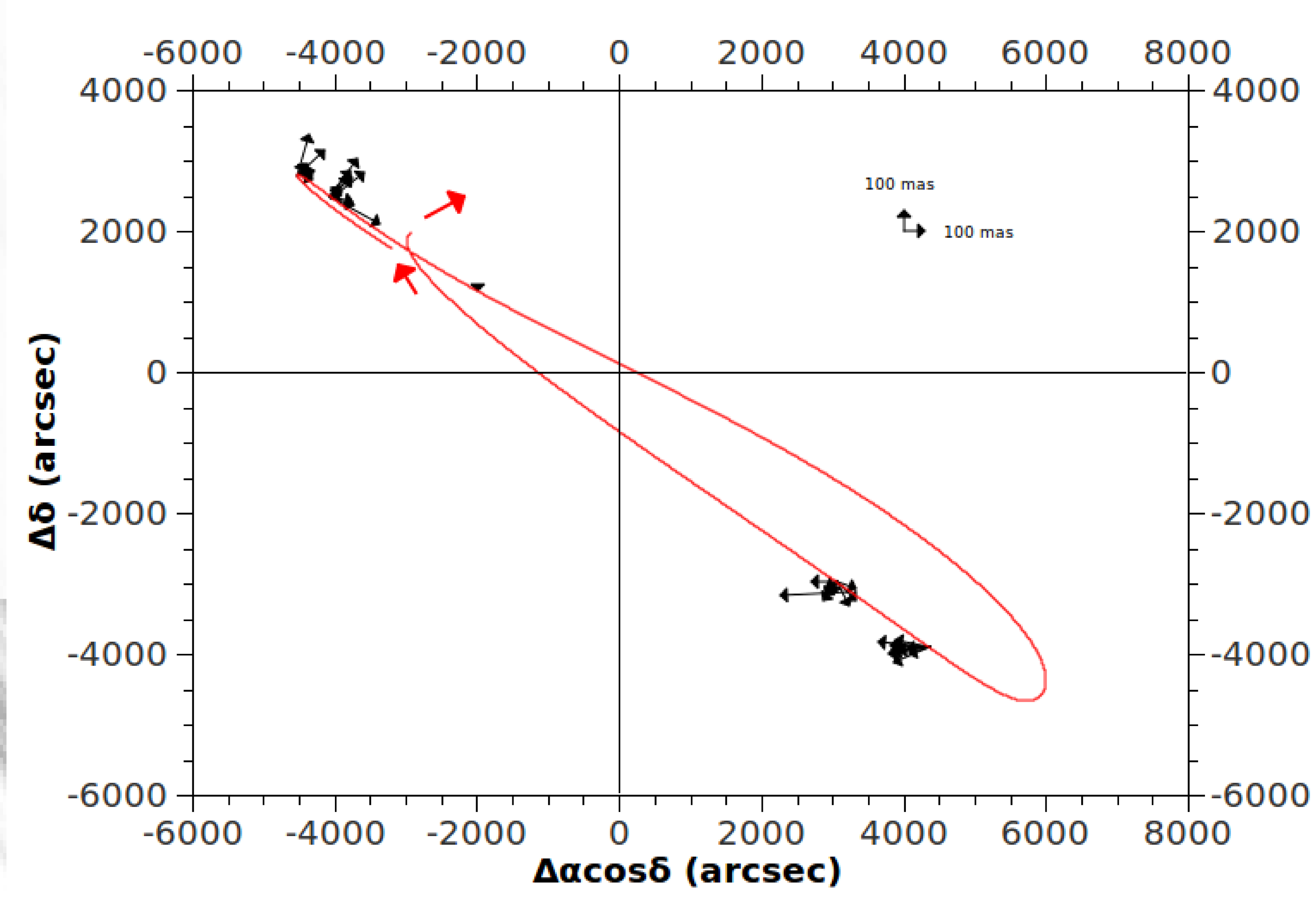
	Mag	OPD	OHP	ESO	OPD+OHP+ESO	Horizons*
Ananke	18.8	70	156	70	296	600
Callirrhoe	20.6	9	4	20	33	95
Carme	17.8	106	222	37	365	973
Elara	16.6	486	203	52	741	1115
Himalia	14.6	900	401	25	1326	1757
Leda	20.1	15	54	55	124	178
Lysithea	18.3	80	91	106	277	431
Megaclite	21.7			11	11	100
Pasiphae	16.8	329	258	75	662	1629
Praxidike	21.2			3	3	118
Sinope	18.2	55	189	11	255	854
Themisto	21			20	20	110
Albiorix	20.5		4	57	61	137
Paaliaq	21.1			14	14	82
Phoebe	16.3	1365	590	35	1990	3479
Siarnaq	19.9		29	59	88	239
Sycorax	20.8			48	48	474
Nereida	18.7	847		119	966	1432

* Jacobson, R. A. et al, 2012, The Astronomical Journal

PRAIA - Package for the Reduction of Astronomical Images Automatically



Carme - Orb4: Out/02 - Set/04



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