Guía Exhibición Posters & Charlas

Astronomía Dinámica en Latinoamérica

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ABSTRACTS POSTERS

POSTER ID: 1
AUTHOR: Carlos Abad
TITLE: Looking for open clusters by using the convergent point version of the Herschel's method
ABSTRACT: Proper motions are the best and fast screening when looking for open cluster members. Deep observations show their double face: benefits and problems. While it makes possible to know more about the sky, they crowd the number of points into the 2" by 2" area where the vector point method applies. The Convergent Point, based on the Herschel's method, permits to extend to the celestial sphere the field of representation for proper motions. A correct interpretation of the new geometry introduced by Herschel is necessary to exploit the natural role of this kinematics stellar propierty.

POSTER ID: 2
AUTHOR: Carolina Agurto
TITLE: VVV Galactic Star Clusters: VVV CL059
ABSTRACT: The VISTA variables in the Vía Láctea (VVV) maps the inner disk and bulge area of our galaxy, and one of the principal objectives is to search for new star clusters in 5 different infrared bands with the aim to build a statistically signi□cant sample. The new open clusters allows us not only to estimate their distance and age, but also provided important information about formation, evolution and dinamical theories of this systems in the Galactic environment.
We present some resent results of photometric and spectroscopic investigation of VVV young cluster CL059, we derived fundamental parameters such as reddening, distance and age by fitting isochrones to the color-magnitude diagram.

POSTER ID: 3
AUTHOR: William Amonacid
TITLE: Papapetrou's equations of motion for a extended test body
ABSTRACT: We use Dixon's general equations of motion for extended bodies to compute the Papapetrou's equations for a test extended body in Schwarzschild space-time. We incorporate force and torque terms which involve multipolar moments. The Corinaldesi-Papapetrou spin supplementary condition is introduced to obtain the equations of motion in the rest frame of the Schwarzschild field.

POSTER ID: 4
AUTHOR: Amelia Bayo
TITLE: Astrometry in the Virtual Observatory
ABSTRACT: I briefly describe the tools that are available in the Virtual Observatory (VO) related to astrometry or that may be of interest for the astrometrists and what is still not implemented/designed.

POSTER ID: 5
AUTHOR: Juan Carlos Beamín
TITLE: Characterization of high proper motion sources from NIR surveys
ABSTRACT: After the appereance of 2MASS and DENIS, several near infrared (NIR) large area surveys have scanned the sky going deeper and/or with a better spatial resolution. Hundreds of new low mass objects and high proper motion stars and Brown dwarfs have been discovered thanks to these surveys, and further characterization is required. We have used multi-epoch data to obtain precise proper motion measurements and parallaxes for nearby sources found near the galactic bulge and inner disk. In addition we are obtaining spectral classes for selected sources (brown dwarfs and/or stars with MIR excess) and applying spectral energy distribution fitting, using multi-wavelength photometry for newly identified high proper motion sources from VVV, VHS and WISE surveys. Here we show first results and perspectives of this project.

POSTER ID: 6
AUTHOR: Jesús Calderón
TITLE: Assessment of photometry with CFHTLS-VW images
ABSTRACT: Work continues on the reduction of a set of images of the ecliptical region belonging to the CFHTLS-VW collection. In this poster contribution the results of a preliminary photometric reduction of stellar objects in one field are presented. The quality of the results is evaluated by comparing with photometric data from the Sloan Digital Sky Survey in the same field. The purpose of this work is to build a catalog providing information on astrometry, photometry and object classification for all point and extended sources detected in these images.

POSTER ID: 7
AUTHOR: Ángel Cancio
TITLE: Radio Transient Signals De-dispersion Using GPU Parallel Computing: Design, Implementation and Operation for the Deep Space Antenna 3
ABSTRACT: This work intends the use of a deep space antenna, which is an antenna designed for telecommunications, in the detection of individual radio signals such as transient signals. The focus of the presented solution to the use of the DSA 3 in transient detection of radio signals, within astronomical purposes, intents to be the least disruptive as possible for the terrestrial main mission, which is telecommunications. The proposed uses commercially available equipment (COTS), avoiding the development of a made-to measure hardware, in order to mitigate risks. Most of the remaining part of the tool to implement is done by developing a processing software.

POSTER ID: 8
AUTHOR: Johanna Coronado
TITLE: Assembling the Largest, Most Distant Sample of Genuine Halo Wide Binaries
ABSTRACT: Samples of wide binaries (a > 100 AU) are a gold mine for Galactic studies. They have been used on a large list of applications in a diversity of fields. In the dynamical arena, wide binaries provided the first meaningful constraints on the mass and nature of disk dark matter and, more recently, were used to all but close the remaining parameter space of MACHO-like halo dark matter not accessible to the microlensing campaigns. All these applications were possible when samples of these objects became large enough to not be dominated by random, chance alignments of two unrelated stars projected on the sky. Nevertheless, still today the largest available sample of the particularly valuable halo wide binaries contains not much more than 100 systems. This project intends to assemble a new, much larger sample of genuine halo wide binaries that will probe regions of the Galactic halo not reached before with such dynamically sensitive test particles.

POSTER ID: 9
AUTHOR: Eddy Dávila
TITLE: Individual uncertainties of catalogues SPM_MC, UCAC4 and XPM in the Magellanic Clouds using Wielen's method
ABSTRACT: The individual uncertainties of the astrometric catalogues SPMMC, XPM and UCAC4 are determined using the method of Roland Wielen, in an area of the sky containing the Magellan Clouds. The data preparation begins by cross identifying stars common to the catalogues, and then systematic differences are detected, modelled and corrected. Results indicate that the catalog of best astrometric quality is UCAC4, with an accuracy of (□□□cos(□),□□□)=(2.92,1.90) mas/yr. SPMMC has a similar quality to the previous catalogue, expressed as (1.11,1.53) times UCAC4's errors. Finally the quality for XPM differs significantly from the other catalogues, it turns out to be (6.32, 8.87) times UCAC4's errors. These uncertainties are a measure of the quality of the reference systems defined by these catalogues, in the determination of stellar proper motions. This characterization establishes the reliability of these catalogues for calculating orbits around our Galaxy.

POSTER ID: 10
AUTHOR: Humberto García
TITLE: Observatorio Astronómico de la UNAN-Managua
ABSTRACT: Se presenta una síntesis de las actividades que se realizan en el observatorio astronómico nacional y del estado de la astronomía en Nicaragua.

POSTER ID: 11
AUTHOR: Altair Gomes
TITLE: Astrometry of Jovian and Saturnian Irregular Satellites
ABSTRACT: The irregular satellites are smaller than the regular ones. They are more distant from the central body and have more eccentric orbits that may also be retrograde. Explaining their existence is a very important topic of study in Orbital Dynamics, and gives clues to the formation and evolution of the solar system. However, their orbits are known with poor precision. Therefore, a more dedicated observational work is necessary. We have organized and reduced thousands of CCD images from Jovian and Saturnian irregular satellites plus Nereid. They were observed with the 1.6 m and 0.6 m telescopes from the OPD (Pico dos Dias Observatory - LNA - Itajuba, IAU code 874), the 1.2 m telescope from the OHP (Observatoire Haute-Provence, France) and the 2.2 m telescope from La Silla (ESO). More than 4 thousand images were retrieved from a database with more than 100 thousand images obtained between 1992 and 2012. In this work, we present the organization and astrometric reduction of these images. We processed all the 100 thousand images searching the satellites, what means reduct images from almost 10 different CCDs in 5 telescopes using 6 different filters. Many of the older images from the OPD were corrupted or had missing coordinates in their FITS headers. A big effort was made to separate and correct the data. We used the astrometric reduction package PRAIA. The UCAC4 was adopted as the reference frame. Positive aspects of the database are the large time span and the great number of observed positions. We eliminated bad observations to improve the astrometric precision using a sigma-clip procedure. We analyze the differences between the current ephemeris and the satellites positions for a better understanding of their orbit status. The projection of the orbits in the plane of the sky, with vectors which represent the position offsets relative to the ephemeris, was an important analysis tool. It clearly shows the level of contribution for improving the orbits. The positions have 40 mas precision. For some of the satellites, there are clear improvements to be made to the orbits, mostly in inclination, after a new integration is made with our new observed positions.

POSTER ID: 12
AUTHOR: Danilo González
TITLE: Advances in a Study of sky quality for astronomical observations in Colombia
ABSTRACT: The aim of our study is to determine the sky quality in Colombia to astronomical observations in the optic. We analyzed images in infrared (6.7 and 10.7 μm) from GOES meteorological satellite in three night times for four years (2008 to 2014). We followed a novel methodology to determine how clear or cover was those skies. We also use meteorological data of the weather stations network of the national meteorological institute, IDEAM. We computed the annual cloud covering over the country and classified the nights as clear or usable based on the definition of a quality factor. We traveled around the country doing measurements of "seeing" using the DIMM method, coefficient of extinction, brightness of sky and other meteorological data.

POSTER ID: 13
AUTHOR: Elvis Lacruz
TITLE: Astrometry and Geostationary Satellites in Venezuela
ABSTRACT: We present the current status and the first results of the astrometric project CIDA - ABAE for tracking geostationary satellites. This project aims to determine the positions of Venezuelan satellite VENESAT-1 with astrometric accuracy. We use optical observations obtained (July-August 2014) from the new observatory installed at the space tracking ground station Bamari in Venezuela, to make the astrometric reductions. This method could be applied to tracking the space debris.

POSTER ID: 14
AUTHOR: Yin-Dun Mao
TITLE: Three dimension positioning of space debris with laser ranging and optical astrometry
ABSTRACT: In the field of monitoring space debris, diffuse reflection laser ranging has more application. At present, diffuse reflection laser ranging is still in experimental stage and the orbit of objects can hardly be determined by ranging data only from one single station, which restricts the application of diffuse reflection laser ranging. According to the principle of orbit determination, the success rate and reliability of orbit determination of the object will be improved obviously if the tangential constraint of the object is afforded while laser ranging. The scheme of three dimension positioning of space debris with laser and optical astrometry is presented. A test system of laser ranging and optical astrometry is established by installing a photographic equipment with short focal length and big field of view to the 60cm satellite laser ranging telescope system of Shanghai Astronomical Observatory, CAS. Experimental observation is carried out and the satellite Ajisai is chosen as the target. The purpose of present experiment is to examine the feasibility of three dimension positioning observation and assess the accuracy of optical astrometry. The results show the scheme is feasible and the optical astrometry accuracy of the satellite Ajisai can be derived as well as 5 arc second.

POSTER ID: 15
AUTHOR: René Méndez
TITLE: Cramer-Rao in Astrometry

ABSTRACT: Optimal parameter estimation can, in general, be formulated using “decision-making” theory (Cover & Thomas 2006). This framework can also provide absolute lower bounds to the uncertainty of these estimators. For example, the "Cramer-Rao (CR) lower uncertainty bound" determines the minimum theoretical variance achievable by any unbiased estimator (Stuart, Ord, & Arnold 2004). The IDS group (see below) has been collaborating for two years on the application of the CR bound to the problem of astrometry and photometry from CCD imaging data. Results have been published in the PASP Journal by Mendez et al. 2013 & 2014. For mathematical simplicity, we have so far analyzed the case of a linear-detector in a 2-dimensional (2d) estimation scenario: Astrometric location and total flux of the source. Our CR estimates agree very well with the empirically determined maximum precisions achieved in photometry and astrometry: Astrometric accuracy vs. flux, ground (HST) & space-based optical astrometry, photometric precision at extremely high S/N. Thus, the CR can be used as a benchmark to guide in: Detector design, testing of pipelines, science planning and design of observational strategies. We plan to extend these studies to incorporate more subtle observational/detector features such as non-uniform pixel response functions, non-symmetric PSFs, rapidly fluctuating backgrounds, moving targets, radiation damage and CTE effects, among others. IDS (www.ids.uchile.cl – PI Dr. Jorge Silva, U. de Chile) is an interdisciplinary group focused on applications of estimation and information theory to decision problems in the presence of statistical errors and uncertainty. One of the limitations of the classical CR formulation is that it does not specify, a priori, how to construct estimators that reach that bound. However, Bayesian statistics allows us to write down parameter estimation expressions that are guaranteed to achieve a minim mean-square error (the conditional expectation (Gray and Davisson 2005). By contrast, classical estimation techniques using least-squares or maximum-likelihood do not achieve, in general, neither the CR bound (Mendez et al. 2013) nor the minimum Bayesian MSE, and are thus less efficient statistically (see talk by Rodrigo Lobos). We are working on implementing optimal Bayesian estimators for photometry and astrometry (see talk by Alex Echeverria).

POSTER ID: 16
AUTHOR: Ernest Michael
TITLE: Concept for Fiber-Based Near-Infrared Interferometry of Highest Frequency Resolution

ABSTRACT: We are presenting first experimental results for subsystems of a low-cost near-infrared heterodyne interferometer concept based on commercial 1.55µm fiber-components with relative phase-stabilization between both telescopes, a shot noise limited heterodyne scheme with ambient temperature operated photodiodes, an ultra-coherent fiber laser, and a ROACH-based correlator. After a first demonstration with two 14-inch amateur telescopes, the system should be upgradable to connect mid- or large-class telescopes, also given that the employed fiber phase stabilization scheme should enable the operation of long baselines.

POSTER ID: 17
AUTHOR: ZhaoXiang Qi
TITLE: Absolute Proper motions Outside the Plane (APOP)

ABSTRACT: The astrometric calibration and removal of systematic errors for absolute proper motions (□□, □□) from Digitized Sky Survey Schmidt plates is presented. This version is based on plate data outside the galactic plane, i.e. |b| ≥ 27deg. The systematic errors of absolute proper motions related to the plate position, magnitude and color are removed using reductions with both stars and galaxies. The resulting zero point error is less than 0.6 mas/yr, and the precision better than 5.0 mas/yr for objects brighter than RF = 19.0, rising to 10.0 mas/yr for objects with magnitude 19.0 < RF < 20.0. We present a proper motion catalogue with sky coverage of 22,525 square degrees, the total number of objects is 100,777,385 and the magnitude limit is RF □ 20.8. This catalogue is a step towards the production of proper motions for the Guide Star Catalog and the procedures will be useful in other reductions to dispel astrometric magnitude- and color-dependent systematic errors.

POSTER ID: 18
AUTHOR: Ricardo Ramírez
TITLE: A Spectro-Astrometric study of bracket gamma emission in Young Stars
ABSTRACT: Unlike the case of T Tauri stars, the mass accretion onto higher mass young stars (Herbig Ae/Be) and in particular the origin of the HI lines is not completely understood. The HI bracket gamma line is well correlated with accretion luminosity in T Tauri stars, and while the same relation holds for Herbig Ae stars, in Herbig Be the bracket gamma line flux often overestimates the accretion luminosity. HD 100546 is an Herbig Be star with a transitional disk. We observed it with the VLT/SINFONI integral field spectrograph in K band. We have applied the spectro-astrometric technique to the SINFONI observations of the HI bracket gamma emission line in this source. Spectro-Astrometry is a technique used to calculate small variations in the position of the emission as a function of wavelength, with the aim to constrain the origin of the spectral line in study. We have reached a positional accuracy (rms) of 10-30 micro arcseconds (0.01-0.03 milli-arcseconds), corresponding to the size scale of the stellar radius. We find an asymmetric signal in RA and a S pattern in Dec of amplitude around 0.2 mas. This signal doesn't follow the expectations from a keplerian accretion disk with the same PA as the large scale disk around this source, suggesting an origin either in a stellar outflow or accretion funnels. I will also show preliminary results on a larger sample of sources.

POSTER ID: 19
AUTHOR: José Ricra
TITLE: Observations of the Occultation of Mars by the Moon - July 6, 2014
ABSTRACT: We present the results of the observation of the occultation of Mars by the Moon of July 06, 2014. The observations were made from the Observatorio Astronomico AFARI, in the town of Tarma, Peru. A Celestron 8 telescope with a camera WATEC 120N (GPS time inserted) were used. Time measurements for the first and second contact were obtained by analyzing of the variation of the flux of Mars using the software LiMovie. The measurements obtained were reported to the International Occultation Timing Association (IOTA).

POSTER ID: 20
AUTHOR: David Rodríguez
TITLE: Identification of Young Moving Group Stars
ABSTRACT: The last few decades have seen the discovery of many 10-100 Myr-old stars in moving groups within 100 parsecs of Earth. The present membership of these groups, however, is still incomplete at the lowest masses. We have initiated a program, the GALEX Nearby Young-Star Survey, or GALNYSS, to search for these missing M-stars. GALNYSS has combined ultraviolet data from GALEX with near-IR surveys (WISE and 2MASS), as well as kinematic information, in order to identify over 2000 candidate young low-mass stars near Earth. Spectroscopic followup is ongoing, and results thus far confirm the youthful nature of many stars among the GALNYSS sample. We present an overview of our survey to date, including the characteristics of the GALNYSS sample and highlights from GALNYSS's latest contributions to our knowledge of the number and membership of nearby, young stellar associations. This work is supported in part by a Chilean FONDECYT grant 3130520 to Universidad de Chile.

POSTER ID: 21
AUTHOR: Eduardo Tello
TITLE: Study of the Evolution of Neptune Trojans
ABSTRACT: Neptune Trojans are objects that share the orbit with the planet Neptune and are in a neighborhood of the Lagrangian points L4 and L5 located 60degrees “front” and 60degrees “behind” the planet in its orbit. So far there have been only eight Neptune Trojans. However stability studies indicate that this population should be large. In this work we report numerical simulations of the evolution of fictitious Neptune Trojans, to detect areas of stability and instability of the population and study the production of the escape of Trojans over the life of the Solar System.

POSTER ID: 22
AUTHOR: Katherine Vieira
TITLE: Recent Star Formation in the Leading Arm of the Magellanic Stream
ABSTRACT: Strongly interacting galaxies undergo a short-lived but dramatic phase of evolution characterized by enhanced star formation, tidal tails, bridges, and other morphological peculiarities. The nearest example of a pair of interacting galaxies is the Magellanic Clouds, whose dynamical interaction produced the gaseous features known as the Magellanic Stream trailing the pair's orbit about the Galaxy, the bridge between the Clouds, and the leading arm (LA), a wide and irregular feature leading the orbit. Young, newly formed stars in the bridge are known to exist, giving witness to the recent interaction between the Clouds. However, the interaction of the Clouds with the Milky Way (MW) is less well understood. In particular, the LA must have a tidal origin; however, no purely gravitational model is able to reproduce its morphology and kinematics. A hydrodynamical interaction with the gaseous hot halo and disk of the Galaxy is plausible as suggested by some models and supporting neutral hydrogen (H I) observations. Here we show for the first time that young, recently formed stars exist in the LA, indicating that the interaction between the Clouds and our Galaxy is strong enough to trigger star formation in certain regions of the LA-regions in the outskirts of the MW disk (R ~ 18 kpc), far away from the Clouds and the bridge.

POSTER ID: 23
AUTHOR: Marion Zacharias
TITLE: Optical positions of ICRF sources from CTIO 1.0m data
ABSTRACT: As part of the USNO radio-optical reference frame link project data was taken with the CTIO 1.0 m telescope in 2009. First position results of 6 ICRF sources are presented of this primarily photometric investigation about optical counterparts color and variability study.

POSTER ID: 24
AUTHOR: Rodolfo Zalles
TITLE: Program “ISON” (International Scientific Optical Network)
ABSTRACT: International Scientific Optical Network (ISON) represents one of largest systems specializing in observation of space objects. ISON project is continuously developing and is joining now the 35 observation facilities in 15 countries with 80 telescopes of different class (aperture from 12.5 cm to 2.6 m). Main goals of ISON activities are an investigation of space debris population, studying of the near Earth asteroids (NEA) and observations of gamma-ray-bursts (GRB) afterglows. They are currently part of the ISON network and participate actively with different telescopes, observatories of Tarija in Bolivia, Cosala in Mexico and New Mexico in the UnitedStates. The agreement for the installation of three telescopes ISON in Macon, Argentina will restart this year, there are talks for the installation of telescopes in the Brazil and Venezuela.

POSTER ID: 25
AUTHOR: Hui-Yan Zhang
TITLE: An orbital determination of Triton with the use of a revised pole model
ABSTRACT: We used the 3108 Earth-based astrometric observations from the Natural Satellite Data Center (NSDC) over more than 30 years time span from 1975 to 2006 for determining the epoch state vectors of the Neptunian largest satellite Triton. These observations almost contain all modern photo and CCD observations available. In integrating perturbation equation, the barycentric frame of Neptune-Triton system is adopted, and in considering the oblateness perturbation due to Neptune, a revised pole model describing the precession of the Neptune's pole is used in our calculation. Moreover, a total of 1095 new observed positions of Triton were collected during 46 nights of observations, involving eight missions and three telescopes during three successive oppositions in 2007, 2008 and 2009. We compared our observations to two ephemerides of Triton. This comparison has shown that our observations present a high level of accuracy as they provide standard deviations of residuals hardly higher than 50 mas and mean residuals lower than 30 mas. In addition, we have compared most of the different planetary ephemerides of Neptune available now as well as two recent orbit models of Triton. These new comparisons have clearly shown the differences between all of these ephemerides which can be significant and that are presented in this work.

CHARLAS LUNES 29/09

SPEAKER: Dante Minniti
TITLE: Astrometric perspectives of the VVV Survey
ABSTRACT: The VVV Survey is currently mapping the Galactic bulge and inner disk in the near-infrared with the VISTA 4m telescope at ESO Paranal Observatory. The survey gives unique information in these regions that have remained mostly uncharted due to crowding and heavy extinction. The VVV database now contains ZYJHKs photometry of 562 sqdeg, and multiple epochs in the Ks-band, expecting to monitor a billion sources in total. The Ks-band observations continue, and the variability light curves would span from 2010 to 2016, also allowing proper motion studies. This large database enables a number of astrometric studies of different objects. We describe the current VVV Survey catalogs, and explore future catalogs (asking for input from the ADeLa community), that would be made accessible through the new VVV web page.

SPEAKER: Radostin Kurtev
TITLE: VVV IR high-proper motion stars
ABSTRACT: The census of the very low mass stars and ultra-cool dwarfs (UCD) in the immediate Solar neighbourhood is still largely incomplete, and the Galactic Bulge and Southern Galactic plane has been largely ignored in the deep near-IR searches. Here we will discuss the methods and the first results of a new search for these objects, based on a deep ongoing public ESO "Vista variables in Vía Láctea" (VISTA-VVV) near-IR (ZY JHKS) survey. The survey area covers the Galactic bulge and the Southern Galactic disk. VISTA-VVV provides multi-band photometry, and more than 70 individual Ks-band epochs, with high image quality, allowing us to make deep search in the regions of high stellar density. The high precision of the coordinates provided by the VVV allows parallax studies to a distance of about 20 pc and more. Our UCD search will complement those made at higher Galactic latitudes in identifying new nearby, interesting, and unusual individual objects, as well as to improve on the current statistics.

SPEAKER: Karla Peña
TITLE: Free floating planets in Sigma Orionis and Upper Scorpio
ABSTRACT: We present our latest results on the search and characterization of the planetary mass population in two nearby and young star forming regions: Sigma Orionis (~3 Myr, ~350 pc, no internal extinction, solar metallicity) and Upper Scorpio (~5 Myr, ~145 pc, low extinction, solar metallicity). Their implications in their mass functions will be addressed and discussed.

SPEAKER: Christine Allen
TITLE: "Early" and "late" runaway stars in the Orion BN/KL region
ABSTRACT: We review the dynamical origin of the high proper motion BN-I-N radio sources in Orion, emphasizing the apparent contradiction between the ages of the sources and the dynamical collapse time. We show that further generations of runaway stars can be produced after the initial collapse, and right until the final dissolution of the multiple proto-cluster.

SPEAKER: Antoine Mérand
TITLE: Astrometry using Optical Interferometry
ABSTRACT: Optical Interferometry (OI) provides unrivaled angular resolution, one order of magnitude better than single dish telescopes. This opens new grounds for astrometry, which are not covered by any over observing techniques. In this talk, I will present OI principles and explain the basis to do astrometry using it. I will explain what are its limitations and provide examples of applications. Finally, I will present what are the upcoming instruments, in particular at ESO's Very Large Telescope Interferometer, and their astrometric capabilities.

SPEAKER: Valeri Orlov
TITLE: Speckle Interferometry of the Solar Neighborhood
ABSTRACT: We present new observational project of speckle interferometric study in three colors (V,R,I) of stars from 5pc solar neighborhood. According to the Tycho catalogue there are more than 5000 objects within this area. Relatively small telescopes can be effectively used for this purpose because allow to reach the Rayleigh resolution limit R = 1.22□/D. For instance, the resolution of 2m telescope in V band is 0.055 arcsec. For 5 pc it corresponds to 0.275 au. In July 2014 we start speckle observations in three colors at the OAN-SPM 2.1m telescope.

SPEAKER: Alexandre Gallenne
TITLE: Low contrast companions around Galactic Cepheids
ABSTRACT: Cepheid masses are a fundamental parameter for studying the pulsation and evolution of intermediate-mass stars. However, the determination of this variable is a long-standing problem since decades. Most of the Cepheid masses are derived using stellar evolution or pulsation model, but they differ by 10-20%. Binary Cepheids offer the unique opportunity to make progress in resolving this mass discrepancy, but so far, only a few Cepheids have a dynamical measurement of their mass. The first problematics in studying binary Cepheids is that the pulsating star outshines its hot main-sequence companion at wavelengths longer than 0.5 microns. In addition, the close orbit of the companion (1-40 mas) complicates the problem because the system cannot be spatially resolved with a single-dish 10m-class telescope. In this talk I will show that long-baseline interferometry is a powerful tool to reach a high dynamic (~1% in H) and a high spatial resolution (<40mas). The astrometric position of the Cepheid companions can be measured at several orbital epochs, and then combined with spectroscopic measurements to derive all the orbital elements, the mass and the distance of the Cepheids.

SPEAKER: Edward Fomalont
TITLE: Cm-wavelength VLBI Astrometry and mm-wavelength ALMA Astrometry
ABSTRACT: Radio astrometry at the cm-wavelengths using VLBI techniques provides the most accurate positions and motions of thousands of celestial objects. Examples of result from solar system objects to distant quasars will be given. The Atacama Large Millimeter/Submillimeter Array (ALMA) will extend sub-mas astrometry to a frequency of 1000 GHz, and ALMA is now being tested with baselines longer than 11 km. Initial astrometric results from ALMA will be described, and its astrometric potential are outlined.

SPEAKER: Nobuyuki Sakai
TITLE: Galactic Dynamical Structure Revealed by VLBI astrometry
ABSTRACT: Astrometry is the most direct and accurate method to delineate the structure of the Milky Way Galaxy. I review the Galactic structure based mainly on VLBI astrometry results. First, I introduce a basic concept of VLBI astrometry and actual VLBI arrays (e.g., VERA, VLBA and EVN).
Second, I show recent scientific results with VLBI astrometry, which are (i) Fundamental parameters of the Milky Way Galaxy, (ii) Dark matter content in the MWG and (iii) The Perseus (main) arm in the MWG.
Finally, I briefly introduce a simulation result to prepare for the future astrometry
(e.g., Gaia & VLBI astrometry).

SPEAKER: Santiago Torres
TITLE: Dynamics of protoplanetary disks in stellar clusters
ABSTRACT: Star formation occurs in dense clouds of gas and dust known as molecular clouds (Shu et al. 1987). Thus, the most stars form in stellar clusters (Carpenter 2000, Lada and Lada 2003). One of the major factors in the dynamics of planetary disks are gravitational interactions. These interactions are different in the different environments of the Galaxy (Jiménez-Torres et al. 2011), from stellar clusters, where the star density is high, to the solar environment present. Planetary disks around stars in stellar clusters are affected by gravitational interactions along their passage through these stellar regions. Disk interactions with stars cause truncations of the disks. In this work we analyzed the dynamics of planetary disks in stars that belong the star clusters. We study the evolution of the orbital parameters (eccentricity, inclination, pericenter and apocentre) after the interaction between the host and the flyby stars, for different stellar masses. We present the result of this simulations and their applications.

SPEAKER: Abraham Luna
TITLE: A simple kinematical model for the gas in the Milky Way, based on an expansion velocity field in the inner Galaxy
ABSTRACT: We discuss a simple kinematic spiral arm model for the gas of MW disk, based on available CO spectroscopic surveys. The model is consistent with the accurate parallaxes to 103 star forming regions (Reid 2014), and satisfies features previously identified in the literature for the galactocentric radial range of 0.5 to 20 kpc, such as: Bania's clouds, the connectic arm, the 3 kpc arm, the tangents to the inner arms, the well defined Carina arm and the outer arms. The model consists of four logarithmic spiral arms with a constant pitch angle (12deg), with a well defined phase at 8.5 kpc, it includes an axisymmetric central expanding velocity field that decreases exponentially from the galactic center region. The required radial dependency of physical parameters such as the velocity field, and the presence of a central bar as a non-axisymmetric element at the inner region, are discussed in the model context.

CHARLAS MARTES 30/09

SPEAKER: Alexandre Andrei
TITLE: PARSEC's astrometry - the risky approach
ABSTRACT: Parallaxes - and hence the fundamental establishment of stellar distances - rank among the oldest, keyest, and hardest of astronomical determinations. Arguably amongst the most essential too. The direct approach to obtain trigonometric parallaxes, using a constrained set of equations to derive positions, proper motions, and parallaxes, has been labelled as risky. Properly so, because the axis of the parallactic apparent ellipse is smaller than one arcsec even for the nearest stars, and just a fraction of its perimeter can be followed. Thus the classical approach is of linearizing the description by locking the solution to a set of precise positions of the Earth at the instants of observation, rather than to the dynamics of its orbit, and of adopting a close examination of the never too many points available. In the PARSEC program the parallaxes of 143 brown dwarfs were aimed at. Five years of observation of the fields were taken with the WIFI camera at the ESO 2.2m telescope, in Chile. The goal is to provide a statistically significant number of trigonometric parallaxes to BD sub-classes from L0 to T7. Taking advantage of the large, regularly spaced, quantity of observations, here we take the risky approach to fit an ellipse in ecliptical observed coordinates and derive the parallaxes. We also combine the solutions from different centroiding methods, widely proven in prior astrometric investigations. As each of those methods assess diverse properties of the PSFs, they are taken as independent measurements, and combined into a weighted least-square general solution. The results obtained compare well with the literature and with the classical approach.

SPEAKER: Henri Boffin
TITLE: Astrometric study of the closest binary brown dwarf system
ABSTRACT: We are astrometrically monitoring the two components of the brown dwarf system WISE J104915.57-531906.1, the closest one to the Sun. Our astrometric measurements - with a relative precision at the milli-arcsecond scale - allowed us to detect the orbital motion and derive more precisely the parallax of the system. Our first measurements also indicate that the relative orbital motion of the two objects is found to be perturbed, which leads us to suspect the presence of a substellar companion around one of the two components. I will present the latest results on this object.

SPEAKER: Marius Gromadzki
TITLE: A deep search for very late type objects
ABSTRACT: We have explored WISE All-sky database applying various selection criteria to obtain sample of W2-only detected and low signal-to-noise (S/N>8) late T and Y dwarf candidates. Spurious sources were removed using database selection criteria defined through analysis of a control sample comprising isolated point-like non-variable non-moving sources from the SDSS. We perform J-band photometric follow-up on 4-8m class telescopes to prove high proper motion and low temperature of these objects. The J2 and J3 filter photometry by the FourStar camera on the Baade Magellan telescope allows for the diagnosis of methane absorption at J band. The low resolution near-IR spectroscopy of the best candidates has confirmed few late T dwarfs (>T7) and one Y dwarf. In my talk I will present results of photometric and spectroscopic follow-up of the candidates.

SPEAKER: Martin Altmann
TITLE: Gaia - the adventure begins
ABSTRACT: With now nine months in space, Gaia is starting the data taking routine. Between the launch on Dec. 19 and today it has been a eventful time for the Gaia team of 400 scientists. Looking into the immediate future, scientists are preparing themselves for the first releases of Gaia data, to take place in 2016. I will give an overview of the Gaia mission, its aims and the data it will produce, and give a report of the first months of the mission.

SPEAKER: Daniel Carpintero
TITLE: The dangers of artificially fixing the Milky Way's center of mass
ABSTRACT: Models with different degrees of complexity have been proposed to explain the distribution of debris from the Sagittarius dwarf spheroidal galaxy. In many of these models, the Milky Way gravitational potential is assumed to be smooth and static, not only structurally but also spatially. Since the total mass of the Milky Way is expected to have changed very mildly during at least the last 5 Gyr, assuming a frozen mass potential should not significantly affect results based on orbital fitting of dynamically young stellar streams. Instead, the assumption that the Milky Way can be regarded as an inertial frame has not been thoroughly tested yet. For example, the Large Magellanic Cloud, with an estimated mass of 1011 M, challenges the assumption of the inertiality of the Galactocentric reference frame. In this work we explore this topic by focusing our efforts on two situations in which the response of the Milky Way to the gravitational pull of the LMC could induce significant perturbations. In particular, we characterize its effects on the inferred orbit of the LMC about the Milky Way and on the phase-space distribution of the Sagittarius stream.

SPEAKER: Francesca Figueras
TITLE: First months of acquisition of Gaia Science Data
ABSTRACT: Gaia, the ESA cornerstone space mission that will revolutionize our understanding of the Milky Way, was successfully launched in December 19th, 2013. An overview of the activities during the Gaia commissioning period and the first months of Science data acquisition will be presented. We will also discuss how the simulated catalogues named GUMS (Gaia Universe Model Simulator) and GOG (Gaia Object Generator) together with tools providing a realistic astrometric, photometric and spectroscopic science performances can be used to prepare our research activities in galactic dynamics for the next decade. The intermediate Gaia Release Scenario will be also presented.

SPEAKER: Angeles Pérez-Villegas
TITLE: Stellar Orbital Studies in Normal Spiral Galaxies: Effect of Spiral Arms on Disk Dynamics
ABSTRACT: We build a family of non-axisymmetric potential models for normal non-barred spiral galaxies. For this purpose a three-dimensional self-gravitating model for spiral arms (PERLAS) is used. We analyze the stellar dynamics varying structural and dynamical parameters such as pitch angle, strength of spiral arms and angular speed. For pitch angle, we found two limits. The first limit, based on ordered behavior, periodic orbits studies show that for pitch angles up to approximately 15 deg, 18 deg, and 20 deg for Sa, Sb and Sc galaxies, respectively, where the spiral arms could be a long-lasting structure. Beyond those limits, spiral arms may be explained as transient features rather than long-lasting large-scale structures. In a second limit, from a phase space orbital study based on chaotic behavior, we found that for pitch angles larger than ~30 deg, ~ 40 deg and 50 deg for Sa, Sb, and Sc galaxies, respectively,for pitch angles larger than these limits, chaotic orbits dominate all phase space prograde region that surrounds the periodic orbits sculpting the spiral arms and even destroying them. Finally, we studied orbital dynamics now varying other parameters as, pattern speed and spiral arms mass; also we were looking for restriction for these parameters in different morphological types. In these studies we noticed that the spiral arms effect produces to the disk dynamics when we vary the pattern speed and mass is strongly linked to the pitch angle.

SPEAKER: Luis Martínez
TITLE: Stellar Disk Heating driven by Spiral Arms
ABSTRACT: The fact that galactic discs heat with time has now been known for over 60 years. Recent studies actually show that many, if not all, edge-on spiral galaxies appears to host dual disk systems. An important question of modern galactic astronomy is how thick discs came into existence. Among the many mechanisms proposed to explain the disk heating, we attempt to isolate and quantified the contribution of the spiral arms to the formation of a thick disk. We perform numerical simulations of test particles in a 3D galactic potential that models normal spiral galaxies (Sa, Sb and Sc) and includes the axisymmetric component plus the spiral arms based on a self-gravitating potential, PERLAS model (Pichardo et al. 2003). By varying the parameters of the spiral arms we found that the disk heating is very important in some cases and strongly depends on the galaxy morphology, pitch angle, arm mass and pattern speed.

SPEAKER: William F. van Altena (via Skype)
TITLE: The new generation of astrometrists
ABSTRACT: Astrometry has entered a new era with the advent of Micro-arcsecond positions, parallaxes and proper motions. Cutting-edge science topics will be addressed that were far beyond our grasp only a few years ago. It will be possible to determine definitive distances to Cepheid variables, the center of our Galaxy, the Magellanic Clouds and other Local Group members. We will measure the orbital parameters of dwarf galaxies that are merging with the Milky Way, define the kinematics, dynamics and structure of our Galaxy and search for evidence of the Dark Matter that makes up most of the mass in the universe. Stellar masses will be determined routinely to 1% accuracy and we will be able to make full orbit solutions and mass determinations for Extrasolar planetary systems. If we are to take advantage of Micro-arcsecond astrometry, we need to reformulate our study of reference frames, systems and the equations of motion in the context of special and general relativity. Methods also need to be developed to statistically analyze our data and calibrate our instruments to levels beyond current standards. As a consequence, our curricula must be drastically revised to meet the needs of students in the 21st Century. With the above considerations in mind, "Astrometry for Astrophysics: Methods, Models and Applications" was prepared and published in 2013 by Cambridge University Press. This new introductory text was edited and written by the author and 27 co-authors from 15 different countries with the goal of rejuvenating the field of astrometry and preparing students and young investigators for the revolutionary data that Gaia and new ground- based facilities will be providing. To accomplish that goal, the book is divided into five parts. Part one provides the impetus to study Astrometry by reviewing the opportunities and challenges of micro-arcsecond positions, parallaxes and proper motions that will be obtained by the new space astrometry missions as well as ground-based telescopes that are now yielding milli-arcsecond data for enormous numbers of objects.

Part two includes introductions to the use of vectors, the relativistic foundations of astrometry and the celestial mechanics of n-body systems, as well as celestial coordinate systems and positions. Part three introduces the deleterious effects of observing through the atmosphere and methods developed to compensate or take advantage of those effects by using techniques such as adaptive optics and interferometric methods in the optical and radio parts of the spectrum. Part four provides introductions to selected topics in optics and detectors and then develops methods for analyzing the images formed by our telescopes and the relations necessary to project complex focal plane geometries onto the celestial sphere. Finally, Part five highlights applications of astrometry to a variety of astronomical topics of current interest to stimulate students and researchers to further explore this exciting field. The figures and tables in the book are available for download at the following site under the tab "Resources" (http://www.cambridge.org/us/academic/subjects/astronomy/astrophysics/astrometry- astrophysics-methods-models-and-applications)

SPEAKER: Zheng-Hong Tang
TITLE: New instrument to measure atmospheric refraction at any azimuth and elevation
ABSTRACT: Based on the idea of two-field-of-view design of HIPPARCOS satellite, a new instrument to measure atmospheric refraction at any azimuth and elevation has been invented. The principle of the instrument is given. Preliminary observation results show that the instrument works well.

SPEAKER: Rodrigo Lobos
TITLE: Achievability of the Cramér-Rao Lower Bound in Astrometry
ABSTRACT: The Cramér-Rao (CR) lower bound gives a limit to the maximum precision attainable by an unbiased estimator. However, there is not certainty as to whether this limit is achievable by commonly used estimators in astrometry, such as Least-Squares (LS) or Maximum-Likelihood. In this talk we show that the CR is not always achievable. We also study in detail the LS estimator, and find that its precision performance is almost optimum with respect to the CR bound.

SPEAKER: Alex Echeverría
TITLE: Bayesian-based astrometry
ABSTRACT: In this presentation we explore new ways to calculate star positions in array detectors, using an estimator that is not frequently used: The Conditional Expectation that gives theoretical guarantees of minimum variance between all possible estimators. Additionally, their fundamental bounds are presented; i.e., the Van Trees Inequality and Bayesian Cramér-Rao Lower Bound. Theoretical foundations are presented for this estimator and its bounds based on a Bayesian approach. These tools are used, as a first application, for the solution of one-dimensional astrometry problems. Significant gains are observed in the Bayesian approach against the parametric case of low signal to noise ratio and normal Probability density functions with small standard deviation obtained from astronomical catalogues. These results are displayed in different theoretical curves. Finally, experimental results are presented. In them, the Van Trees bound's predictive capability is tested against the mean Conditional Expected Value's square error, comparing a normal a priori distribution and a priori uniform distribution.

CHARLAS MIÉRCOLES 01/10

SPEAKER: Andrea Bellini
TITLE: HST high-precision proper motions of globular clusters
ABSTRACT: The stable environment of space makes HST an excellent astrometric tool. Its diffraction-limited resolution allows it to distinguish and measure positions and fluxes for stars all the way to the center of most globular clusters. Apart from small changes due to breathing, its PSFs and geometric distortion have been extremely stable over its 20-year lifetime. There are now over 20 globular clusters for which there exist two or more well-separated epochs in the archive, spanning up to 10 years or more. In addition, new properly designed observations are being acquired for 47 clusters, 34 of which are currently without prior high-quality second-epoch observations (GO-13297, PI: Piotto). Our photometric and astrometric techniques allow us to measure thousands of stars in the central few arcmins from the clusters' center, with typical proper-motion errors of ~0.2 mas/yr. These high-quality measurements are crucial in order to detect the possible central intermediate-mass black hole and put constraints on its mass, in addition to provide direct a measurement of the cluster anisotropy and equipartition, allow detailed studies of the clusters' internal dynamics, their distance, their rotation and many other scientific applications.

SPEAKER: Mario Soto
TITLE: Galactic stellar populations and proper motions with HST: studying mass segregation in Globular Clusters and proper motions in low extincion bulge Windows
ABSTRACT: We report on two ongoing projects currently being carried out at the Space Telescope Science Institute (STScI). The first project attempts to characterize the mass segregation on a sample of 65 Galactic Globular Cluster by analyzing HST archival data in three instruments, the Wide Field Camera 2 (WFPC2), the Advance Camera for Surveys (ACS) and the Wide Field Camera 3 (WFC3). Our second project studies the proper motions in several low foreground extinction windows of the galactic bulge in 10 fields strategically placed on both ends of the Galactic bar and the Galactic minor-axis. A detailed account of both project motivations and techniques will be presented, as well as their respective current status, including new results.

SPEAKER: Mirko Simunovic
TITLE: The Blue Straggler Star Population in NGC 1261: Evidence for a Post Core-Collapse Bounce State
ABSTRACT: I will present a multi-passband photometric study of the Blue Straggler Star (BSS) population in the Galactic globular cluster (GC) NGC 1261, using available space- and ground-based survey data. The inner BSS population is found to have two distinct sequences in the color-magnitude diagram, similar to double BSS sequences detected in other GCs. We find further evidence for a previously unprecedented third, but far less populated, BSS sequence. These well defined sequences are presumably linked to single short-lived events such as core collapse, which are expected to boost the formation of BSSs. In agreement with this, we find that two of the BSS sequences in NGC 1261 can be well reproduced individually by theoretical model predictions of 200 Myr and 2 Gyr old populations of stellar collision products, which are expected to form in the denser inner regions during short-lived core contraction phases. The properties of the NGC1261 BSS populations, including their spatial distributions, suggest an advanced dynamical evolutionary state of the cluster, but the core of this GC does not show the classical signatures of core-collapse. I will argue that these apparent contradictions provide evidence for a post-core-collapse bounce state seen in dynamical simulations of old GCs.

SPEAKER: Alejandra Jiménez
TITLE: Flattened velocity dispersion profiles in Globular Clusters: Newtonian tides or modified gravity?

ABSTRACT: Over the past couple of years, a number of observational studies have confirmed the flattening of the radial velocity dispersion profiles for stars in various nearby globular clusters. As the projected radial coordinate is increased, a radius appears beyond which, the measured velocity dispersion ceases to drop and settles at a fixed value σ_{∞}. Under Newtonian gravity, this is explained by invoking tidal heating from the overall Milky Way potential on the outer, more loosely bound stars, of the globular clusters in question. From the point of view of modified gravity theories, such an outer flattening is expected on crossing the critical acceleration threshold a_{0}, beyond which, a transition to MONDian dynamics is expected, were equilibrium velocities cease to be a function of distance. We have constructed gravitational equilibrium dynamical models for a number of globular clusters for which the above gravitational anomaly has been reported, using a modified Newtonian force law which yields equilibrium velocities equivalent to MOND. We find models can be easily constructed having an inner Newtonian region and an outer modified gravity regime, which reproduce all observational constraints.

Also in this talk we attempt to sort out between the above competing explanations, by looking at their plausibility in terms of an strictly empirical approach. We determine Newtonian tidal radii using masses accurately calculated through stellar population modelling, and hence independent of any dynamical assumptions, distances, size and orbital determinations for the sample of 16 globular clusters studied. We show that their Newtonian tidal radii, at perigalacticon, are generally larger that the radii at which the flattening in the velocity dispersion profiles occurs, by large factors of 4, on average. While this point makes the Newtonian tidal explanation suspect, it is found that the radii at which the flattening is observed on average correlate with the radii where the a_{0} threshold is crossed, and that σ_{∞} values scale with the fourth root of the total masses, all features predicted under modified gravity theories.

SPEAKER: Sergio Vásquez
TITLE: Dynamical pattern of the X-shaped Milky Way Bulge

ABSTRACT: Our Galaxy bulge has been proved as an X-shape bulge from the distribution analysis of red clump stars. Dynamical models predict the formation of X-shaped bulges as extreme cases of boxy-peanut bulges. However, since X-shaped bulges were known to be present only in external galaxies, models have never been compared to 3D kinematical data for individual stars. In this talk I will present the first comparison between 3D velocities obtained from radial velocities and proper motions derived for the field (l,b)=(0,-6), with dynamical models of peanut-shaped bulges.

SPEAKER: Mauricio López
TITLE: Timekeeping in the Americas
ABSTRACT: Time and its measurement are part of the most fundamental core of physics. A great amount of science and technology achievements have been related somehow with time measurements. From the simplest everyday uses to very sophisticated applications like telecommunications, navigation and radio astronomy, particularly when using the VLBI technique, time measurements are of the highest importance. In this paper we start describing succinctly the physics behind the operation of an atomic clock and discuss the main characteristics of accuracy and stability of the different type of atomic clocks, including Hydrogen Masers. Then we discuss the timekeeping capabilities in the American continent maintained at the National Metrology Institutes (NMIs) including development of primary frequency standards, time scales and time dissemination. Finally we briefly comment the future of the SI second and time scales based on optical frequencies.

SPEAKER: Norbert Zacharias
TITLE: Bright star astrometry with URAT
ABSTRACT: The US Naval Observatory Robotic Astrometric Telescope (URAT) begun an all-sky survey in April 2012. The same "red lens" as used for the UCAC project was utilized, however, with a completely new telescope tube structure and a 4-shooter camera covering 28 sq. deg of sky in a single exposure at 0.9 "/mm. Regular survey 60 and 240 sec exposures cover stars in the R = 10 to 18 mag range, while for bright stars 30 and 10 sec exposures with an objective grating are used. The clocked anti-blooming feature of the CCDs allow to observe stars well into traditional saturation and URAT thus can access stars as bright as about R = 3 mag. Positions are obtained using UCAC4 reference stars. A first URAT catalog release is scheduled for later in 2014. This presentation will concentrate on comparing current epoch positions of bright stars from URAT data with the Hipparcos Catalogue.

SPEAKER: Iván Bustos
TITLE: Astrometric reduction of CFHTLS-VW images: preliminary results
ABSTRACT: Work continues on the reduction of a set of images of the ecliptical region belonging to the CFHTLS-VW collection. In this contribution the choice of the model used for the reduction and the criteria for the selection of the reference stars is presented. The maximum achievable astrometric accuracy with this choice is discussed based on the analysis of the results obtained with different filters to images in four fields widely separated in the sky. The purpose of this work is to build a catalog providing information on astrometry, photometry and object classification of the sources detected in these images.

SPEAKER: Carlos Guerrero
TITLE: High angular resolution survey for binary and multiple stars in the Galactic open cluster ASCC 113
ABSTRACT: We present a high angular resolution survey for binary and multiple stars in the Galactic open cluster ASCC 113. Our observations were conducted on the 2.1 m telescope of the Observatorio Astronómico Nacional, Sierra San Pedro Mártir, México. Combining our results with data taken from the literature, we found a ratio of the number of single to binary stars to be 27:7 for the most probable members, so the multiplicity fraction for this cluster is 20.6% ± 3%. We also observed field stars in the vicinity of the cluster and estimated a ratio of multiplicities to be 125:27:4:1:0:0:0:1 (between one and eight companions), equivalent to a multiplicity fraction of 20.9% ± 1%. We estimated the number of undetected companions in our sample to be very small. Comparing the multiplicity frequency of the cluster with the frequency of the field, we concluded that they are statistically indistinguishable from each other.

SPEAKER: Ana María Pacheco
TITLE: LOD first estimates in 7406 SLR San Juan - Argentina station
ABSTRACT: We show results derived from satellite observations in San Juan SLR station of Felix Aguilar Astronomical Observatory. The telescope was installed early 2006, according to international cooperation agreement between UNSJ and the Chinese Academy of Sciences.

SPEAKER: Marco Muñoz
TITLE: Chaotic Dynamics of Halley´s Comet: Lyapunov Exponent and Survival Time Prospect
ABSTRACT: We explore the dynamical evolution of the comet 1P/Halley over 1 Myr with detailed numerical simulations, under the gravitational influence of all planets in the present day Solar System (except Mercury). To this purpose we employed the Mercury 6.2 code, including, in addition to the planets, the 9 biggest minor bodies (among them the known as dwarf planets but Sedna) to conduct the N-body simulation. Halley´s comet fiduciary orbit, and a set of orbits surrounding it in phase-space (a-e), are solved as test particles in this problem. The ensemble of orbits explored is constructed as a mesh of 10,000 particles with different initial conditions covering the observational error of Halley's orbit in semimajor axis and eccentricity (+- 10-6 AU and +- 10-6, respectively). We find that the comet's fate is highly sensitive on initial conditions. Survival time maps from the simulations and Laskar frecuency analysis map for the vicinity of Halley's comet are shown. Also, the maximum Lyapunov exponent for neighboring orbits is calculated. This shows that chaos is dominant for these highly eccentric bodies as found by Chirikov & Vecheslavov (1989) and produces large non-stable regions for the comet´s surrounding phase space. We provide estimations of the probability of survival of the Halley´s comet and a general perspective about the dynamical evolution of comets on a wider region of phase-space which covers several currently known Halley type comets.

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VI Reunión de Astronomía Dinámica en Latinoamérica y Taller de Postgrado "The VLBI-Gaia connection – The next step in reference frames for astronomy"

Salón Auditorio Gorbea
Facultad de Ciencias Físicas y Matemáticas
Universidad de Chile

Santiago de Chile
29 de septiembre al 3 de octubre de 2014-09-16

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