

CURRICULUM VITÆ

Kleomenis Tsiganis

Personal Data

Full Name: Kleomenis (Menios) Tsiganis
Date of Birth: January 12, 1974
Place of Birth: Larissa, Greece
Nationality: Hellenic

Work Address: Aristotle University of Thessaloniki (AUTH)
Department of Physics
Section of Astrophysics, Astronomy & Mechanics
Unit of Mechanics and Dynamics
GR – 54124 Thessaloniki
Greece

Phone: +30-2310-998963 (office), +30-6936-444876 (cell)
Fax: +30-2310-998037
e-mail: tsiganis@auth.gr

Current Position

- Associate Professor, Department of Physics, AUTH (elected 10/2016)

Academic Titles

- PhD in Physics (Dynamical Astronomy), 2002, Dept. of Physics, AUTH
- BSc in Physics, 1996, Dept. of Physics, AUTH

Previous Research Experience

- 2011 – today: Assistant Professor, Section AA&M, Department of Physics, AUTH
- 2011: Visiting Researcher, Observatoire de la Cote d’ Azur (Nice, France) – *on sabbatical leave from AUTH*
- 2011: Visiting Researcher, Southwest Research Institute (SwRI, USA) – *on sabbatical leave from AUTH*
- 2006 - 2011: Lecturer, Section AA&M, Department of Physics, AUTH
- 2005-2006, Postdoc researcher, Lab. of Astronomy, AUTH.
- 2003-2005, Postdoc researcher, Observatoire de la Côte d’ Azur, CNRS (UMR 6202 Cassiopée), Nice, France (EC Marie Curie Fellowship, advisor: Dr. A. Morbidelli)
- 1998-2002, Doctoral researcher, Lab. of Astronomy, AUTH (Scholarship by the National

Scholarships Foundation of Greece)

Doctoral Thesis

Title: *Diffusion of chaotic trajectories in the phase space of Hamiltonian systems: applications in celestial mechanics*

Scientific Interests

My main scientific interests are:

Celestial Mechanics and nonlinear dynamics

- Hamiltonian systems with 2 and 3 degrees of freedom. Analytical and numerical methods for studying chaotic behavior, construction of approximate models (normal forms) and test-particles dynamics in resonances within the N-body planetary problem.

Dynamical evolution of the solar system

- Chaotic motion of asteroids – origins and dynamical evolution of the small bodies populations (asteroids in the main belt, Torjans, NEAs, etc.) – effects of weak non-conservative forces (Yarkovsky/YORP effects) – formation and dynamical evolution of asteroid families. Binary asteroids
- Early stages of dynamical evolution of the solar system – smooth and chaotic migration models for the planets – formation, evolution and stability of small body reservoirs
- Motion of regular and irregular natural satellites

Extrasolar planetary systems

- Formation and dynamical evolution of exo-planetary systems. Resonant motion and secular evolution

Dynamics of artificial satellites and space debris

- Orbits of artificial satellites around irregularly-shaped objects
- Satellite and space debris motion around the Earth

Teaching

Since my appointment as Lecturer (2006) I have taken up the following teaching duties:

Courses

Department of Physics (undergraduate):

- *Theoretical Mechanics II (analytical mechanics)*
- *Observational Astronomy*
- *Problems of the near-Earth environment*
- *Planetary Systems*
- *Theoretical Mechanics (Newtonian and Analytical mechanics)*
- *Programming (in C) and applications*
- *Applied Mathematics II (differential equations)*
- *Numerical Analysis*

Department of Physics: Graduate School “Computational Physics”:

- *Computational Dynamics, Astrodynamics and Applications*
- *Data analysis*
- *Simulations of Chaotic Systems*
- *Computational Mathematics I*
- *Programming Tools (Fortran)*

Department of Mathematics:

- *Observational Astronomy and Astrophysics*
- *Theoretical Mechanics*

Open Courses:

I participated, together with Prof. Seiradakis in the development of an open course on Observational Astronomy, within the framework of the related program of the Ministry of Education. Our course was awarded an honorary distinction (among the few in AUTH and over 2.500 courses in national level) by the Committee of the Central Register of Greek Open Courses.

Teaching outside AUTH:

- *Resonant motion and chaos in the solar system* (6-hrs master-class in English), Institut für Astronomie, Universität Wien, Αυστρία (academic year 2006 –2007), in the framework of the ERASMUS program.
- *Planetary Science* (6-hrs lecture) in the framework of the “Basic Training Program for Astronauts 2016” of the European Space Agency (ESA) – European Astronaut Centre, Cologne, May 2016

Books

- “Planetary Systems” (in Greek), K. Tsiganis and H. Varvoglis, 2015 (ISBN: 978-960-603-402-2). Electronic book, written with financial support by the program “*Greek Academic Electronic Books and Supplements – Action: KALLIPOS*” of the Ministry of Education.

Teaching Notes

- Notes for the “Planetary Science” course of the ESA/EAC “Basic Training Program for Astronauts 2016” of the European Space Agency
- “*Problems in Analytical Mechanics*” (in Greek), K. Tsiganis, 2008 (39 pages)
- “*Motion of bodies in the near-Earth environment*” (in Greek), K. Tsiganis and N. K. Spyrou, 2008 (55 pages)
- “*Computational Astrodynamics*” (in Greek), K. Tsiganis, 2007 (3 chapters, 28 pages)
- “*Resonant motion and chaos in the solar system*”, K. Tsiganis, 2007, (in English) for the ERASMUS master-class given in Vienna (44 pages)

Supervision of Undergraduate and Master Theses

- I have supervised numerous undergraduate theses, also in collaboration with other colleagues.
- I have supervised 2 completed Master Theses (S. Tzirti and S. Sotiriadis) and 1 currently being written (A. Myrisas) in the Computational Physics program.
- I was a member of the jury in 14 master theses of the same graduate program.

Out of the students that I have supervised (undergraduate or master level), the following have completed or are working on their PhD Thesis:

- Stella Tzirti (completed PhD at AUTH)
- Sotiris Sotiriadis (working on a PhD Thesis at FUNDP, Namur)
- Athanasia Toliou (working on a PhD Thesis at AUTH under my supervision)
- George Tsirvoulis (working on a PhD Thesis at the University of Belgrade, as Marie Curie fellow)
- Christos Nikolaides (completed PhD at MIT)

Supervision of Doctoral Theses

- Currently supervising two (2) students (Mrs. Toliou and Mrs. Skoulidou)
- Member of the advisory committee of Mr. Sotiriadis (FUNDP, Namur)

- I have been a member of the advisory committee of Mrs. Antoniadou (completed her PhD at AUTH)

Collaborations with Early-stage Researchers (post-doc)

- (2016 -) Dr. Aaron Rosengren (USA, PhD from UC Boulder, USA). Dr. Rosengren is working under contract within the program “ReDSHIFT” (see below), in which I am P.I.
- (2008 –) Dr. *Anne-Sophie Libert*, (PhD from FUNDP, Namur). In the academic year 2007-2008 spent a 6 months post-doc stage at AUTH, working with me (funding from FNRS). Our collaboration still continues. We have co-authored 5 original publications.
- (2008 –) Dr. *Bojan Novakovic*, then graduate student at the Astronomical Observatory of Belgrade. Mr. Novakovic spent time at AUTH during 2007. I have also been a member of his Majistar Jury in 2009. Our collaboration is still on going. We have co-authored 2 original publications.
- (2008 –) Dr. Stella Tzirti, former PhD student at AUTH, on satellite dynamics. We have co-authored 4 original publications.

- Dr. Libert has been recently appointed as Assistant Professor at FUNDP, Namur
- Dr. Novakovic has been appointed Lecturer at the University of Belgrade.
- Dr. Rosengren was recently offered an Assistant Professor's position at the University of Arizona, Tucson.

Administrative Duties / Societies

Committees of the Department of Physic AUTH

- Member of the Public Outreach Committee (2007-2009)
- Member of the consulting committee for 1st-year students (2008-2010)
- Member of the evaluation committee for applicants in the computational physics graduate program (2007- today)
- Member of the Committee for the Curriculum of the Department
- Member of the Committee for Laboratories of the Department

Membership in Scientific Societies

- (1997 - today) Member of the Hellenic Astronomical Society (Hel.A.S.)
- (2008-2012) Auditor of Hel.A.S.
- (2012-2014) Elected member of the Governing Council of Hel.A.S.
- (2014-2016) Elected Secretary of the GC of Hel.A.S.

- (2014 - today) Member of the IAU

Research Work

Resume of publications - arithmetics

Until today (25/5/2016) I have co-authored **46** papers in international refereed journals (of which **16** as Assistant Professor), **4** review articles by invitation (special volumes) (of which **2** as Assistant Professor) and **25** papers in volumes of international conferences (of which **8** as Assistant Professor). **12** of the conference papers are independent of my refereed papers (of which **5** as Assistant Professor).

In 2015 I published a “News & Views article in **Nature**, about new developments in the research of terrestrial planets formation, after an invitation by the Editor.

Finally, I have published **3** articles in periodical publications of societies (of which 1 is original and refereed, see E1 in list below) και **2** more articles (in Greek) in publications of AUTH.

The yearly average of original publications (total: **64**) is **3.8** (4.0 in the last 6 years) – excluding conference papers that are not independent of my research papers and articles in periodical journals of societies/AUTH.

The average number of authors per paper is **4.4** for all original publications. Note that 5 of these papers (2 in refereed journals and 3 in conference proceedings) are the result of consortium-level collaborations (space mission studies and observational programs) and thus have more than 10 authors each. In the remaining 59 original papers, the average number of authors per paper is **3.3**. The full list of publications is shown below (a detailed description is given, in Greek).

Citations by other researchers

Until 25/5/2016 the number of independent citations to my work is **2625** (in **51** papers), according to the Astrophysics Data System (ADS), of which ~1.600 during the last five years.

Other search engines give the following results:

-Web of Science: **2526** citations in **48** papers

-Scopus: **2595** citations in **50** papers

According to both Scopus and Web of Science my hirsch index is **h=19**.

Distinctions

- In December 2004, **Science** (2004, Vol. 306, p. 1676) published a summary on the *highlights* of the DPS 2004 meeting of the American Astronomical Society (AAS), citing my talk on planet migration and the Late Heavy Bombardment of the Moon as one of the top 3 presentations

- The publication of our papers on the origin of the orbits of the planets and the LHB (C13-C15, see list below) was covered by at least 50 communication media (press and web-sites) of the international scientific and civil press
- In August 2008, the Committee for Small-body Nomenclature of the IAU renamed asteroid 1999RC221 to “**(21775) Tsiganis**”, in recognition of my scientific achievements. The decision was published in the IAU Minor Planet Circulars (17/8/2008).
- In December 2009, I received an award of research excellence by the Research Committee of AUTH for a publication (Γ 21 in list) in ***Nature***.
- In December 2013 I received the “G. Foteinou Award” for Astronomy by the Academy of Athens.
- In October 2016 I received the European “2016 Paolo Farinella Prize” for my contribution in applications of celestial mechanics to the dynamics of natural bodies in the solar system. (Plenary invited talk at EPSC/DPS, Pasadena CA, USA)

International and National Collaborations

I have a long-standing and on-going collaborations with the following researchers/groups abroad:

- Prof. Humberto Campins, University of Central Florida (Orlando, USA)
- Dr. Anne-Sophie Libert and Prof. Anne Lemaitre, FUNDP (Namur, Belgium)
- Drs. Harold Levison, W. Bottke and D. Nesvorny, *SouthWest Research Institute* (USA)
- Dr. Alessandro Morbidelli, Dr. Patrick Michel and Dr. Alain Noullez, *Observatoire de Nice* (France)
- Prof. Zoran Knezevic and Dr. Bojan Novakovic, *Astronomical Observatory of Belgrade*
- Prof. Rudolf Dvorak and Dr. Elke Lohinger, *Astronomical Institute, Vienna* (Austria)

I maintain a close collaboration with all members of the Unit of Mechanics at the Department of Physics at AUTH, Also, I have an on-going collaboration with Dr. Efthymiopoulos (Academy of Athens) and his group.

Participation in Actions and Programs funded by International Organizations

- (2015 – today) member of the “AIM Investigation Team” (P.I. Dr. Patrick Michel, OCA, Nice) which supervises the science part of the on-going study of the Asteroid Impact Mission, on behalf of ESA.

At the same time I participate as co-chair of Working Group #3: “Dynamical and Physical

properties of Didymos” (co-chairs: Prof. Derek Richardson and Prof. Adriano Campo-Bagatin) in the international consortium that studies the scientific part of the proposed (combined) mission AIDA (Asteroid Impact and Deflection Assessment, ESA/AIM, NASA/DART, P.I. Prof. Andy Cheng, JHU/APL, USA).

- Project “AstroMap” (2014-2016, P.I. Felipe Gomez, INTA, Madrid). Funded by the E.C. to enable the definition and scientific validation of a RoadMap of the E.C. for future research in Astrobiology. My participation consisted in:
(α) participating in a 2-days meeting in ASI (Rome), after an invitation by the consortium, and
(β) participation in the definition and publication of the RoadMap (see Γ44), after being invited by the E.C. official of the program, Mr. Nicolas Walter.
- Program “Vesta, the key to the origins of the solar system” (2012-2014, P.I. Dr. Diego Turrini, INAF, Rome). The international team of researchers was supported financially by the action “ISSI International Teams 2012” of the International Space Science Institute in Berne (Switzerland).

Participation in funded Research Programmes

(a) as Assistant Professor:

- P.I. in the program “Revolutionary Design of Spacecraft through Hollistic Integration of Future Technologies (ReDSHIFT)”, E.C. Horizon 2020. Funding for AUTH: **134.000** euros
- Participant in the action “*Greek Academic Electronic Books and Supplements – Action: KALLIPOS*”, Ministry of Education, 2015 – Funding: **10.000** euros (for writing an e-book on planetary systems).
- P.I. in the program “Study of planet formation process usign high-resolution numerical simulations”, Research Committee of AUTH, Action C, 2013-2014. Funding: **4.000** euros

(b) as Lecturer:

- “*Simulations à haute résolution du processus de formation des planètes telluriques*”, Programme PICS/CNRS (Planetologie), P.I. A. Morbidelli (2008-2010)
- “*Constraining planet formation processes by modeling the collisional and dynamical evolution of inner solar system asteroids*”, P.I. Dr. W.F. Bottke (SwRI), NASA Program: *Origins of the Solar System*, Contract nr: NNX08AI42G (2007 - 2009)
- “*Large-scale simulations of gravitational astrophysical systems*”, national research program *Pythagoras*, G.S.R.T. Greece, P.I. Prof. H. Varvoglis (01/2006 – 08/2006)

Other funding

- 15.000 Euros (2009, AUTH internal proposal) for the purchase and installation of 2 state-of-the-art parallel-processing Workstations, with multiple GPUs (2xQuad-core with 3 GPUs Nvidia Tesla C1060 each)
- Program on “*Simulations of the formation of the solar system*” (P.I. H. Varvoglis), Empeirikeio Foundation 2004 (funding for purchasing a **GRAPE 6A/Pro** platform)

Reviewer in International Refereed Journals

I am a regular reviewer (over >6 papers/year after 2011) for the following journals:

- *Celestial Mechanics and Dynamical Astronomy*
- *Icarus*
- *Monthly Notices of the Royal Astronomical Society*
- *Astronomy & Astrophysics*
- *The Astronomical Journal*
- *The Astrophysical Journal*
- *Nature Geosciences*
- *Planetary and Space Science*
- *Astrophysics and Space Science*
- *Serbian Astronomical Journal*

Reviewer of Scientific Proposals

- Post-doctoral research program of FNRS, Belgium, 2008
- Program of Post-Doctoral research “Herakleitos II”, Greek Min. of Education, 2010
- Research Programs of the Czech Science Foundation, 2012

Research Visits

I am regularly visiting the following institutes, for educational and research activities:

- Astronomical Observatory Beograd, Serbia
- Institut für Astronomie, Universität Wien, Austria
- Observatoire de Nice, France
- Southwest Research Institute (SwRI), Boulder, USA
- RCAAM, Academy of Athens

I have also visited (for lectures and/or collaboration) the following institutes:

- Max-Planck Institut für Astronomie, Heidelberg, Germany

- University of Tuebingen, Germany
- University of FUNDP, Namur, Belgium
- Konkoly Observatory, Hungary
- University of Roma «Tor Vergata», Italy
- Italian Space Agency (ASI)

Scientific Conferences and Advanced Schools

I have participated in **37** international and national meetings (of which 10 as Assist. Prof.) I was an invited speaker in **8** of these (of which **3** as Assist. Prof.). In the last five years I received an invitation for another 3 international meetings, in which I was unable to attend at the end, for personal reasons. In **25** meetings I presented my work (of which **6** as Assist. Prof.) and in **4** meetings I took part without presenting a paper. More specifically:

Invited Speaker

1. “IAU Colloquium No 196 – *Transits of Venus: New views of the Solar System and the Galaxy*”, 06/2004, Preston, UK.
2. CNRS School on “*Open Problems in Celestial Mechanics*”, 2006, Aussois, France
3. SUPPA/SUSSP School (No 62) on “*Extra-Solar Planets*”, 2007, Skey Isl., UK
4. CNRS School on “*Dynamics of gravitational systems*”, 2009, Aussois, France
5. “CELMEC V – *International Meeting on Celestial Mechanics*”, 2009, Viterbo, Italy
6. Nordita Master Class in Physics 2012. “Planet formation and evolution of young planetary systems”, 2012, Hilleroed (Denmark) **(4-hrs lectures)**
7. STARDUST Marie Curie Training Network 2014 School. “Orbital Dynamics: an overview of asteroids and artificial satellites motion”, Rome, 2014 **(4-hrs lectures)**
8. STARDUST Marie Curie Training Network 2015 School. “*Chaotic diffusion and Asteroid families*”, Belgrade, 2015 **(3-hrs lectures)**

* I was invited in the following meetings that I was unable to attend at the end:

- Pluto System Meeting, 2013 (APL/JHU, HPIA)
- “CELMEC VI – *International Meeting on Celestial Mechanics*”, 2013, Viterbo, Ιταλία
- IAU Symposium 318 (στα πλαίσια της XXIX General Assembly της IAU), Hawai, ΗΠΑ

Paper or poster presentation

1. “10th Summer School/ 5th National Conference on Complexity and Chaotic Dynamics of Nonlinear Systems”, 1997, Peraia, Thessaloniki
2. “11th Summer School/ 5th National Conference on Complexity and Chaotic Dynamics of Nonlinear Systems”, 1998, Levadia
3. “4th Conference of the Hellenic Astronomical Society, 1999, Samos
4. “JENAM 97 – *New Trends in Astronomy & Astrophysics*”, 1997, Kallithea, Chalkidiki

5. *“International Winter School on Nonlinear Time Series Analysis”*, 1998, Max Planck Institute for Physics of Complex Systems, Dresden, Germany
6. *“IAU Colloquium No 172 – The Impact of Modern Dynamics in Astronomy”*, 1998, FUNDP, Namur, Belgium
7. *“5th Alexander von Humboldt Colloquium for Celestial Mechanics”*, 2000, Bad Hofgastein, Austria
8. *“CELMEC III – International Meeting on Celestial Mechanics”*, 2001, Rome, Italy
9. *“JENAM 2003”*, 2003, Budapest, Hungary
10. *NATO ASI 2003- “Chaotic Worlds”*, 2003, Cortina d’ Ampezzo, Italy
11. *“DDA 2004 – Annual meeting of the Division on Dynamical Astronomy of the American Astronomical Society”*, 2004, Cannes
12. *“6th Alexander von Humboldt Colloquium for Celestial Mechanics”*, 2004, Bad Hofgastein, Austria
13. *“IAU Colloquium No 196 – Dynamics of populations of planetary systems”*, 2004, Belgrade, Serbia & Montenegro
14. *“DPS 2004 – Annual meeting of the Division on Planetary Sciences of the American Astronomical Society”*, 2004, Louisville KY, USA
15. *“Chaos in Astronomy”*, 2007, Athens
16. *“8th Hellenic Astronomical Conference”*, 2007, Thasos
17. *“Theory and Applications of Dynamical Systems”*, 2007, Spoleto, Italy
18. *“7th Alexander von Humboldt Colloquium for Celestial Mechanics”*, 2008, Bad Hofgastein, Austria
19. *“Dynamics of Celestial Bodies (DCB-08)”*, 2008, Litohoro, Greece
20. *“10th Conference of the Hellenic Astronomical Society”*, September 2011, Ioannina
21. *“8th Alexander von Humboldt Colloquium for Celestial Mechanics”*, March 2011, Bad Hofgastein
22. *“AstRoMap Workshop: Origins and Evolution of Planetary Systems”*, ASI Rome, November 2014
23. *“11th Conference of the Hellenic Astronomical Society”*, September 2013, Athens
24. *“12th Conference of the Hellenic Astronomical Society”*, July 2015, Thessaloniki
25. *Asteroid Impact Mission (AIM) Science Meeting*, March 2016, ESAC Madrid

Participation without presentation

1. *“8^o Summer School / 3^o Hellenic Conference on Complexity and Chaotic Dynamics of Nonlinear Systems”*, July 1995, Xanthi
2. *“Workshop on planet formation”*, February 2003, Observatoire de Nice, France
3. *“Marco Polo Workshop”*, ESA Cosmic Vision Science Programme, March 2008, Cannes (France).
4. *“Nonlinear Dynamics and Complexity: Theory, Methods and Applications”*, July 2010, Thessaloniki.

Recent Seminars

(2010 – today) presented at AUTH and elsewhere:

(a) at AUTH

1. *“The AIDA mission to the the binary NEA Didymos”*, Seminar of the AA&M Section, May 2016.
2. *“Solar System: Birth and Evolution”*, in the framework of the E.C.-funded BEST program, March 2015
3. *“Dynamics of small bodies and evolutionary history of our solar system”*, Department Seminar, February 2014.
4. *“Decifering the orbital and spectral distribution of asteroids”*, Seminar of the AA&M Section, November 2010.
5. *“Dynamical evolution of the solar system: contemporary views”*, Department Seminar, March 2010.

(β) other Institutes

1. *“Is there a 9th planet in the solar system?” (in Greek)*, RCAAM Academy of Athens, February 2016
2. *“Is there a 9th planet in the solar system?”*, National Observatory of Athens, February 2016
3. *“Early dynamical evolution models and constraints”*, ISSI Bern, January 2013.
4. *“A formation scenario for the Uranian satellites: making the orbits of the satellites compatible with Uranus's axial tilt”*, RCAAM Academy of Athens, February 2012
5. *“Planet formation in the presence of inclined stellar perturbers”*, Astronomical Institute of Vienna, May 2012
6. *“Origin of the equatorial orbits of the Uranian satellites in a scenario of impact-induced axial tilt”*, OCA/Nice, May 2011

(c) other events

1. *“Near-Earth Asteroids: risk assessment and methods for mitigation”*, in the “8th Maths Week”, Thessaloniki 2016.

Conference Organization

Έχω συμμετάσχει στη διοργάνωση των παρακάτω διεθνών συνεδρίων:

1. *AIDA 2nd International Workshop*, 2016, Nice, member of the SOC
2. *Asteroid Impact Mission (AIM) Science Meeting*, 2016, ESAC Madrid, member of the SOC
3. *“12th Conference of the Hellenic Astronomical Society”*, 2015 Thessaloniki, member of the SOC and LOC
4. *“11th Conference of the Hellenic Astronomical Society”*, 2013, Athens, member of the

SOC

5. *Complex Planetary Systems*, IAU Symposium No 310, 2014, Namur, member of the SOC
6. “Nonlinear Dynamics and Complexity: Theory, Methods and Applications”, 2010, Thessaloniki, member of the LOC
7. *Dynamics of Celestial Bodies (DCB-08)*, Lithoro, 2008 (LOC)
8. *DDA 2004 – Annual meeting of the Division on Dynamical Astronomy of the American Astronomical Society*, April 2004, Cannes, France
9. *JENAM 97 – New trends in Astronomy & Astrophysics*, 1997, Kallithea, Greece

Public Outreach Activities

talks on secondary education

- Talk at the meeting: “*Space exploration in the secondary education*”, Ioannina, Division of Secondary Education of Epirus, under the auspices of ESA and the Region of Epirus (2009)
- Talks at “*Orientation Day*” of the 1st Lyceum of Polichni (2009) and the “*Anatolia College*” (2013)

public talks

I have participated in many public events such as:

- The “Open Nights”, organized by the Observatory of AUTH (since 2005).
- Talks at the “NOESIS” Museum, the City of Larisa, the AUTH event for the International Year of Astronomy 2009, numerous talks in amateur astronomy clubs all over Greece, etc.
- Participated in local TV shows on several science issues.

Linguistic and Computing Proficiency

Languages

- Greek (native)
- English (excellent)
- French (basic)

Software development

Over 17 years of experience in software development (F77/F95, also C++ and *Mathematica*), related to:

- Evolution codes for systems of ODEs and PDEs, with applications in Dynamical Astronomy, Astrophysics and Celestial Mechanics
- Implementation of nonlinear time-series analysis and chaos detection methods

List of Publications (not including abstracts in meetings)

A. Dissertations

A 1. *Diffusion of chaotic trajectories in Hamiltonian systems: applications in celestial mechanics* (in Greek), K. Tsiganis, 2002, Publications of AUTH, Greece.

B. Review articles and “News & Views” (by invitation)

B 1. *Early dynamical evolution of the Solar System: Models and constraints from Asteroid and KBO dynamics.* K. Tsiganis, 2005. In: *IAU Colloquium No 196 - Transits of Venus: New views of the Solar System and the Galaxy*, D.W Kurtz and G.E. Bromage (eds), Cambridge University Press, p. 209.

B 2. *Chaotic Diffusion of Asteroids,* K. Tsiganis, 2007, *Lecture Notes in Physics* **729**, (D. Benest, C. Froeschle and E. Lega eds.), Springer-Verlag Berlin, p. 111.

B 3. *Dynamics of small bodies in the solar system,* K. Tsiganis, 2010, *Eur. Phys. J. Special Topics* **186**, 67.

B 4. *Late stages of solar system formation and implications for extra-solar systems,* K. Tsiganis, 2011, In “*Extra-Solar Planets: The detection, formation, evolution and dynamics of planetary systems*”, (B.A. Steves, M. Hendry and A.C. Cameron eds), CRC Press, p. 123.

B 5. *Planetary Science: How the Solar System didn't form,* K. Tsiganis, 2015 *Nature* **528**, p. 202

Γ. Publications in International refereed journals

Γ 1. *On the relationship between the maximal LCNs and the width of the stochastic layer in a driven pendulum,* K. Tsiganis, A. Anastasiadis and H. Varvoglis, 1999, *J.Phys. A* **32**, 431-442.

Γ 2. *Dimensionality differences between sticky and non-sticky chaotic trajectory segments in a 3-D Hamiltonian system.* K. Tsiganis, A. Anastasiadis and H. Varvoglis, 2000, *Chaos Sol. & Fractals*, **11**(14), 2281-2292.

Γ 3. *Stable chaos in the 12:7 mean motion resonance with Jupiter and its relation to the stickiness effect.* K. Tsiganis, H. Varvoglis and J.D. Hadjidemetriou, *Icarus*, **146**, 240-252.

Γ 4. *Thersites: a ‘jumping’ Trojan?* K. Tsiganis, R. Dvorak and E. Pilat-Lohinger, 2000, *Astron.*

& *Astrophys.*, **354**, 1091-1100.

Γ 5. *The power spectrum of geodesic divergences as an early detector of chaotic motion.* Ch.,L. Vozikis, H. Varvoglis and K. Tsiganis, 2000, *Astron. & Astrophys.*, **359**, 386-396.

Γ 6. *Chaotic evolution of (719)-Albert, the recently recovered minor planet.* K. Tsiganis and H. Varvoglis, 2000, *Astron. & Astrophys.*, **361**, 766-769.

Γ 7. *Why do Trojan ASCs (not) escape?* R. Dvorak and K. Tsiganis, 2000, *Cel. Mech. Dyn. Astron.*, **78**, 125-136.

Γ 8. *Stable chaos in high-order Jovian resonances.* K. Tsiganis, H. Varvoglis and J.D. Hadjidemetriou, 2002, *Icarus*, **155**, 454-474.

Γ 9. *Stable chaos vs. Kirkwood Gaps in the asteroid belt: A comparative study of mean motion resonances.* K. Tsiganis, H. Varvoglis and J.D. Hadjidemetriou, 2002, *Icarus*, **159**, 284-299.

Γ10. *Short-lived asteroids in the 7/3 Kirkwood gap and their relationship to the Eos and Koronis families.* K. Tsiganis, H. Varvoglis and A. Morbidelli, 2003, *Icarus*, **166**, 131-140.

Γ11. *Chaos and the effects of planetary migration on the orbit of S/2000 S5 Kiviuq.* V. Carruba, D. Nesvorny, J. Burns, M. Cuk and K. Tsiganis, 2004, *Astron. J.*, **128**, 1899-1915.

Γ12. *Chaotic diffusion and effective stability of Jupiter Trojans.* K. Tsiganis, R. Dvorak and H. Varvoglis, 2005, *Cel. Mech. Dyn. Astron.* **92**, 71.

Γ13. *Origin of the orbital architecture of the Giant Planets of the Solar System.* K. Tsiganis, R. Gomes, A. Morbidelli and H. Levison, 2005, *Nature* **435**, 459.

Γ14. *Origin of the Cataclysmic Late Heavy Bombardment of the Terrestrial Planets.* R. Gomes, H. Levison, K. Tsiganis, and A. Morbidelli, 2005, *Nature* **435**, 466.

Γ15. *The chaotic capture of Jovian Trojan asteroids during the early dynamical evolution of the Solar System.* A. Morbidelli, H. Levison, K. Tsiganis and R. Gomes, 2005 *Nature* **435**, 462.

Γ16. *Dynamics of the Giant Planets of the Solar System in the Gaseous Protoplanetary Disk and Their Relationship to the Current Orbital Architecture,* A. Morbidelli, K. Tsiganis, A. Crida, H. Levison and R. Gomes, 2007, *Astronomical Journal* **134**, 1790.

Γ17. *Reconstructing the orbital history of the Veritas family.* K. Tsiganis, Z. Knezevic and H. Varvoglis, 2007, *Icarus* **186**, 484.

Γ18. *Kozai Resonance in Extrasolar Systems,* A.S. Libert and K. Tsiganis, 2009, *A&A* **493**, 697.

Γ19. *Origin of the structure of the Kuiper belt during a dynamical instability in the orbits of Uranus and Neptune.* H. Levison, A. Morbidelli, C. Vanlaerhoven, R. Gomes, K. Tsiganis, 2008, *Icarus* **196**, 258.

- Γ20.** *Quasi-critical orbits for artificial lunar satellites*, S. Tzirti, K. Tsiganis and H. Varvoglis, 2009, *Cel Mech Dyn Astron* **104**, 227.
- Γ21.** *Contamination of the asteroid belt by primordial trans-Neptunian objects*, H. Levison, W. Bottke, M. Gounelle, A. Morbidelli, D. Nesvorny, K. Tsiganis, 2008, *Nature* **460**, 364.
- Γ22.** *Chaotic transport and chronology of complex asteroid families*. B. Novakovic, K. Tsiganis and Z. Knezevic, 2010, *MNRAS* **402**, 1263.
- Γ23.** *Trapping in high-order orbital resonances and inclination excitation in extrasolar systems*. Libert A.-S. and Tsiganis K., 2009, *MNRAS* **400**, 1373.
- Γ24.** *Constructing the secular architecture of the solar system I: the giant planets*. Morbidelli A., Brasser R., Tsiganis K., Gomes R., and Levison H.F., 2009, *A&A* **507**, 1041.
- Γ25.** *Constructing the secular architecture of the solar system II: the terrestrial planets*. Brasser R., Morbidelli A., Gomes R., Tsiganis K., Levison H.F., 2009, *A&A* **507**, 1053.
- Γ26.** *Dynamical portrait of the Lixiaohua asteroid family*. Novakovic B., Tsiganis K. and Knezevic Z., 2010, *Cel Mech Dyn Astron* (doi 10.1007/s10569-010-9263-9) in press.
- Γ27.** *Origin of the near-Earth asteroid Phaethon and the Geminids meteor shower*. J. de Leon, H. Campins, K. Tsiganis, A. Morbidelli and J. Licandro, 2010, *A&A* **513**, A26.
- Γ28.** *Effect of higher degree gravity harmonics and Earth perturbations on lunar artificial satellite orbits*, S. Tzirti, K. Tsiganis and H. Varvoglis, 2010, *Cel Mech Dyn Astron.* **108**, 389.
- Γ29.** *Evidence from the asteroid belt for a violent past evolution of Jupiter's orbit*. A. Morbidelli, R. Brasser, R. Gomes, H. Levison, K. Tsiganis, 2010, *Astron. J.* **140**, 1391.
- Γ30.** *The Origin of Asteroid 101966 (1999 RQ 36)*, H. Campins, A. Morbidelli, K. Tsiganis, J. de Leon, J. Licandro and D. Lauretta, 2010, *Astrophys. J.* **721**, L53.
- Γ31.** *Formation of “3-D” multi-planet systems by dynamical disruption of multiple-resonance configurations*, A.-S. Libert and K. Tsiganis, 2010, *MNRAS* **412**, 2353.
- Γ32.** *Formation and evolution of planetary systems in presence of highly inclined stellar perturbers*, Batygin K., Morbidelli A., Tsiganis K., 2011 *A&A*, **533**, A7.
- Γ33.** *Trapping in three-planet resonances during gas-driven migration*, Libert A.-S., Tsiganis K., 2011, *Cel Mech Dyn Astron* **111**, 201.
- Γ34.** *Late orbital instabilities in the outer planets induced by interaction with a self-gravitating planetesimal disk*, Levison H.F., Morbidelli A., Tsiganis K., Nesvorny D., Gomes R., 2011, *Astron. J.* **142**, art. no. 152.

Γ35. *Interaction of free-floating planets with a star-planet pair.* Varvoglis H., Sgardeli V., and Tsiganis K., 2012, *Cel Mech Dyn Astron.* **113**, 387.

Γ36. *Explaining why the Urnian satellites have equatorial prograde orbits despite the large planetary obliquity.* Morbidelli A., Tsiganis K., Batygin K., Crida A., Gomes R., 2012, *Icarus* **219**, 737.

Γ37. *Constraining asteroid dynamical models using GAIA data,* Tsiganis K., Varvoglis H., Tsirovoulis G., Voyatzis G., 2012, *Plan. & Spa. Sci.* **73**, 47.

Γ38. *Lightcurve Analysis of 266 Aline, 664 Judith, (16959) 1998 QE17 and (32910) 1994 TE15,* C. Avdellidou, P. Ioannidis, D. Skulidou, K. Tsiganis and J.H. Seiradakis, 2012, *Minor Plan. Bull.* **39**, 103

Γ39. *Secular dynamics of a lunar orbiter: a global exploration using Prony's frequency analysis,* S. Tzirti, A. Noullez, K. Tsiganis, 2014, *Cel Mech Dyn Astron.* **118**, 379.

Γ40. *Vertical instability and inclination excitation during planetary migration,* G. Voyatzis, K. I. Antoniadou, K. Tsiganis, 2014, *Cel Mech Dyn Astron.* **119**, 221.

Γ41. *The origin of long-lived asteroids in the 2:1 mean-motion resonance with Jupiter,* O. Chrenko, M. Broz., D. Nesvorny, K. Tsiganis, D. K. Skoulidou, 2015, *MNRAS* **451**, 2399

Γ42. *Is Vesta an intact and pristine protoplanet?,* G.J. Consolmagno, G.J. Golabek, D. Turrini, M. Jutzi, S. Sirono, V. Svetsov, K. Tsiganis, 2015, *Icarus* **254**, 190.

Γ43. *Satellite orbits design using frequency analysis,* A. Noullez, K. Tsiganis, S. Tzirti, 2015, *Adv. Sp. Res.* **56**, 163

Γ44. *AstRoMap European Astrobiology Roadmap,* G. Horneck, N. Walter, F. Westall, J. L. Grenfell, W. F. Martin, F. Gomez, S. Leuko., N. Lee, S. Onofri, K. Tsiganis, R. Saladino, E. Pilat-Lohinger, E. Palomba, J. Harrison, F. Rull, C. Muller, G. Strazzulla, J. R. Brucato, P. Rettberg and M.-T. Capria, *Astrobiology* **16**, 201-243,

Γ45. *Science case for the Asteroid Impact Mission (AIM): A component of the Asteroid Impact & Deflection Assessment (AIDA) mission,* P. Michel, A. Cheng, M. Kuppers, P. Pravec, J. Blum, M. Delbo, S.F. Green, P. Rosenblatt, K. Tsiganis, J.B. Vincent, J. Biele, V. Ciarletti, A. Herique, S. Ulamec, I. Carnelli, A. Galvez, L. Benner, S.P. Naidu, O.S. Barnouin, D.C. Richardson, A. Rivkin, P. Scheirich, N. Moskovitz, A. Thirouin, S.R. Schwartz, A. Campo Bagatin, Y. Yu, 2016, *Adv. Sp. Res.* **57**, 2529

Γ46. *Magnitude and timing of the giant-planet instability: A re-assessment from the asteroid belt perspective,* A. Toliou, A. Morbidelli and K. Tsiganis, 2016, *A&A* in press.

Δ. Conference Proceedings

Δ 1. *Effective Lyapunov Numbers and Correlation Dimensions in a 3-d.o.f. Hamiltonian system.* K. Tsiganis, A. Anastasiadis and H. Varvoglis, 1999, in *IAU Colloquium No 172 – The Impact of Modern Dynamics in Astronomy*, S. Ferraz-Mello and J. Henrard (eds.), Kluwer Academic Publishers, p. 441.

Δ 2. *Stable chaos and stickiness in the 12/7 Jovian resonance.* K. Tsiganis, H. Varvoglis and J.D. Hadjidemetriou, 2000, in *4th Conference of HEL.A.S.*, J. Seimenis and N. Soulakelis (eds.), p. 249.

Δ 3. *Is (1868)-Thersites an escaping Trojan?* K. Tsiganis, R. Dvorak and E. Pilat-Lohinger, 2000, in *4th Conference of HEL.A.S.*, J. Seimenis and N. Soulakelis (eds.), p. 255.

Δ 4. *Transport in the outer asteroid belt: Fokker-Planck solutions vs. Numerical Integrations.* K. Tsiganis, A. Anastasiadis and H. Varvoglis, 2000, in *4th Conference of HEL.A.S.*, J. Seimenis and N. Soulakelis (eds.), p. 135.

Δ 5. *Power Spectrum of Orbits' Divergence as a stochasticity indicator.* Ch. Vozikis, H. Varvoglis and K. Tsiganis, 2000, in *4th Conference of HEL.A.S.*, J. Seimenis and N. Soulakelis (eds.), p. 151.

Δ 6. *On a Fokker-Planck approach to asteroidal transport.* K. Tsiganis, A. Anastasiadis and H. Varvoglis, 2000, in *5th Alexander von Humboldt Colloquium for Celestial Mechanics*, R. Dvorak and J. Henrard (eds.), Kluwer Academic Publishers (*Cel. Mech. Dyn. Astron.* **78**, 337).

Δ 7. *Achates: a Trojan on the edge of escape.* K. Tsiganis and R. Dvorak, 2001, in *Proceedings of the 2nd Austrian-Hungarian Workshop on Trojans and related topics*, Eotvos University Press, Budapest, p. 39.

Δ 8. *Diffusion of asteroids in the outer belt.* K. Tsiganis, H. Varvoglis and A. Anastasiadis, 2002, *CELMEC III – Modern Celestial Mechanics: from Theory to Applications*, A. Celetti et al. (eds), Kluwer Academic Publishers (Netherlands), p. 451.

Δ 9. *Stable chaos in mean motion resonances.* H. Varvoglis, K. Tsiganis, J.D. Hadjidemetriou, 2002, *CELMEC III – CELMEC III – Modern Celestial Mechanics: from Theory to Applications*, A. Celetti et al. (eds), Kluwer Academic Publishers (Netherlands), p. 459.

Δ10. *The dynamical portrait of the Veritas family region.* Z. Knezevic, K. Tsiganis and H. Varvoglis, 2002, *Proceedings of Asteroids, Comets, Meteors (ACM 2002)*, Technical University of Berlin, Berlin, Germany, ESA SP-500 November 2002, p.335.

Δ11. *Stable chaos and local integrals of motion.* H. Varvoglis, K. Tsiganis and G. Hadjivantsides, 2002, *Proceedings of Asteroids, Comets, Meteors (ACM 2002)*, Technical University of Berlin, Berlin, Germany, ESA SP-500 November 2002, p.355.

Δ12. *The “third” integral in the restricted three-body problem revisited.* H. Varvoglis, K. Tsiganis and J.D. Hadjidemetriou, 2003, In *Chaos & Galaxies*, G. Contopoulos and N. Voglis (eds.), *Lecture Notes in Physics* **626**, p. 433, Springer.

Δ13. *Age of the Veritas asteroid family from two independent estimates.* Z. Knezevic, K. Tsiganis and H. Varvoglis, 2006, *Publ. Astron. Obs. Belgrade* **80**, p. 161.

Δ14. *The Collisional Evolution of Objects Captured in the Outer Asteroid Belt During the Late Heavy Bombardment,* W. Bottke, H. Levison, A. Morbidelli and K. Tsiganis, 2008, *Lunar & Planetary Science Institute* **39**, 1447

Δ15. *Exosystems in Kozai Resonance: How to increase the mutual inclination?* A.S. Libert and K. Tsiganis, In *Dynamics of Celestial Bodies: Proceedings of the 2008 International Conference in honor of John D. Hadjidemetriou* (Lithoro, Greece), 2009, H. Varvoglis and Z. Knezevic (eds.), AUTH (Greece) /AOB (Serbia), p. 143

Δ16. *Local diffusion characteristics and the age of the Veritas asteroid family.* B. Novakovic, K. Tsiganis and Z. Knezevic. In *Dynamics of Celestial Bodies: Proceedings of the 2008 International Conference in honor of John D. Hadjidemetriou* (Lithoro, Greece), 2009, H. Varvoglis and Z. Knezevic (eds.), AUTH (Greece) /AOB (Serbia), p. 151

Δ17 *Quasi-critical orbits for artificial Lunar satellites.* S. Tzirti, K. Tsiganis and H. Varvoglis. In *Dynamics of Celestial Bodies: Proceedings of the 2008 International Conference in honor of John D. Hadjidemetriou* (Lithoro, Greece), 2009, H. Varvoglis and Z. Knezevic (eds.), AUTH (Greece) /AOB (Serbia), p. 189

Δ18. *Formation mechanisms of highly non-coplanar systems.* Libert A.-S., Tsiganis K., 2011, EPSC-DPS Joint Meeting, p.1429

Δ19. *The Origin of Near-Earth Asteroid 1999 JU3,* Campins H., Morbidelli A., de Leon J., Tsiganis K., Licandro J., 2011, EPSC-DPS Joint Meeting, p.1365

Δ20. *Explaining why the satellites of Uranus have equatorial prograde orbits despite of the large planet's obliquity,* Morbidelli A., Tsiganis K., Batygin K., Gomes R., Crida A., 2011, EPSC-DPS Joint Meeting, p. 54

Δ21. *Influence of the inclination damping on the formation of planetary systems,* S. Sotiriadis, A.-S. Libert and K. Tsiganis. In *Proceedings of IAU Symposium No 310 on Complex Planetary Systems*, Namur 2014 (Z. Knezevic and A. Lemaitre eds.), p. 220.

Δ22. *Long-term evolution of asteroids in the 2:1 Mean Motion Resonance,* D. K. Skoulidou, K. Tsiganis and H. Varvoglis. In *Proceedings of IAU Symposium No 310 on Complex Planetary Systems*, Namur 2014 (Z. Knezevic and A. Lemaitre eds.), p. 178.

Δ23. *NELIOTA: ESA's new NEO lunar impact monitoring project with the 1.2m telescope at the National Observatory of Athens,* A.Z. Bonanos, M. Xilouris, P. Boumis, I. Belas-Velidis, A. Maroussis, A. Dapergolas, A. Fytsilis, V. Charmandaris, K. Tsiganis, K. Tsinganos. In *Proceedings of IAU Symposium No 318 on Asteroids: New Observations, new models*, Hawaii 2015 (S. Chesley, A. Morbidelli, R. Jedicke, & D. Farnocchia, eds.).

Δ24. ASTEROID IMPACT AND DEFLECTION ASSESSMENT (AIDA) MISSION: THE DOUBLE ASTEROID REDIRECTION TEST (DART), A. F. Cheng, P. Michel, O. Barnouin, A. Campo-Bagatin, P. Miller, P. Pravec, D. C. Richardson, A.S. Rivkin, S. R. Schwartz, A. Stickle, K. Tsiganis, S. Ulamec. In *47th Lunar & Planetary Science Conference* (2016), p. 2023.

Δ25. DYNAMICAL AND PHYSICAL PROPERTIES OF 65803 DIDYMOS, D. C. Richardson, O. S. Barnouin, L. A. M. Benner, W. F. Bottke Jr., A. Campo Bagatin, A. F. Cheng, M. Hirabayashi, C. Maurel, J. W. McMahon, P. Michel, N. Murdoch, S. P. Naidu, P. Pravec, A. S. Rivkin, D. J. Scheeres, P. Scheirich, K. Tsiganis, Y. Zhang. In *47th Lunar & Planetary Science Conference* (2016), p. 1501.

E. Other publications

(a) periodical reviews of scientific societies:

E 1. *Chaotic diffusion of small bodies in the Solar System.* K. Tsiganis & A. Morbidelli, 2003, *Annals of MCFA*, Vol. 3, p. 999 (**refereed**).

E 2. *The Chaotic Sculpting of the Solar System,* K. Tsiganis, 2006, *HIPPARCHOS*, Vol. 2 (1).

E 3. *New insights on the asteroid-meteorite connection,* K. Tsiganis, 2010, *HIPPARCHOS* Vol. 2 (7).

(b) AUTH publications (in Greek):

E 4. “Αστεροειδείς: Από ... “μικρό” μαθαίνεις την αλήθεια!”, Κλ. Τσιγάνης, 2009, *Α.Π.Θέματα Έρευνας* (**1**), σ. 16-17.

E 5. “Δυναμική Εξέλιξη του Ηλιακού Συστήματος: Σύγχρονες απόψεις”, Κλ. Τσιγάνης, 2010, περιοδικό “Φαινόμενο”