

# Beibei Zhu



- **Mobile:** +34 658942995; +86 13146219439
- **Email:** [zhubeibei@lsec.cc.ac.cn](mailto:zhubeibei@lsec.cc.ac.cn)
- **Address:** Zhongguancun East No 55, Haidian district, Beijing, China  
Calle Palmera No 12, Leganés, Madrid.

## Education

- Mar. 2014— Ph.D. Candidate, Academy of Mathematics and Systems Science  
Present *Chinese Academy of Sciences.*
- Sep. 2012— M.E., Academy of Mathematics and Systems Science  
July 2014 *Chinese Academy of Sciences.*
- Sep. 2008— B.E., School of Mathematics and Statistics  
July 2012 *Changsha University of Science & Technology.*

## Current Research Interests

Averaging methods for delay differential equations; Structure-preserving methods for Hamiltonian systems; Splitting methods

## Research Experience

- Oct. 2016 – Present • **Research on “Averaging method for delay differential system”.** *Universidad Carlos III de Madrid.*
- The study focuses on developing averaging method for delay differential system and investigate its behavior. For delay differential system with one high frequency, the averaging system can be obtained by using changed of variables. The higher order averaged system can be also obtained.
- Mar 2014 – Sep 2016 • **Research on “Structure-preserving algorithms for non-canonical Hamiltonian systems”.** *Chinese Academy of Sciences.*
- Construct K-symplectic methods for separable non-canonical Hamiltonian systems. First analyze the situations in which K-symplectic methods can be constructed. Then construct splitting K-symplectic methods for three non-canonical Hamiltonian systems and compare the symmetric splitting methods with the same-order Gauss methods.
  - Construct volume-preserving methods for Lorentz force system. By combining one-step numerical method with its adjoint method, we can prove that this method is volume-preserving for Lorentz force. This method is also explicit and symmetric. The numerical results also show its advantage over Boris method and Runge-Kutta method.
  - Construct canonicalized symplectic methods for guiding center system. We provide the general procedure of constructing canonical coordinates for the gyrocenter dynamics in series form. The coordinates can be achieved recursively without solving differential equations.

- Dec. 2013 – • **Research on “Convergence analysis of the formal energies of symplectic methods for Hamiltonian systems”.** Chinese Academy of Sciences.  
Nov. 2014 • We study the convergence problem of the formal energies of symplectic methods for Hamiltonian systems and give the clear growth of the coefficients in the formal energies. With the help of B-series and Bernoulli function, we prove that the coefficients of many merging trees approach infinity. This conclusion implies that in general the formal energies is not convergent.

## Publication

Paper X. B. Tu, **B. B. Zhu**, Y. F. Tang, H. Qin, J. Liu, R. L. Zhang, A family of new explicit, revertible, volume-preserving numerical schemes for the system of Lorentz force, Phys. Plasma, 23, 122514 (2016).

**B. B. Zhu**, R. L. Zhang, Y. F. Tang, X. B. Tu, Y. Zhao, Splitting K-symplectic methods for non-canonical separable Hamiltonian problems, J. Comput. Phys. 322 (2016) 387-399.

**B. B. Zhu**, Z. X. Hu, Y. F. Tang, and R. L. Zhang, Symmetric and symplectic methods for gyrocenter dynamics in time-independent magnetic fields, Int. J. Model., Simul., Sci. Comput. 7, 1650008 (2016).

R. L. Zhang, Y. F. Tang, **B. B. Zhu**, X. B. Tu, Y. Zhao, Convergence analysis of the formal energies of symplectic methods for Hamiltonian systems, Sci. China Math. 59 (2016) 379-396.

C. Y. Lin, L. Y. Huang, Y. Zhao, **B. B. Zhu**, A local energy conservative scheme for the fourth-order Schrodinger equation with cubic nonlinear terms, Mathematica Numerica Sinica, 37 (2015) 103-112.

R. L. Zhang, J. Liu, Y. F. Tang, H. Qin, J. Xiao, B. B. Zhu, Canonicalization and symplectic simulation of the gyrocenter dynamics in time-dependent magnetic fields, Phys. Plasmas. 21, 032504 (2014).

## Academic Activities

Oct. 2016 **Joint PhD Student in Universidad Carlos III de Madrid**, China Scholarship Council, China.

Sep. 2016 **Workshop on Averaging: new techniques and new applications**, Morningside Center of Mathematics Chinese Academy of Sciences.

Dec. 2015 **Annual Conference of Structure-preserving algorithm and its application**, Nanjing Normal University, Nanjing, China.

Dec. 2014 **Workshop on Structure-Preserving Algorithms for Differential Equations**, Nanjing University, Nanjing, China.

May. 2014 **International Conference of Physics of Plasmas**, University of Science and Technology of China, Hefei, China.

May. 2014 **4th International Conference on Numerical Analysis of Differential Equations**, Nanjing University, Nanjing, China.

### **Honors & Awards**

Sep. 2016 First-class Dean Scholarship

May. 2013 Merit Student of Chinese Academy of Science

May. 2012 Merit Student of Chinese Academy of Science

Jun. 2012 Outstanding Graduates Awards of Hunan Province

### **Skills**

Programming MATLAB, LaTeX

Software MATLAB, Microsoft office, C Programming Languages