国台学术报告 NAOC COLLOQUIUM

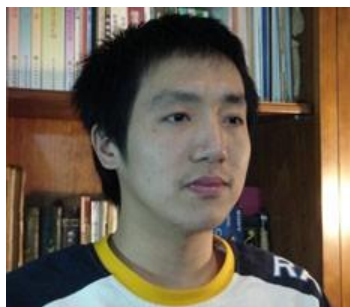## 2013 年 第 28 次 / Number 28, 2013

TIME: Friday, 2:30 PM, May 31, 2013   LOCATION: A601 NAOC

Listening to Gravitational Waves with Pulsar Timing Arrays and Appreciate Them with Bayes

Mr. Xihao Deng

**The Pennsylvania State University and NANOGrav Collaboration**

Mr. Xihao Deng is currently a PhD student at the Pennsylvania State University. His research has centered on Bayesian data analysis of gravitational wave detections with pulsar timing arrays. He has developed 5 gravitational wave detection pipelines that try to detect gravitational waves with known and unknown waveforms. He is the first one who discovered that gravitational wave data analysis has to include the incoherent phases of the signal, the first one who developed the generic pipelines to detect gravitational waves with evolving frequencies and from eccentric binaries. He has introduced Bayesian nonparametrics analysis to gravitational wave detection, which is a popular method in social science but is the first time applied in physics and astronomy. He is also doing research on exoplanet searching. By collaborating with Prof. Alex Wolszczan, who discovered the first exoplanet in human history, he applied his Bayesian analysis method to exoplanet data and discovered the smallest planet around the intermediate massive star, which has not been confirmed for 8 years. He is also collaborating with Kepler team to apply the advanced Bayesian methodology to try to find the first habitable exoplanet.

Abstract

Detecting gravitational waves will open a new window of universe complementary with the conventional electromagnetic astronomy. Pulsar timing array is one of the two developing detectors designed to listen to the heavenly music. I will first give an overview on gravitational wave astronomy with pulsar timing arrays, and then I will present Bayesian data analysis methods developed by our group to analyze the gravitational wave data. I will also summarize the achievements and deficiencies of current pulsar timing analysis, and propose a Bayesian framework to improve it, which implies the important role a good software can play in the current and future astronomical sciences.
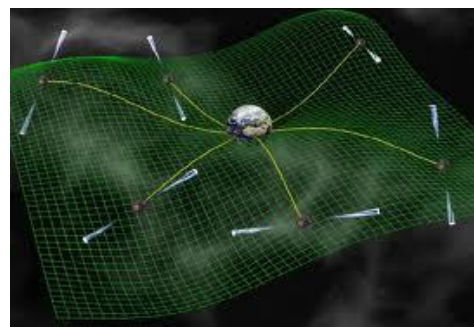
All are welcome! Tea, coffee, biscuits will be served at 2:15 P.M.

You are welcome to nominate speakers to Weimin Yuan (wmy@nao.cas.cn), Mei Zhang (zhangmei@bao.ac.cn), Licai Deng (licai@bao.ac.cn), Xuelei Chen (xuelei@cosmology.bao.ac.cn), Shude Mao (smao@nao.cas.cn)