日本天文学会早川幸男基金渡航報告書

2018 年 06 月 10 日採択

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任期 (再任昇格条件)	
渡航目的	研究集会でのポスター発表
講演・観測・研究題目	ESO Workshop: A revolution in stellar physics with Gaia and large surveys
渡航先 (期間)	ポーランド (2018 年 8 月 31 日〜9 月 10 日)

Many thanks to the Hayakawa funding which support me the flight ticket to the ESO workshop in Warsaw, Poland. Without this financial support, I will not be able to attend this workshop and acquire such achievement.

The ESO Workshop: A revolution in stellar physics with Gaia and large surveys is closely related with the recently developing topic, the structure and evolution of the Milky Way. As the release of DR2 of Gaia catalog, we now have the unprecedented accuracy on the 5D information of more than 1.3 billion stars: their position, parallaxes and proper motions. This will bring an evolutionary development to many related aspects: stellar modelling, stellar abundances, nLTE effect on stellar spectra, galaxy archaeology, chemical evolution, etc. Here some highlighted reports will be briefly introduced, following the content of my poster and discussion.

Empirical relation to estimate stellar masses and radii in the Gaia era is studied by Andres Moya, which provide a new method to measure these parameters. Stellar parameters are derived from Gaia data, and a small set of stars with both Gaia parameters and mass/radii measurement from other source is adopted. Various forms of relation between mass/radii and parameters are tested, and among these 18 and 20 relations are adopted or revised for mass and radii. The relative accuracies and precisions are less then 10%, and computational tool is available.

Combination of Gaia and Kepler data also gives promising result. Precise brightness and parallaxes measurement can derive the radius independent of asteroseismology, thus provide the chance to cross-check their data quality. It was well known that there is a $\approx 5\%$ overestimation on $R_{\rm Gaia}/R_{\rm Seismo}$ in the TGAS result, which is expected as the effect of subgiants or spatial systemics. This is eliminated in the Gaia DR2 dataset, indicating the improve of the data quality and the reason as spatial systemics as the coverage of Gaia DR2 is more complete. However, a zero shift of Gaia data of ~ 50 μas is confirmed.

As for my poster, I mainly focused on calibrating the effective temperature using line depth ratio (LDR) of the atomic lines in YJ-band spectra. Although the line pair with one low excitation potential and one high excitation potential can trace effective temperature quite well because of their different dependency on it, metallicity and gravity also play roles in the line depth. This is so far considered as a weak effect on line depth in the optical region, but as now more and more spectroscopic observation are performed in the infrared to penetrate through high extinction area, this assumption is needed to be revised. We used atomic line pairs from WINERED specra (0.91-1.35 μm) of around 200 stars to detected and confirmed the metallicity and gravity effect on LDR relations. Line saturation and differences of the line ionization situation are found to be the reason of these effects separately.

As a basic and convenient method to determine the effective temperature, this work attracted some interest. Sara Mancino derived similar result between the modeled Cepheid temperature and LDR derived temperature with a research previous to this work (Jian et al. in prep), which over-estimate the temperature in $T_{\rm eff}$ less than 4500 K and under-estimate in $T_{\rm eff}$ larger than 5500 K. While the tendency is the same with Jian et al. (in prep), our bias from APOGEE $T_{\rm eff}$ is smaller than that work. Nevertheless, this consistency may indicate there is a cutoff of the accuracy of LDR relations in these two range, regardless of the line adopted. Stellar rotation is also thought to be a factor affect the LDR. It is true that rotation will broaden the line, but as we are adopting line depth ratio, as long as the broaden is in the same extent for the lines adopted, it will have little effect on the relations.

Beside my own works, I am also evolved in other discussion. Maria Bergermann stressed the effect of nLTE of spectral line on abundance determination. The abundance pattern will have a dramatic change between LTE and nLTE analysis. This, if is true and general to all the wavelength range and temperature, can have a large impact on the structure and evolution on the milky way. I raised the question about if all the lines will be effected by nLTE assumption, and this may be a valuable project according to Maria and we are now discussing the possible cooperation on this topic.