

Significance of astronomical observation and analysis by Sumner's method in university geoscience experiment

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1. Role of university geoscience experiment

For many students other than those majoring in geoscience, university geoscience experiment as a faculty subject is their final school study for geoscience and astronomy with a few lecture subjects. Contents of the university geoscience experiment are variant among universities and faculties, and are often lopsided in one discipline. This brings about serious problems, because the university geoscience experiment actually determines the geoscientific background for many science teachers. Accordingly it is necessary to evaluate contents of the experimental subject.

2. Diagnosis of astronomical experiments in university geoscience experiment

The problem is most serious in the field of astronomy, because astronomical experiment is included only in 1/3 of geoscience experimental subjects of 32 universities and faculties which I examined. Nevertheless, many astronomical contents are included in the science education in elementary and high schools. Any astronomical contents should be covered by the experimental subject.

On the other hand, current astronomical experimentations in the subject have some problems, from the viewpoints of the background for science teacher, standards of university education, availability of multipurpose method, and being basic and deep-going contents or not. Recently proposed some new experiments in astronomical observatories or by expensive hardware might be difficult in many universities having no stuff of astronomy. With reasonable equipments, the experiments that are appropriate to the viewpoints above, are necessary for the improvement of the university geoscience experiment.

3. Significance of Sumner's method

Sumner's method was originally developed for the precise positioning of ships in ocean by Captain T. H. Sumner in 1843. This method is based on the theory that the places sharing the same altitude of one star at the same time make one small circle around the right down site of the star on the earth surface. If we observed three stars by this method, we can uniquely determine the observation site. Through direct careful observation by reasonable theodolite (transit compass) instead of expensive astronomical telescope, everybody realize the mode of moving stars quantitatively. Moreover, in processing the observed data, we need to take account of all the factors connecting with motion of stars; rotation, orbital revolution, precession of the earth, precession of other planets, and proper motion of stars. The method provides us to learn spherical trigonometry that exceed high school level study and we hardly study by self-study in spite of basic mathematical tool in astronomy.

Furthermore this method has a large practical advantage, for it allows observation in every season and still in some cloudy nights.

4. Acknowledgment

This method had already been adopted as one content of geoscience experiment in Konan University by predecessors of me. I just examined the significance of the method as astronomical experiment in university level experimental subject again. I have been greatly indebted to Dr. I. Katsura and his precursors not only on preparing texts and instructing students by this method but also on valuable advices to me.