Diversified approach in astronimical education4   Classroom of Using FITS image in high school

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I have taught cosmology in the earth science lesson of the third-year high school students. In the past I mostly only used the blackboard to teach the lesson.Since the topic was space,the theory tended to come first.The scale of the observation is so large and the latest technical equipments is needed ,so these experiments are difficult to carry out in school. However, the Internet and intranet provisions are being improved by the school due to the rapid development of the personal computer and network technology are the past sevral years. In addition,the image data of the FITS form and analysis software,which,until a short time ago,were only used in the reserch field, are now widely available.Good teaching Materials for high school students using the using the data of this FITS form have recently been proceeded. One of the Spectrum Curriculum which the Japan Association for Hands-On Universe (abbreviated to JAHOU) developed, and another is a teaching materials which the Paofits working group of the Public Astronomical Observatory NETwork (abbreviated to PAONET) developed and which measures the age of a globular cluster. Both use the Internet and personal computers as tools,andare devised to allow the students to develope a scientific spirit.

In this report I will desende the cosmology experiments performed using the teaching materials which make use of FITS images. I taught ten 3rd year students in the earth science elective class Toyooka High School Saitama Prefecture. Using the Spectrum Curriculum, we measured the bright line spectrum of the galaxies whose distances are known,and decided the Hubble Constant. The images were taken from the 188cm telescope at Okayama Astrophysical Observatory. The students acquired the value of 14-22 [km/s / million light years]. The students calculated the age of the universe to be around 15 billion years. In order to calculate the age of a globular cluster, they use the images of B-band and V-band taken by Hst to form a color-magnitude diagram. This was compared with the theoretical curves of globular clusters of various ages,and a figure of about 10 billion years was acquired. The software used in order to take data from the image is JIP (Junior Image Processor) which was developed by JST, the National Astronomical Observatory, and Astro-Arts.

According to the results of a questionnaire given to the student, they had more interest in the subject than they would have had from a lecture alone. Moreover, their desire to research other heavenly bodies and the images taken by the Subaru Telescope has also increased. It turns out that the images of large-sized telescopes, such as that of Okayama Astrophysical Observatory used this time and HST, are increasing the students' motivation to study and in maintaining their concentration during the lesson.