QEF Project 2007/0471

Development of Learning and Teaching Resources in 'Astronomy and Space Science'

Elective Module in New Senior Secondary Physics Curriculum

Reference Notes

A. Additional Notes for the Investigations

1. Change in earth-moon distance

- Students usually do not realize that the moon-earth distance changes with the altitude of the moon, and so it is necessary to keep the altitude the same when the moon picture was taken every night.
- Students also do not usually realize that the moon is at a different altitude at the same time every day due to the motion of the moon around Earth. For example, students can be asked to find out the times from when the altitude of the moon is 40 degrees from digital star-maps (e.g. Stellarium). Then they will realize that they cannot take the moon picture at exactly the same time on consecutive nights.
- To shoot the moon, it is impossible to shoot from school every night. It is necessary to have a student who can have a good view of the moon near to his or her home to undertake this project.
- The shooting of the moon is very straight-forward as it does not require the use of any motor tripod to follow the moon.
- The period between apogee and perigee is called a 'anomalistic month' (近點月), which is 27.555 days. There are about 13.2 anomalistic months in a year. Hence, there are 13 perigees and 13 apogees in a year. Not all perigees are equal. Some perigees are closer than others. The same holds for apogees. This is due to the complicated interplay between the earth, the moon and the sun.
- The moon at mid-autumn festival is not necessarily big because Perigees don't necessarily appear at full moon. There is no significance in the moon size at mid-autumn festival. A simple calculation shows that perigee full moons come in 14-month cycles. (http://www.idialstars.com/hmly.htm)
- Other useful web resource:

Websites	Comments
http://www.jgiesen.de/moonmotion/index.html	Click Orbit, then choose date. Press d to change the date. Pressing d continuously will give you an animation.
http://www.jgiesen.de/moondistance/index.htm	Instead of using Virtual Moon Atlas, this website includes a Java Applet which allows you to find the moon distance more quickly.
http://en.wikipedia.org/wiki/Month#Anomalistic_month http://zh.wikipedia.org/wiki/%E6%9C%88%E4%BB%BD#.E8.BF.91.E9.BB.9E.E6.9C.88.28Anomalistic_month.29	Information on anomalistic month in Wikipedia.
http://www.fourmilab.ch/earthview/pacalc.html	Lunar Perigee and Apogee Calculator
http://www.fourmilab.ch/earthview/moon_ap_per.html	An article with good background information on earth-moon distance.

2. The origin and evolution of lunar features

- This project is relatively straightforward in data-collection. For convenience, it is suggested that students should shoot on dates when the moon can be seen after sunset, rather than before sunrise. However, students do not usually know when they can find the moon. Use digital star-maps (e.g. Stellarium) to find out the answer.
- After shooting the pictures, the project becomes an information search exercise. However, there does not seem to be enough Chinese resource on the web, and the students need to be prepared to read English materials. It is better to find students who have higher English-ability for this investigation.

3. Change of the moon in one night

- This project requires the students to stay out late at night because the data-collection requires at least 6 hours. It is necessary to keep the number of students involved in data-collection to the minimum, and other group members can be responsible for data-processing.
- Students needed to be reminded that the observation site must have a very good view of the eastern (if involving shooting moon-rise) or western horizon (if involving shooting moon-set).

4. Solar phenomena

- This is a relatively straightforward data-search exercise. The students just have to be patient to check out the sun whenever it is sunny to complete the work.
- This is possibility the easiest investigation among the six suggested here because of the ease in data collection and in finding reference materials on the web in both Chinese and English.

5. The sun in various wavelengths

- This project requires a set of low-magnification pictures of the whole solar disk (taken without using any Barlow lens) and a set of high-magnification pictures of a sunspot (taken with a Barlow lens) in three different wavelengths.
- Relevant equipment for white light and calcium-K images can be found in Section B for this document.
- After taking the images, the investigation is a relatively straightforward data-search exercise.

6. Measurement of the rotational rate of the sun

- The data-collection is straightforward, which merely involves the shooting one picture of the sun each day. The main difficulty is that it is necessary to have a few consecutive school days of sunny weather and with big sunspots on the sun.
- To check the current location of sunspots on the sun, refer to http://www.spaceweather.com

- Students needed to be reminded to take account of the spherical geometry of the sun when analyzing the data.
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B. Solar Equipment Suppliers

1. Hydrogen-alpha telescopes and filters

   Lunt Solar Systems
   http://www.luntsolarsystems.com

   Coronado
   http://www.meade.com/product_pages/coronado/coronado.php

   DayStar
   http://www.daystarfilters.com

   Solarscopes
   http://www.solarscope.co.uk/index.html

2. White light filters

   Baader Planetarium AstroSolar Safety Film
   http://www.astro-physics.com/index.htm?products/accessories/solar_acc/astrosolar

   Thousand Oaks
   http://www.thousandoaksoptical.com/solar.html

3. Calcium-K filters

   Lunt Solar Systems
   http://www.luntsolarsystems.com

C. Local Dealers of Solar Equipment

巨眼天文儀器社
http://www.grandeye.com.hk

星河科研社
http://www.astro.hk