Planetary Wonderings
December 2005 Topic: the Sun

by Mary-Frances Bartels, NASA Solar System Ambassador

December 21 marks the solstice, when winter starts for the northern hemisphere. The word *solstice* comes from the Latin word *solstitium*, meaning "sun stand still." For a few days before and after the solstice, the sun's path across the sky does not appear to change; rising and setting in nearly the same place, thus appearing to stand still in its souththward trek. The day after the solstice the daylight time increases.

Here is a math activity that demonstrates what happens with daylight hours around the solstice. Feel free to use whatever technology you feel appropriate. I used a combination of computer program, spreadsheet, and good old pencil and paper. For this iteration take the dates from Dec. 1 through Jan. 10 (or another spread of your choice). Find the number of daylight hours for each day at your home in hours, minutes, and seconds. If you also can get decimal seconds, all the better. I used a Jewish calendar at http://aish1.com/aishluach.exe when I did this exercise. It's a bit cumbersome if you are not interested in Jewish holidays, but contains a lot of helpful solar information nevertheless. Next, determine the difference in daylight hours (in minutes and seconds or seconds.DecimalSeconds) from one date to the next. For the dates I suggest, there should be 40 results. Lastly, graph the Date (x-axis) vs. Time (y-axis) increase or decrease values. I converted all my time differences to their absolute values in seconds. For example: -1:12 means a decrease of one minute and 12 seconds in daylight. I graphed this as 72 seconds. What you should get is a nice V-shaped graph showing a decrease followed by an increase in daylight with the least time difference being on the solstice. An additional activity would be to do a similar thing around the summer solstice. That graph should be shaped like an inverted-V. If you would like to show others your results, e-mail me at ki0dz@arrl.net and I will make them available on the Internet.

NASA has had many missions to the sun. My favorite is SOHO (Solar and Heliospheric Observatory). December 2 marks the 10th anniversary of its launch. SOHO, which is a collaboration between NASA and the European Space Agency, orbits a point, called L1, between the Earth and Sun. L1 is almost a million miles sunward of Earth. SOHO has studied the sun's atmosphere, surface, magnetic fields, and wind. It has helped scientists warn of coronal mass ejections that could potentially disrupt communications. An added benefit is that SOHO has discovered dozens of comets too small, passing too close to the sun, to be detected otherwise.

Genesis was a recent sample return mission. It collected particles of the solar wind for 2 ½ years. Like SOHO, Genesis was in orbit around LaGrange Point 1. Despite a hard landing in September 2004, samples were recovered and are now being studied in a special lab at NASA's Johnson Space Center in Texas.

Launched in 1990, Ulysses is the first spacecraft to study the unexplored region of space above our Sun's poles. It is in a most unusual orbit at nearly 90° out of the ecliptic plane, the plane roughly stretching out from the Sun's equator where all the planets orbit. This feat was accomplished only through using Jupiter's gravity to throw the spacecraft high above the solar poles. Now well into an extended mission, Ulysses continues to send back valuable information on the inner working of our star, especially its magnetic field and how it influences our solar system.

Remember - Keep looking up!

Primary Source: http://solarsystem.nasa.gov