Weeks 12, 13, and 14: *"Solar Research Project"*

***A* three-week inquiry with Connie Walker (**cwalker@noao.edu).

Welcome and Goals

Welcome to Weeks 12, 13 and 14 of Astronomy RBSE with me, Connie Walker. Hopefully many of you read my introductory posting, but let me briefly repeat it. I'm an astronomer by training and am a science education specialist by trade at NOAO in Tucson, Arizona. My research interest in recent years has been the evolution of sunspots as exhibited by their morphology and magnetic field strength. My Ph.D. research focused on the study of star formation in the centers of galaxies at different epochs. For NOAO I provide professional development for educators, develop curricula and kits for informal and formal science education programs, convene conference sessions and workshops on hands-on science and research for students and teachers and manage a few programs. Recently I have been asked to chair both the U.S. and the global working groups on dark skies awareness for the U.N.-approved International Year of Astronomy (2009). I am married to a super astronomer/engineer and have two beautiful kids.

It is nice to make your acquaintance!

The goals and objectives for this three-week block are:

- Examine the evolution of sunspots by studying the changes in their morphology and magnetic field strength.
- Employ image processing with ImageJ for exploring, qualitatively and quantitatively, the changes in morphology of the sunspots.
- Employ image processing with ImageJ and spectroscopic analysis with Graphical Analysis 3.1 for exploring, qualitatively and quantitatively, the changes in magnetic field strength.

Materials for these three weeks have been sent to you by mail, including:

- 6 1/2" x 3/4" x 1/4" bar magnet with red and blue ends
- 4 small compasses
- a clear sheet protector
- a cow magnet (0.5" x 3")
- an Alnico magnet (1/4" x 1 3/4") (lifts over 2 lbs.)
- 50 mesh fine iron filings in a 500g bottle
- a Magnet Tube (4" x 3") filled with 1.3 oz of iron filings and a cow magnet
- CD Assignments 1-6 and corresponding data

Where to find the assignments and or assignment files (3 choices):

PDF instruction files for Assignments 1-6 can be found either on

- A-RBSE-ONLINE_2008 (RBSE_000-008) > ASSIGNMENTS > WEEKS 12, 13, 14: SOLAR RESEARCH PROJECT WITH CONNIE WALKER

- The NOAO webpage: http://www.noao.edu/education/arbse/arpd/sres.
- A solar research CD (being FedEx'd to you with materials for Assignment 1)

Where to find the data for the assignments (2 choices):

- The NOAO webpage (http://www.noao.edu/education/arbse/arpd/sres) has the data files for all assignments and the solar plugin for Assignments 2 and 3:
    - Data directories (Magnetograms; Integrated_Intensity) for Assignments 2 and 3 are within the zip file called "Assignment_2 files".
    - Data directories (Magnetograms; Integrated_Intensity) for Assignments 4 through 6 are within the zip file called "Assignment_4 files".
- A solar research CD (being FedEx'd to you with materials for Assignment 1) has the data files for all assignments and the solar plugin for Assignments 2 and 3.

Where to find the programs to analyze or examine the data:

- The software necessary for handling the data include the program ImageJ, which is available as a free download from the ImageJ web site. To get the program itself, click on "Downloads," and choose the version of ImageJ appropriate for your computer. Unzip and install on your computer.
- Graphical Analysis 3.0 (or higher) installed on your computer. Teachers in the RBSE program receive a copy of this software; otherwise it is available from Vernier Software.

Overview files:

READme1st_StartUp_Info.pdf
week12-13_assignments2-3_Overview.pdf
week13-14_assignments4-6_Overview.pdf

Files for Week 12 Assignments:

week12_assignment1.pdf
week12_assignment2.pdf
Integrated_Intensity (a directory of data files)
Magnetograms (a directory of data files)
READme_SolarData_assignments2-3.pdf
READme_SolarPlugin.pdf
Solar.zip (the solar plugin for ImageJ)

Files for Week 13 Assignments:

week13_assignment3.pdf
week13_assignment4.pdf
READme_SolarData_assignments4-6.pdf
Flare_Events&Observn_times.pdf
BBSO_images (a directory of data files)
Integrated_Intensity (a directory of data files)

Magnetograms (a directory of data files)
Dopplergrams (a directory of data files)
StokesV (a directory of data files)

Files for Week 14 Assignments:

week14_assignment5.pdf
week14_assignment6.pdf
1.565um_spectra_data.fit
1.565um_spectra.txt
SPECTRA (a directory of data files)

Due Dates for Assignments 1 – 6:

Assignment 1	Saturday, April 12
Assignment 2	Tuesday, April 15
Assignment 3	Saturday, April 19
Assignment 4	Tuesday, April 22
Assignment 5	Saturday, April 26
Assignment 6	Tuesday, April 29

The assignments are explained in files named "weekXX_assignmentY.pdf", where "XX" represents Week 12, 13 or 14 and "Y" represents Assignments 1, 2, 3, 4, 5 or 6. The activities require posting answers and results on the Discussion Board by the respective due dates. In the "weekXX_assignmentY.pdf" documents**, the Discussion Board assignments are written in green for ease of access**. In order to keep the Discussion Board as orderly as possible, please answer **all** the questions for each assignment in **one** posting and please post to the appropriate thread. This will make it easier for all of us to follow the postings. (Thanks.)

Questions?

I can be reached easiest by email at cwalker@noao.edu or during the weekdays at 520-318-8535 or at other times at 520-331-2448.

Have fun!