Term project: "Measuring the Sunset"

Introduction

Science progresses by making careful observations of nature, developing a working hypotheses that describes the observed phenomena, using that hypothesis to make predictions about nature, and finally querying nature again to test the predictions. If nature agrees with the predictions, the hypothesis gains support. If the hypothesis gains enough support, it may be elevated to the status of scientific theory. However, if nature disagrees with the predictions, the hypothesis must either be revised or scrapped. As scientists, we believe that, over time, the nature of the entire universe can be uncovered through application of these methods.

An observation that has been made is that the Sun sets at different locations on the horizon at different times of the year. We are going use a theoretical model of the Earth/Sun system to predict the exact location of sunset. Over the course of the semester, we will measure the azimuth of sunset and track how it changes over time. Towards the end of the semester, we will compare our observational data to the ***theoretical*** values provided by a mathematical model. The mathematical model comes from our hypothesis that the Sun is at the center of the Solar System, the Earth is in orbit around it, and further, the Earth's rotational axis is tilted with respect to the plane of its orbit.

Procedure: Making an observation

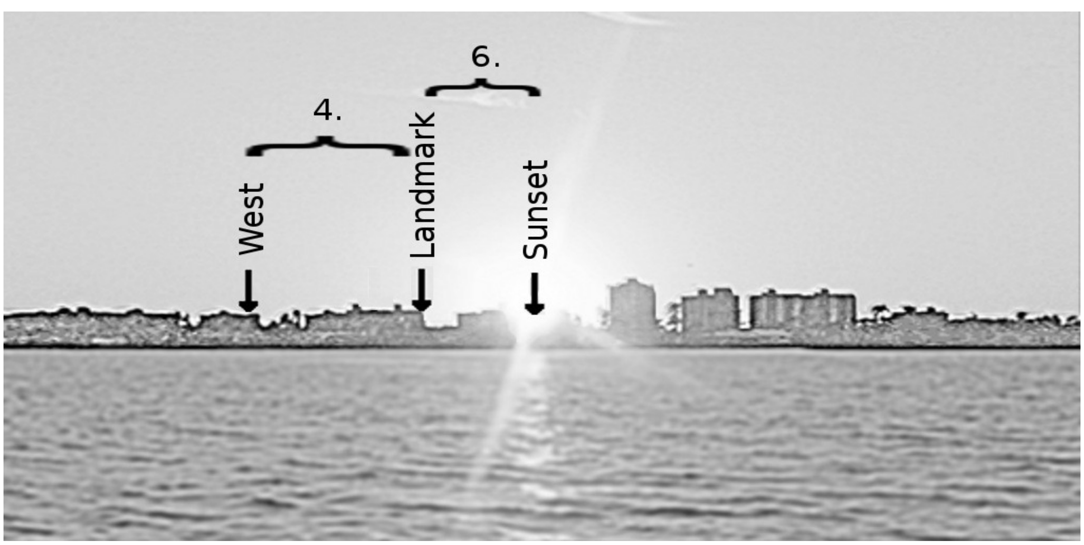
!!!NEVER LOOK DIRECTLY AT THE SUN!!!

1. Pick a location that gives you a clear view of the western horizon. Your data will be better if you use the same location for each observation.

2. Find west using a compass or a local street that you **are positive** runs east/west.

3. Pick a landmark on the horizon that is as close to due west as possible. Use this landmark every time you observe so that you don't have to relocate west for every observation.

4. Using your ruler, measure the angle (in centimeters) between due west and your landmark. Calculate the Azimuth of your landmark (see steps 8 and 9 for more details. In this case the number is negative if it is to the left of WEST). Record this number on your data sheet. *You only need to do this once*.



5. To make an observation of sunset, wait until it has just sunk below the horizon, noting its final position. **DO NOT LOOK DIRECTLY AT THE SUN**.

6. Use your ruler to measure the angle between your **landmark** and **sunset**. *You will do this for every observation.*

7. Use the sheet provided on the web page (an example appears here) to record your observation including the date, time, ruler reading, and comments about the current conditions (cloudy, clear, hazy etc.) If the sun is to the **left** of your landmark, write down the ruler reading as **negative**; if to the **right** it should be **positive**.

8. Calculate the Angle from your ruler reading by multiplying by your Personal Conversion Factor (from Lab 1: Measuring the Sky). Be sure to keep the negative or positive sign! Record this number in the **Angle** column of your data sheet.

9. Calculate the actual Azimuth from your measured Angle and the Azimuth of your Landmark as follows:

   Azimuth = Azimuth of Landmark + Angle

   Remember that adding a negative is just subtracting.

   Record this number in the **Azimuth** column of your data sheet.

10. Plot your data on both the ***HelioCentric: Tilted Earth*** plot and on the ***GeoCentric: Great Turtle*** plot.

Julian Day Numbers (Leap Year):

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	1	32	61	92	122	153	183	214	245	275	306	336
2	2	33	62	93	123	154	184	215	246	276	307	337
3	3	34	63	94	124	155	185	216	247	277	308	338
4	4	35	64	95	125	156	186	217	248	278	309	339
5	5	36	65	96	126	157	187	218	249	279	310	340
6	6	37	66	97	127	158	188	219	250	280	311	341
7	7	38	67	98	128	159	189	220	251	281	312	342
8	8	39	68	99	129	160	190	221	252	282	313	343
9	9	40	69	100	130	161	191	222	253	283	314	344
10	10	41	70	101	131	162	192	223	254	284	315	345
11	11	42	71	102	132	163	193	224	255	285	316	346
12	12	43	72	103	133	164	194	225	256	286	317	347
13	13	44	73	104	134	165	195	226	257	287	318	348
14	14	45	74	105	135	166	196	227	258	288	319	349
15	15	46	75	106	136	167	197	228	259	289	320	350
16	16	47	76	107	137	168	198	229	260	290	321	351
17	17	48	77	108	138	169	199	230	261	291	322	352
18	18	49	78	109	139	170	200	231	262	292	323	353
19	19	50	79	110	140	171	201	232	263	293	324	354
20	20	51	80	111	141	172	202	233	264	294	325	355
21	21	52	81	112	142	173	203	234	265	295	326	356
22	22	53	82	113	143	174	204	235	266	296	327	357
23	23	54	83	114	144	175	205	236	267	297	328	358
24	24	55	84	115	145	176	206	237	268	298	329	359
25	25	56	85	116	146	177	207	238	269	299	330	360
26	26	57	86	117	147	178	208	239	270	300	331	361
27	27	58	87	118	148	179	209	240	271	301	332	362
28	28	59	88	119	149	180	210	241	272	302	333	363
29	29	60	89	120	150	181	211	242	273	303	334	364
30	30		90	121	151	182	212	243	274	304	335	365
31	31		91		152		213	244		305		366

Physics 104 (Astronomy) - Sunset Data Sheet

Name: ____________________ Personal Calibration: _____ Az. of Landmark_____

Date	Time	Ruler	Angle	Azimuth	Comments

Raw Data- Not corrected for Azimuth Offset