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Lab 5 – Online Astronomy Resources

This lab will introduce you to a number of online tools used by astronomers for the analysis of data and for the planning of observations. No separate write-up is required. Answer all of the questions editing this document (or create your own document with your answers to each question clearly indicated). Submit a PDF version of your completed lab if possible.

Note that this lab is to be done individually, not in groups.

1. **Simbad: simbad.harvard.edu/simbad/   (15 points)**

   Simbad is a database containing observational data and links to publications on a wide variety of astronomical objects.

   a) Using *Simbad*, query by identifier, retrieve the following information for one Messier object of your choice.

   Messier Object   ___M101___   (the Messier object of your choice)

   NGC   NGC 5457   (every Messier object has an NGC designation)

   Equatorial Coordinates (ICRS):   RA _14 03 12.583_   DEC _+54 20 55.50_

   Galactic Coordinates: Longitude: ___102.036991___   Latitude __+59.771411__

   b) Using *Simbad*, query by identifier, retrieve the following information for one bright star of your choice.

   Star's Common Name: _____Mintaka_____

   Equatorial Coordinates (ICRS):   RA _05 32 00.40009_   DEC _-00 17 56.7424_

   Galactic Coordinates: Longitude: _203.85591662_   Latitude _-17.73973623_

   Bright Star Catalog designation: HR ___1852___

   Spectral type & luminosity class (e.g. B3 III)   ____B0 III____

c) Using a *Simbad* "*Coordinate query*", give the common name (not the catalog number) of the well-known stars located at the following positions:

Galactic Longitude & Latitude: 47.744 ° -08.909 ° _____Altair_____

Equatorial (FK5) RA & DEC: 14h15m40s +19° 10' 56"   _____Arcturus_____

d)   From *Simbad*, search around the HII region LBN 473 using a 10' search radius and find the object that has OTYPE = WR*. This object is a type of high-mass variable star called a Wolf-Rayet star. Find the HD catalog number for this star, its RA and DEC, and its Galactic coordinates:

Name of the star: HD _211853_

Equatorial Coordinates (ICRS):   RA _22 18 45.6058273717_
DEC <u>+56 07 33.896665584</u>

Galactic Coordinates: Longitude: <u>102.7825109841288</u>
Latitude <u>-00.6531894168510</u>

Calculate the angular separation between the WR star and the position given for LBN 473 (use either Cartesian or spherical geometry).

Star-Nebula Angular Separation _____258.57 deg_____

2. VizieR: vizier.u-strasbg.fr   (5 points)

This on-line service allows you to find and query a wide range of astronomical catalogs. Using *VizieR* is usually a two-step process. First, you need to identify the catalog to use, and then you need to construct the correct query to extract the necessary data from the catalog.

Using the *VizieR* service, generate a listing of all stars with *V* < 1.5 in the sky. Extract your information from the 1991 edition of the Bright Star Catalogue (enter "Bright Star Catalogue 1991" in the Find catalogues box, then select Data to access the query page).

How many stars are on your list?   _____22_____

You've looked at the summer triangle a lot this semester (Vega, Altair and Deneb). What is the ranking in brightness for each of the stars (i.e., 10th brightest, 32nd brightest…)?

Vega _____5[th]_____   Deneb _____18[th]_____   Altair _____12[th]____

How many of the stars on your list are Sun-like (G2 V) stars? ___1___

3. NASA Astrophysics Data System
adsabs.harvard.edu/abstract_service.html   (5 points)

This is a resource used by astronomers to obtain journal articles and do literature searches.

a) Find the paper about the star R Aquarii, published in 2008 by S. Ragland et al..

What criteria did you use to query the *ADS*:

___(R Aquarii author:"S. Ragland" AND year:2008-2008)_____

Describe the paper:

Title   _First Images of R Aquarii and Its Asymmetric H2O Shell_____

Journal   __The Astrophysical Journal_____

b) Use the citation search feature to find the article published in 2009 describing observations of the star U Ori.

Title   The Structure and Kinematics of the Envelope Around U Ori from Iota Observations

Journal   __The Astrophysical Journal_____

4. Solar System Ephemeris Generator: ssd.jpl.nasa.gov/horizons.cgi

(5 points)

An ephemeris is essentially a table showing the position of a celestial object (RA and DEC) as a function of time. Astronomers, when planning observations of solar-system objects, often use the JPL Horizons ephemeris generator.

Pluto has been in the news in the past couple of years so, using the solar system ephemeris generator, set your location to Ames, Iowa and generate an ephemeris for Pluto starting on the day you complete this lab and extending for 60 days at 10 day intervals.

What is the position of Pluto (RA & DEC) at the start of your ephemeris?

RA: ____<u>19 21 10.39</u>____   DEC: __<u>-22 02 08.0</u> ___

What is the position of Pluto (RA & DEC) at the end of your ephemeris?

RA: ___<u>19 23 29.73</u>_____   DEC: ___<u>-22 06 08.5</u>_____

What is the approximate (no decimals) visible magnitude of Pluto?

_____<u>14</u>_____

In what constellation is Pluto located? Use the general star chart in the Blackboard   "*Course Content*" → "*Handout Section*".

_____<u>Sagittarius</u>_____

In the ephemeris you generated, what is the maximum angular separation between the Sun and the Earth as seen from Pluto?

_____<u>1.6958</u>_____

5. **Staralt tool: catserver.ing.iac.es/staralt/**   **(5 points)**

The Staralt tool plots the *altitude* of an astronomical object for any location on Earth, as a function of time, based on its RA and DEC coordinates. The tool also provides the *airmass X* of the object, defined as the secant of the *zenith angle*, where the zenith angle *z* is the angle between the star and the vertical direction:
This tool is very useful to determine if an object is observable at a given time.

a) Using Simbad, find the RA and DEC of the star η Aql (eta Aql), and of Vega:

η Aql   RA: _19 52 28.3702607706_   DEC: _+01 00 20.378344832_

Vega   RA: _18 36 56.33635_   DEC: _+38 47 01.2802_

b) Go to the *Staralt* website (link above). In the web form, select the "*Staralt*" mode , the date of one observing night of your choice, and type the longitude, latitude and altitude of the Zaffarano Deck (`-93.64734 42.02993 342`) in the "*Observatory*" field. You should then type the equatorial coordinates of the two stars of interest (η Aql and Vega) in the "*Coordinates*" field (separated by a semicolon). Then press the "*Retrieve*" button, and you should get a plot with the altitude and airmass as a function of time. **Attach the plot to this lab report.**

c) Are the two stars visible from Ames during the night you selected?

_____Yes_____

d) What is the best time (in local time) for observing η Aql? *Hint:* the airmass is a measure of the column of air between you and the top of the atmosphere in the direction of the object: smaller the airmass, better are the observing conditions.

_____22:30ish_____

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Altitudes, Observing site coordinates: −93.6473E 42.0299N, 342 m above sea level

List of objects:
1 Object 19^{h}52^m + 1° 0'
2 Object 18^{h}36^m +38°47'

Moon (dashed):
Coordinates: 23^{h}49^m − 5°26'
Illumination: 97%
Quarter: 3

Numbers below curves are Moon distance (in degrees) at the corresponding times.

Mean Solar Zone Time, starting night 28 08 2018
Processed: 2018/08/29 at 01:53:51 UT. Isaac Newton Group of Telescopes, La Palma.