SIO 15 (FQ 2024) – Homework #7 Due November 19, 2024

Maximum score: 20 points + 1 bonus point

- 2 penalty points for late submission (more than 30 min past due date)

Divide by 4 for contribution to total cumulative

ANSWERSHEET

Topics 19 – 20

1) a) When is the typical hurricane season in the Atlantic? (0.25 pt)
b) Go to Wikipedia and find the 2024 Atlantic hurricane season: during which months did the four strongest hurricanes occur? (0.25 pt)
c) What were the names and category of these hurricanes? (0.5 pt)
d) look up each of these hurricanes in Wikipedia. For each of them, log the following: calculated duration (dates of dissipation minus formation), highest wind speed (in km/h), lowest central air pressure (in mbar), most affected area? INCLUDE UNITS. (1 pt)
(2 points total)

a) Jun – Oct
also accepted: Jun – Nov
b) June/July, September and October
c) Beryl (C5); Helene (C4); Kirk (C4); Milton (C5)
-0.25 pt for partial answer
d)

Name	Duration (days)	Highest wind speed	Lowest central pressure	Most affected area
	(days)	(km/h)	(mbar)	
Beryl	13	270	934	US Also accepted: Texas
Helene	5	220	938	NC, SC, FL, GA
Kirk	14	230	934	France, Spain, Portugal
Milton	7	285	897	Florida, Yucatan

+0.25 pt if info given in a table like above

2) a) According to the old Saffir-Simpson scale **on the class website**, what are the maximum wind speeds and lowest central air pressure each of category 4 and 5 hurricanes? include units (0.5 pt)
b) Check your answers under 1c and d. Compare each of your answers for wind speeds with the values under 2a and write down whether this matches the declared category, and if not, into which category would this storm fall? (0.75 pt)
c) Now do the same for the central surface air pressure. (0.75 pt)
(2 points total)

a) category 4: 209-251 km/h (also accepted: 130-156 mph); 920-944 mbar
category 5: 251+ km/h (156+ mph); < 920 mbar
b) Beryl (5 - yes); Helene (4 – yes); Kirk (4 – yes); Milton (5 – yes)
-0.5 pt if only 2 hurricanes are correct
-0.25 pt partial answer

c) Beryl (4 – no); Helene (4 – yes); Kirk (4 – yes); Milton (5 -yes)
-0.5 pt if only 2 hurricanes are correct
-0.25 pt partial answer
-0.25 pt if Beryl does not have a no

3) a) Describe how, chemically, a fire is a reverse process of photosynthesis. (0.5 pt)
b) Name and describe each leg of the fire triangle. (0.5 pt)
c) How can each leg of the fire triangle be removed by fire fighting/prevention measures? (0.5 pt)
d) What are the four stages of fire? Include a short description of each. (0.5 pt)
(2 pts total)
a) fire uses cellulose and oxygen to produce heat, CO2 (and water)
b) fuel: material that burns; heat: aids stage 1/preheating phase; oxygen: needed to drive combustion
c) fuel: clear vegetation; heat: drop water in fire; oxygen: apply fire retardant (also accepted: apply CO2, smother fire)
d) preheating phase: remove water, heat fuel to 300°C
pyrolysis: release flammable gases
flaming combustions: gases burn
glowing combustions: solid fuel burns

4) a) What are the three main factors that define a Santa Ana? (0.5 pt)
b) How does a Santa Ana change one of the four stages of fire? (0.5 pt)
c) What are two ways how Santa Ana winds influence the spread of a wildfire? (0.5 pt)
d) In southern California, when do most Santa Anas occur? When is the wildfire risk the greatest? (0.5 pt)
e) Explain why the two answer under d) would be different? (0.5 pt)
(2.5 pts total)
a) low relative humidity; strong winds; high temperatures
b) low relative humidity removed water from fuel, therefore shortens preheating phase
c) winds push fires downhill; winds push fires out of control
d) Sep – Feb; through Oct – Nov (also accepted: until the first big winter storm arrives)
e) the fire risk drops after the first winter storm brings a significant amount of rain

5) Go to Wikipedia and search for the list of California wildfires.
a) In the last 24 years, which four years had the highest number of wildfires? Provide the corresponding numbers. (1 pt)
b) In the last 24 years, which four years had the largest acreage burned? Provide the corresponding numbers. Include units. (1 pt)
(2 points total)

a) 2013 (9907 fires); 2020 (9639); 2017 (9560); 2001 (9458)
-0.5 pt if numbers of only 2 years are given/correct
-0.25 pt is numbers for 1 year are wrong

b) 2020 (4,397,809 acres); 2021 (2,568,948); 2018 (1,975,086); 2008 (1,593,690)
-0.5 pt if numbers of only 2 years are given/correct
-0.25 pt is numbers for 1 year are wrong

6) Stay on that same Wikipedia page:
a) In terms of single (complexes of) wildfires, which four had the largest burn area, also provide numbers (with units!) and the year they occurred? (0.75 pt)
b) Now do the same for the four deadliest wildfires. (0.5 pt)
c) Given the notes in the tables what was special about the 2021 Dixie fire? What about the 2024 Park fire? What about the 2017 Thomas fire? What about the 2018 Camp fire? (0.75 pt)
(2 points total)

a) August Complex 2020; 1,032,648 acres
Dixie 2021; 963,309 acres
Mendocino Complex 2018; 459,123 acres
Park 2024; 429,603 acres
-0.5 pt if numbers of only 2 fires are given/correct
-0.25 pt if numbers for 1 fire are wrong

b) Camp 2018; 85 deaths
Griffith Park 1933; 29
Tunnel 1991; 25
Thomas 2018; 23
-0.25 pt if numbers of only 2 fires or less are given/correct

c) Dixie: largest single-source wildfire in CA history
Park: largest caused by arson
Thomas: most deaths be subsequent mudslide
Camp: caused by PG&E
-0.5 pt if info given for only 2 fires are correct
-0.25 pt if info for 1 fire is wrong

7) Go to Wikipedia and search for the Line fire:
a) In which county and in which state did this fire start? (0.5 pt)
b) When did the fire start, when did it end? (0.5 pt)
c) What is the acreage burned? How many people were killed? (0.5 pt)
d) What was the cause of the fire? (0.5 pt)
(2 points total)

a) San Bernardino county; California
b) Sep 5, 2024; still buring
c) 43,978 acres burned; no fatalities
d) arson

8) Search for Hurricane Helene in Wikipedia:
a) When did the storm form, when did it dissipate? (0.5 pt)
b) This storm broke which three recent records? (0.5 pt)
c) How many people were killed? List the total as well as, for the U.S., the numbers and state for the top four states. (0.5 pt)
d) In terms of the most intense hurricanes making landfall in Florida, where does Helene place? Which one is top? (provide year and name). (0.5 pt)
(2 points total)
a) sep 24, 2024; sep 29, 2024
b) strongest on record to strike FL Big Bend area; deadliest Atlantic hurricane since 2017 Maria; deadliest to strike mainland U.S. since 2005 Katrina
-0.25 pt if 1 is missing
-0.5 pt if more than 1 is missing
c) 233 – in US: NC 102; SC (51); GA (33); FL (26)
d) Helene is # 9; 1935 "Labor Day"

9) Go to Google Earth:
a) Place a placemark at 34.05ºN/118.26ºW. Consider this downtown Los Angeles.
Search for Camarillo, CA, the location of the Mountain wildfire. Measure the distance between Camarillo and downtown LA. Error margin (3 km) (0.5 pt)
b) Imagine you drive from downtown LA to Camarillo on the 101, what is the distance driven considering only to route driven on the 101. Provide both numbers, the one for km as well as miles. (error margins: 3 km/1.86 mi). (0.5 pt)
c) Which major city is just to the southwest of Camarillo? (0.5 pt)
d) Click on the Wikipedia box of that city. In terms of population, where does this city place in the U.S.? Where in California? Thirdly, this city is the largest in which county? (0.5 pt)
(2 points total)
a) 74.0 km (allowed range: 71.0 – 77.0 km)
b) 80.5 km (allowed range: 77.5 – 83.5 km) also accepted: 48.1 – 51.9 mi)
-0.25 pt if the number under b is smaller than the number under a)
c) Oxnard
d) 121 in US; 21 in CA; Ventura County
-0.25 pt if 1 answer is wrong
-0.5 pt is 2 or more answers are wrong

10) Google Earth (GE): download the kmz file and load it into Google Earth. This shows the path and physical data of 2024 Hurricane Helene. Work only with the symbols given along the track.

a) As what and when (date and time UTC) did the storm originate? (0.25 pt)

b) How much later (days and hours) did it become hurricane? (0.25 pt)
c) From that point, how much later did it become a major hurricane (category 3)? (0.25 pt)
d) Given only the symbols along the track, measure the shortest distance to Cancun, Mexico.
error margin: 10 km (0.5 pt)
e) Given only the symbols along the track, measure the shortest distance to Havana, Cuba.
error margin: 10 km (0.5 pt)
f) During which 6h-window did the storm make landfall in Florida? (provide date/time) (0.25 pt)
g) What is this time window in EDT (provide date/time)? (0.5 pt)

(2.5 points total)

a) Tropical Storm Helene; 1200 UTC Sep 24

-0.25 pt for partial answer

b) 1 day later; also accepted: 24 h later

not accepted: the date/time; the question and homework video were specific!

c) 1 day 6 h later; also accepted: 1.25 days later

not accepted: the date/time; the question and homework video were specific!

d) 66 km; accepted range: 56 – 76 km

e) 405 km; accepted range: 395 – 415 km

f) between 0000 and 0600 UTC on Sep 27

g) between 2000 EDT on Sep 26 and 0200 EDT on Sep 27

NB: ***both times and dates have to be given for full credit***

NB: EST is -5 h to UTC but EDT is only -4 h to UTC

-0.25 pt if only times but no dates are given

-0.5 pt if at least one time is wrong, regardless of date