Homework–Module 2–Air Motions   **Name:**

1) The length of day has steadily increased throughout the earth's history. Geological evidence[1] suggests that the length of day was 21.9 hours 620 million years ago (Mya). In other words, the rotation rate of earth was nearly 10% faster 620 Mya. If we assume the earth's atmosphere had same horizontal pressure distribution then as it does now (which it did not), what changes in the geostrophic wind speeds (faster or slower) would you expect relative to today conditions over the middle latitudes? Use concepts of chapter 6 of Ahrens to defend your answer.

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[1] https://www.scientificamerican.com/article/earth-rotation-summer-solstice/

The most recent assessment from International Panel on Climate Change (IPCC 2103) states that during the 20 year period of 2016 to 2036 (see Fig. 11-10 of AR5-WG1)[2], the average surface temperatures over high latitudes of the wintertime Northern Hemisphere will warm by 3˚C, which is more than any other region of the world. On the other hand, the tropics are expected to warm the least, 1˚C or less. If the IPCC surface temperature projections materialize, it follows that features of the global circulation during northern hemisphere winter could change too. Answer the last two questions based on the IPCC projections.

2) What changes in the intensity (i.e. average speed) of the polar jet stream (increase or decrease) would you expect if the polar troposphere warms 2˚C more than the tropics? Explain your answer using concepts of module 2. Material in chapter 6 of Ahrens should prove especially useful.

3) What changes in the intensity of extratropical cyclones during winter would you expect if the average tropics-to-pole temperature difference decreases by 2˚C? Again, explain your answer using concepts of module 2. Material in chapter 8 of Ahrens should prove quite valuable. (Ignore the impact that changes in temperature would have on atmospheric moisture content.)

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[2] http://www.ipcc.ch/report/graphics/images/Assessment Reports/AR5 - WG1/Chapter 11/Fig11-10.jpg