NWS Melbourne Marine Web Letter

August 2006

Comments from the Program Leader

We have reached the "August Doldrums" where the Bermuda high pressure ridge meanders back and forth across the waters, resulting in long periods of rather light winds. It has been a drier than normal summer too so disruptions from squalls or thunderstorms have been less frequent than normal. All in all, weather conditions have been better than normal for boating. As we move towards the height of the Hurricane season, we should expect more bothersome periods of weather though.

I don't have any significant updates from the last Web Letter in April, however I did attend a Melbourne Yacht Club meeting in early August. Their weather concerns are different than Charter Boats that venture offshore. They were more concerned about the Intracoastal waterway, which has its own set of problems due to the land/water interactions that occur. Therefore, I will present some questions posed to me about nearshore processes:

There has been some recent cold water upwelling, especially from Brevard county northward. I have gotten some questions about what causes this phenomenon.

Many years during the summer (especially July) there is a period of upwelling that lowers temperatures over the nearshore waters. This is a result of the persistent south/southeast wind flow caused by the nearly stationary Bermuda high pressure ridge. Water transport in the upper oceanic layers is 90 degrees to the right of the wind flow (known as Ekman Transport) , which is directly away from the coast when the winds are predominantly south/southeast. Therefore colder water from below must upwell.

A notable cold water episode occurred in the summer of 2003. It is documented at:
http://www.srh.noaa.gov/mlb/upwelling_2003.html

Further references can be found by searching the internet.

Periodic meandering of the Gulf Stream (technically it should be called the Florida Current offshore our coast) also occurs and induces upwelling. This upwelling originates near the edge of the Continental Shelf (100 fathom line), which does not necessarily explain why large portions of the Continental Shelf are cooled. Since the winds are known to drive ocean currents, the large scale synoptic wind flow dictated by the position and strength of the Bermuda high pressure ridge should also have a significant impact on the upwelling during any particular year, as was the case in the summer of 2003.

The upwelling usually subsides during August due to an overall diminishing of the winds (high pressure ridge sets up across the area).

There may be some correlation to the cooler near shore waters and increased intensity of afternoon thunderstorms. This would mainly be due to a slight increase in the strength of the winds behind the sea breeze boundary and depth of the "cooler air", which produces stronger convergence with the west coast sea breeze boundary.

The cooler waters would have no appreciable impact on a tropical cyclone. The reason for this is that a tropical cyclone covers hundreds of miles and the cooling near shore is on a much smaller scale.

I sometimes get questions about the sea breeze.

Basically, the sea breeze results from the Florida peninsula being heated into the 90s each day while the surrounding waters remain cooler. A thermally direct circulation results (rising warm air over land and sinking "cool" air along the coast). Sailors and kite boarders are often miffed by the strength of the seabreeze. Some have found the winds to be stronger on the intracoastal waterway than just offshore the beaches or vice versa.

I am not sure I can answer why this occurs to a high degree of certainty. The following reply was offered to a question about why afternoon winds on July 31 over the Indian River were stronger than they were just offshore Indialantic.

There were actually 2 sea breeze circulations that developed, one for the barrier island and another for the mainland. Data from a weather station at Melbourne Beach showed the sea breeze there formed between 3 and 330 pm. Initially it was about 10 mph then decreased quickly to less than 5 mph. The Melbourne airport showed a river/sea breeze forming sooner, around 2 pm. Initially it was near 10 mph, then increased to a little over 10 mph.

I think what happens this time of year when the land/sea temperature differences are not very great is that the initial barrier island sea breeze develops and cools down the barrier island. The primary land/sea temperature gradient then shifts to near the mainland as essentially it is "cooler" from there eastward. It is not well known how far away from the land/sea temperature gradient that the winds accelerate but I have heard cases where you don't have to go very far away from the beach to get into light/variable winds. So in this case, the sinking motion associated with the sea breeze circulation was occurring across the barrier island and the accelerating winds were occurring from the river to the sea breeze boundary which was moving onto the mainland.

On this day, the Bermuda high pressure ridge axis was just to the south of the area and we actually had a westerly wind (caused by the pressure gradient) in the morning. On days where the ridge axis is to our north, the beaches are likely to stay a little breezier than they were on this day since there would be an easterly wind caused by the pressure gradient.

You asked about the effect the cooler surf temps have and it does not appear to be that great. Again, we had an offshore gradient wind, so this may have partially negated the effect that cooler waters would be expected to have (slightly stronger sea breeze). Further south where the pressure gradient was weaker (near the high pressure ridge axis), Vero Beach and Ft. Pierce had a stronger sea breeze.

I would say that you should monitor the position of the high pressure ridge and conduct an experiment as to whether the Atlantic or the River would be the preferred place to kiteboard. I would appreciate hearing if you arrive at any conclusions.

A logical follow-up question to number 2 (above) is how do you know where the axis of the Bermuda high pressure ridge is?

It's easy for us at the weather office to plot the surface data and determine where the ridge axis is, but I did not find a web link that was suitable.

I'll give you some links and tell you what to look for on them:

The USAF wind profilers at Cape Canaveral -- Look on the y axis for 0 and 32 (that's zero and 3200 feet). If you see southwest to west winds somewhere in this layer it means that there is higher pressure to the south and lower pressure to the north, so the sea breeze (if it forms) would have to move inland while opposing the pressure gradient. If you see 10-15 knot westerly flow in this layer (probably depicted as a black color) the sea breeze may not form at all.

Buoy 41009 and 41010 -- If the winds are southwest to west at the buoys offshore Cape Canaveral, then it is likely that the high pressure ridge axis is south of Melbourne.

Of course, if our Coastal Waters Forecast is forecasting southwest to west winds, then the high pressure ridge is to our south. Remember to take into account how strong the winds are and whether the sea breeze will be able to form.

You can look at the Melbourne MOS (Model Output Statistics) -- This data will often depict a west wind in the morning and the sea breeze in the afternoon. Note that the top one is from the GFS model which we tend to have higher confidence in, the second one is from the ETA (lower confidence) and the last one is from the NGM (20+ years old model). You can also look at other locations along the coast (i.e. Shuttle Landing Facility, Patrick Air Force Base, Vero Beach, etc.) Note that you subtract 4 hours for EDT, 5 hours for EST.

You can also look at our aviation forecast -- just type in KMLB and you can see when we think the sea breeze will form at the Melbourne airport (again, subtract 4 hours for EDT, 5 hours for EST).

Look these suggestions over and find which one works best for you.

Boaters are often confused about our terminology for the Intracoastal Waters (i.e. smooth, light chop, moderate chop, choppy, etc.).

Instead of forecasting wave heights on the intracoastal waters, descriptive terms are used. This is because the water depth limits the maximum height of the waves. The Intracoastal Waters have varying degrees of depth, so it is impossible to give a representative wave height forecast. The following descriptive terms are used instead to give the boater an idea of the degree of choppiness:

DESCRIPTIVE TERMS	WIND SPEED
Smooth	< 5 KT
Light Chop	5-10 KT
Moderate Chop	10-15 KT
Choppy	15-20 KT
Rough	20-25 KT
Very Rough	> 25 KT

Fetch needs appropriate consideration on the inland waters since they are surrounded by the mainland and barrier islands. Generally, north and south winds produce the choppiest conditions. However, for marginal choppy conditions with an east or west wind, the phrase INTRACOASTAL WATERS CHOPPY IN OPEN AREAS is sometimes included.

The next Marine web letter can be expected late in 2006. Feel free to contact me by email, Randy.Lascody@noaa.gov.

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