Question 1) In Normandy, as you know, we can fly cliffs on Manche coast when wind is North.
In summer, the wind is often the seabreeze and we can soar the cliffs if the breeze is minimum 15 km/h.
Sometimes, we observe that the seabreeze is only 10 km/h on coast (not enough to soar/even seagulls can't soar) and it is moderate 20 to 35 km/h at 10 to 30 km in lands. We don't understand this non standard/non usual situation concerning seabreeze . Have you eventually an explanation ?

To begin, we have to be clear that not all conditions where the wind blows from the sea to the shore is a seabreeze. A true seabreeze only occurs if the upper winds (the wind above the influence of the ground effects—about 500 to 1000m above the surface) are blowing *from the land to the sea*. So, the heating of the land expands the air and the upper winds help to upper air move out to sea, which then makes a higher pressure at sea, which them pushes air at the sea surface towards the shore. If the heating of the ground is high enough (compared to the temperature of the sea), the air moving into the land (the seabreeze) can move quite fast or suddenly and act like a small-scale cold front with a convergence zone at the boundary of the cool and stable air from the sea and the warmer air over the land. Incidentally, the seabreeze air is cool and stable not only because it comes from the sea, but because it has fallen from aloft out at sea as part of the circulation that occurs with the seabreeze. Sinking air becomes more stable, and although it is heated a bit, it starts out cool as it comes from aloft, and then is cooled as it passes over the sea.

Typically a seabreeze only extends about 15 km inland, because of two reasons. First, it gradually gets heated and also has to oppose the true wind. So even though it is stable, it lifts at the boundary with the land air and goes back out to sea to complete its circulation. In addition, the seabreeze, like all moving wind gradually turns to the right (in the northern hemisphere) due to Coriolis effect, so it no longer blows directly inland. In some cases—such as when a hot desert is near the sea, or a river valley channels the seabreeze, the seabreeze can extend 30 or even 50 km inland, but this is rare. I would expect, in your region it only goes about 15 km inland.

When the general wind is from the direction of the sea to the land, there is no true seabreeze and the only effects from the sea and land is the different heating of the lower airmass and its effect on thermals. The final thing I will mention is that when the general wind is blowing from the sea to land, because of the increased friction when it hits the land, it veers a bit to the right (about 15 to 20 degrees) and slows, so a convergence zone exists within about one (1) km of the shoreline. Sailplane pilots generally speak of this as a thermal source, and it appears on the downwind side of lakes as well as the sea. I will call this “shoreline convergence” when I speak of it later.

Now, with the above background, I will try to answer your first question. My first guess is that on the days where you find light winds right at the coast, but stronger winds inland, it isn’t a true seabreeze situation, but the overall (general) wind is from the sea (north or northwest). Why should it be lighter right near the shore? Many years ago (in the 70s) Dr. Paul MacCready wrote some articles about micrometeorology. He was one of the first to study micrometeo for flying, as well as invented simple variometers, along with the Macready ring, and, of course the Gossamer Condor and Gossamer Albatross. He pointed out way back then that beach areas on a sunny day will create a hot bubble of air above them that will partially block the wind. The bubble does not hold to the ground like a soap bubble attaches to a surface, but it grows so fast it expands and resists being triggered as a thermal. So it can block the wind just like a thermal (thermal blocking is a favorite topic of pilots). **If this is what is happening, I expect occasionally the hot air at the shore would rise like a thermal, but it is also possible that the airmass coming in from the sea is stable so that the hot bubble never releases.**

So, with this blocking at the shore, the wind coming in from the sea passes above the warm bubble, then comes ack down further inland. The light wind you feel at the shore is reduced by the bubble, but it blows full force inland. I shoul dmention that we have a site which is a huge bowl, about 8 km wide, formed by two long ridges (one 40km long, the other 1600km long—a world record sailplane site) that come together. Very strangely, it will often be very strong winds in the valley about 40km upwind, but when we get to the bowl directly downwind at the end of the valley, it can be very light and not soarable. This has happened many times and my conclusion is that in a similar manner to the shore line, we get a heat bubble created at the end of the valley (it faces southwest) that sends the wind up over it, greatly reducing the wind at launch.

One other possibility is that there is wave action going on. Where I live we have many parallel long ridges and waves are very frequent, even on thermal days. In fact, the wave action tends to be above the thermal layer, and influences the thermal layer. Where the wave goes up, it promotes thermals and also the wind is lessened at the surface. Where the wave comes down it suppresses thermals and also increases the surface wind. So, it is possible that the airmass moving across the sea suddenly hits the shore and the lift from the cliffs (and possibly from a hot bubble), gets deflected upward and then comes down further inland to increase the wind at the surface. Normally, waves happen in more stable airmasses, and the airmass coming in from the sea is typically stable since it is not heated much (or even cooled) at the water surface.

Where I live we can see the wind effect of waves because we have a highway that travels perpendicular to the ridges. Driving along this highway, I have seen strong surface wind, then 10 km further almost no wind, then 10 km further strong winds, then light winds, etc. Typically we think of waves as being created by high mountains in high wind, but researchers are finding wave action in many situations. It makes sense that the air, like any fluid would be very susceptible to wave action. In your area, if there is a wave set up by the cliff, I expect it dies out quickly inland because it would be small and the area is flat, but it would be interesting to drive downwind parallel to the wind and see if there is cycles of surface wind at different distances.

Question 2) Sometimes, when we soar the cliffs (50 to 80 m high) on Manche coast, we observe that the soarable lift includes two parts : one near the top of the cliff and another 100 to 200 m over (if you can reach it). We observe this situation when the tide is low since many hours in the day and the beach (of sand) is heated by the sun. The situation is

stable on many kilometers along the cliff. Have you eventually an explanation for this "double" lift ?

For this question, I refer you to the photo I sent you.

It shows the dynamic lift (ridge lift) rising above the building to a height not equal to the building height. I am sure this happens above hills, ridges and mountains: the lift is never as high as the solid creating the lift unless there is some instability (thermal action) adding to the lift. So I would expect to only get 20 or 30 meters above the cliff on pure ridge lift. But, because of the shore heating, I would expect that there would also be some thermals that develop on the beach that would create a layer of higher lift. Any thermal lifting off on the beach would probably not be strong enough to hold you up at the cliff level, because it takes some vertical rise before a thermal has accelerated upward enough to sustain flight (we all know that it is hard to use a thermal below about 60 m). But up above—100 to 200m, as you mention—the thermals have developed enough strength to soar. On a hot beach this thermal production may be somewhat continuous.

In addition, as I mentioned in an earlier paragraph, there is a convergence right near a shoreline as the wind is slowed due to friction. This convergence may be what you find soarable higher up. In fact, both the weak thermals and the convergence work together to produce lift, but neither of them would be soarable lower down. Finally, **I suggest that if there is a bubble partially blocking the wind at the surface along the shore, it will act like a higher ridge so the wind is deflected above it like a higher ridge or cliff.** We certainly experience this effect sometimes nears thermal clouds when we can pass in front of the cloud and find dynamic lift as the thermal pushes up into faster wind. I have climbed up the outside of a cloud numerous times in this manner.

In my view, all of these factors I have mentioned occur on occasion and what you have observed may be any combination of these effects. With some of these ideas in mind, perhaps you can continue your observations and not only determine the actual effects, but also the different overall conditions (wind profile, wind direction,

wind strength, stability, amount of solar heating, humidity, etc.) that result in the different experiences. I would be interested in anything more you discover. Certainly the air is complex and we haven't yet figured it all out. We are ideal test subjects. Remember, no one in the world even knew thermals existed until the mid 1920s when Germans started designing and flying primary gliders at the Wassercuppe!