

## The Topband Searchlight, as seen from Southern Africa

Chris R. Burger ZS6EZ

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During our past summer, from December 2012 to March 2013, I was very active on 1,8 MHz. For those three months, I tried to be on the band every morning at sunrise. As I recall, I missed only five mornings: Two because of travel, one because of illness and two because of municipal power failures.

It's the first time in more than a decade that I have operated the sunrise opening. The experience awakened memories from decades ago, but also brought a few new perspectives.

Most of my previous low-band experience was from DXpeditions in southern Africa. Although the general propagation patterns are similar, there are substantial differences too. You need to understand those differences to appreciate the gist of this story.

### Distances

Although most people tend to think of Africa as a single place, it is a large continent separated by vast distances. Durban to Las Palmas is almost 8000 km. Considering that Las Palmas is only 9000 km from Los Angeles, it turns out that an EA8 is closer to about 80% of the US amateur population than to another African in Durban (ZS5).

Even southern Africa is a big place. The distance from my station near Pretoria to Walvis Bay, where I operated several times in the past, is 1700 km.

Just like a W9 in the suburbs of Chicago would be inclined to bemoan his fate with phrases that include the words "black hole", a ZS6 can complain plaintively about propagation differences between a V5 and himself. After all, Chicago is closer to Boston than I am to Walvis Bay!

The difference in location has two major effects. On the one hand, openings are much stronger and last much longer in Namibia than in the eastern half, including the major population centres of Pretoria and Johannesburg and also the smaller countries of Lesotho and Swaziland. On the other, there is more than an hour of difference in sunrise times. Comparing signals between different ZS stations is not very sensible if you don't take account of the difference in sunrise times, as signals often peak noticeably only a few minutes before and after sunrise. Depending on the time of year, my sunrise peak could be much more than an hour before ZS1REC's.

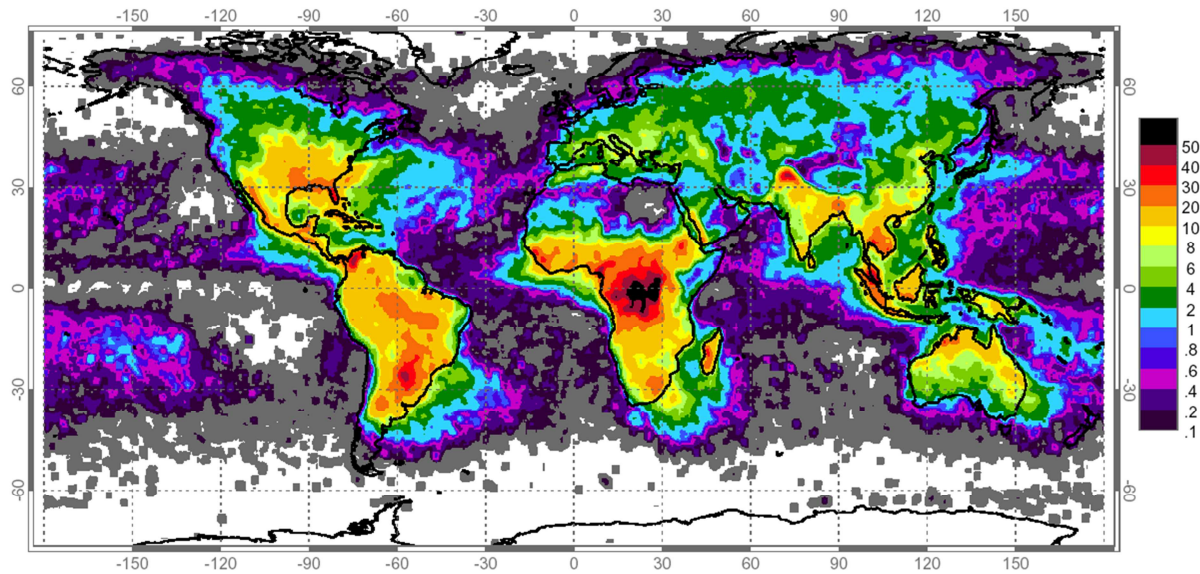
### Thunderstorms

There is another major difference: Weather. Seeing that amateurs in the Northern Half only work DX in their winter, and unplug their antennas at the first sign of spring thunderstorms, we have to work them in our summer. The area around Pretoria where I live is home to daily thunderstorms from late September to about early April. As a pilot, I've often watched these storms in awe, towering above me when I'm flying well above 40 000 feet (about 12 km). Lightning can be seen about once per second, and these storms last for several hours. They bring torrential rain and sometimes hailstones larger than a golf ball.

There is also a band of thunderstorms in the ITCZ, the Intertropical Convergence Zone, which strides the continent at the equator, roughly between Gabon and Kenya. This almost-continuous belt of thunderstorms produces noise that clutters up even the most directional receiving antenna. Even a

long Beverage doesn't help much if you have to beam through a continuous belt of thunderstorms to get to your target audience!

Locally, the distribution of thunderstorms is uneven. Some storms occur over the Drakensberg, a massive mountain ridge 400 km to our southeast, and around the northern Free State, 200 km to our southwest. We also get regular storms overhead. The further you get away from these areas, the better you can hear on the low bands. The map below was stolen from NASA's Web site. The ITCZ forms a black spot around the DRC, and the local thunderstorm alley forms a red blob in the southeast of South Africa.



The most benign place for low band operating in South Africa is the west coast north of Cape Town and up into Namibia. Distances to the US are a full 1500 km shorter than from my location, and the lightning storms are well to the east. There is also a clear shot into the US, without having to go through the ITCZ. Furthermore, the hour's difference in sunrise means that all the major thunderstorms will have dissipated by the time sunrise occurs, or will be effectively attenuated by the daytime D layer to the east.

ZS6 stations are right inside the thunderstorm area. The lightning density in my area is about 20 strikes per km<sup>2</sup> per annum. In other words: I will have approximately 20 ground strikes within 500 m of my house in a typical year, or about 6000 strikes within 10 km of my house. Spread over a six month period, I can expect 1000 ground strikes within 10 km of my house in a typical month, or over 30 in a typical day. These figures do not include cloud-to-cloud strikes, which are the majority of noise producers.

I have operated on 160 from north Africa, Europe and New England. In all three those areas, I experienced noise levels below S5, and it was possible to have a comfortable conversation with an S6 signal. From New England, I worked 1A0KM, who was not lifting the S meter.

In southern Africa, I have never, ever, once heard a noise level under S7. Except once, briefly, when the guy lines on the top hat of my vertical burned off due to fog-induced moisture and the vertical collapsed in a heap...

## Technology developments

What struck me most about the changes since my previous low band activity was the presence of the ON4KST Chat, Internet skimmers and ubiquitous email.

Internet skimmers now provide a real-time feedback mechanism to assess propagation. You can call CQ and see immediately where you are being heard, and at what signal to noise ratio. I was astonished to learn how widely my signals were propagating, even with a simple sloper and 400 W output (although those slopers are not too shabby with the apex at 36 m!).

The ON4KST Chat and email provide an instant (or almost-instant) feedback mechanism, as an opening can be observed in real time through the Chat, and in retrospect through the inevitable deluge of emails that follow. I think that real-time observations can cause openings to be exploited which would otherwise have gone by without two-way contacts.

Unfortunately, the Chat is also abused by individuals who inordinately facilitate QSOs to an extent that strikes me as being no different to a DX net. “Please give me the report again, Bob!” or “Who is the station with 6 in the callsign?” strikes me as inappropriate and debases the attempts to actually master the challenge of low band DX. They are no different to the “Give the second digit again, Bob; It’s a little too low” and the “Over-Over” of the DX brothels.

My personal favourite is the individual who kept expressing anguish over not being able to hear a particular rare DX station, who was also on the Chat Page. When the DX operator said that he’d logged the complainant, a campaign started to fish out what time the QSO had taken place. This campaign was maintained for days. It was pathetic to see how desperate this individual was for a new country, even to the extent of logging a contact with a station that he could never hear well enough to hear an exchange!

During January, I experienced the anguish of having two Alaskans reporting my signal on 1,8 MHz. Alaska is one of the hardest places on earth to work, with a direct path across Africa and Europe and straight across the North Pole. I’d never heard or worked Alaska on Top Band. Although I was delighted to know that I was getting out that well, I was traumatised to realise that I was being heard, while I could not hear them!

I also witnessed an incident during December, in which spectacular propagation coincided with severe QRN in the pre-dawn hours. I could hear dozens of loud signals on the band, but it was very, very tough to copy them. I persevered, and worked several dozen stations. At that time, two individuals started posting abuse on the Chat in real time, based on the fact that I was very loud in North America but could not hear them. There was a certain amount of wry irony in this event, as one of the two abusers is in a semi-rare location, and has called CQ in my face on dozens of occasions. I subsequently found a blog post from a European describing the same incident, and mentioning that this individual is famous for calling CQ in the face of myriads of European callers too.

Perhaps things were easier in the olden days, when we didn’t have real-time feedback on the way in which we were embarrassing ourselves. It’s always easier to handle when you don’t know the full extent of it...

## Callsigns

The description below refers to geographic selectivity. Unfortunately, it is no longer easy to assess the distribution of US stations being heard. Once upon a time, it was easy to monitor propagation in real time. If a US station wasn’t in its assigned location, it would use a “Portable” suffix to advertise the

fact. W2NQ was in the Northeast; W2NQ/7 was in the West. Unfortunately, such is no longer the case. Increased mobility and the Vanity programme have resulted in a situation where up to a quarter of stations are not where their callsigns say they should be. As a result, hearing a W4 is no longer meaningful. And hearing a W7 no longer makes my pulse race, as he is probably in North Carolina or Florida.

While the FCC's relaxed stance has been great for human rights, it has been very detrimental to real-time propagation assessment. Sometimes I only understand what happened after the opening, when I punch all the worked callsigns into a database to see where the stations actually were.

The description below uses FCC districts to indicate areas. When I refer to a W5, I mean a W5 in the Southwest, not in Boston...

## A typical sunrise opening

Enough background; now let's look at the morphology of a sunrise opening.

In general, only one out of four sunrise periods during December and January produces workable signals from North America and Europe. "Workable" is relative, as the signal strength is not the only issue. Thunderstorms sometimes produce unbelievable static levels, and even though signals are strong and audible, they cannot be understood or even identified.

There is often an opening in the early morning, perhaps two hours before sunrise. However, getting up at this time of day is too disruptive to my sleep patterns. Given the demands of my job and other commitments, I seldom catch that opening. Although I am no early riser, the sunrise opening is less disruptive, and is the one on which I concentrated in my quest for Worked All States on 1,8 MHz. In a two-month period, from December 2012 to February 2013, I worked 46 US states. Apart from Alaska and Hawaii, I missed only Rhode Island and Louisiana. Both of these are propagationally relatively easy, and missing them was probably due to low activity rather than a difficult path. Alaska has already been discussed, and Hawaii is almost antipodal to us.

Typically, as little as half an hour before sunrise there is not a single station on the band. I often start calling CQ without hearing a single signal. Upon calling CQ, if it is one of the useable mornings, there is normally an audible cluster of callers on the nominated calling frequency. Sometimes one is copiable, sometimes not. Very seldom is there more than one copiable signal at the same time.

The first signals to appear are normally in Europe or the US East Coast. Most often, the Americans are in New England and perhaps down to W3. Signals are difficult copy, but it's normally possible to work a steady string of stations.

If there is a strong European opening, it normally starts in the east and progresses to the north and west. I might work a few Ukrainians, then some Czechs, then some Germans, then some British and Scandinavians. In general, only one area is audible at any given time.

I have often run a steady string of stations, starting with Europe. At some point, typically 15 minutes before sunrise, I would hear my first American. From that point on, not a single European could be heard. This pattern is too consistent to be coincidental. Literally, as the first station from North America appears, the band closes to Europe--completely.

About 10 minutes before sunrise, the signals become louder and the skip moves further west. Some W8 and W9 traffic can be heard, with occasional W5 or W4 stations further south. Very seldom do you hear more than one area at a time. Signals continue to build all the way to sunrise.

At sunrise, there is normally a sudden drop in the noise level, sometimes down to S9 or less. At this point, it is often possible to work a dozen stations in just a few minutes. As the signals start to fade, the band sometimes suddenly opens to the West Coast, with several callers suddenly audible. I have had openings of under 30 s duration into California on several occasions. Almost invariably, when the West is audible, nothing else comes through. There is no competition from the East Coast or anywhere else, despite what the Left Coasters claim.

Once the West Coast fades, the opening is over. In my shack, the end of the opening is normally announced by solar glare on my computer monitor. It's now time to move to 3,5 MHz for another crack at the same dawn opening. This time, the same pattern is evident, but with much less spatial selectivity, and with much longer duration. Again, about half an hour after sunrise we are only working the West Coast.

### Some observations

I receive a constant stream of complaints from self-styled propagationally-disadvantaged individuals. The complaints sometimes arrive via email after the opening, but the Chat and the cluster system have made the complaints available in real time too. "Only working Southern Europe". "Listen for south-central Ukraine". "Only working East Coast". The complaints most often come from Northern Europe (because they are so far), western USA (because they cannot get through the "East Coast Wall") and from southern Europe and USA (because of their terrible QRN level).

Let me put most of these objections to bed. I admit that there is some veracity in those claims for stations close to a population centre (such as the recent Clipperton operation). However, they are simply not true for a geographically-isolated station.

Remember the Spotlight. We very seldom hear more than two or three stations simultaneously in the noise. When we do, they are almost always from the same area. In other words: Competition from stations in other areas is almost never the problem. Even for stations from the US West Coast, there is almost never significant competition from the East Coast, especially late in the opening.

The secret is that everyone is very, very far. Another few thousand km won't make much difference. For us, southern Europe is about 8000 km away. Northern Europe is at about 10 000 km, only 20% further. Likewise, the US east coast is about 13 000 km away, with the west coast at 17 000 km. Again, the difference is only 30%. We have less than 100 stations that are active on LF within 8000 km of my location, so everyone is almost as far as you are.

Here is something that you can do to enhance your chances. One of the effects of fancy radios with stable oscillators and accurate displays has been that everyone has the ability to transmit on exactly the same frequency. Occasionally, when I can hear more than one station, I have two or three callers that call exactly zero-beat on my nominated listening frequency. The result is that I cannot copy any of them. If one were to move by 50 Hz, I could probably work both of them in about ten seconds. Unfortunately, explaining this problem (and the solution) to them between static crashes is not simple. So: If you hear several callers calling exactly where the advertised listening frequency is, try moving slightly one way or the other. Don't overdo it, as the DX station may be using narrow filters and moving more than 100 Hz or so will probably place you completely outside the passband.

Another very important issue is the regularity of your Morse code. If the DX station is having trouble copying the full callsign, the best thing you can do is to use a memory keyer and send your callsign repeatedly with perfect timing. Don't try to stretch your callsign in a misguided attempt to enhance intelligibility. Morse code has redundant timing characteristics. Let's take my callsign (ZS6EZ) as an



example. If I send it using regular timing, a receiving operator must know that there is an “E”, even if the “E” itself is masked by static crashes. I couldn’t possibly be ZS6Z, as there is just too much open space between the 6 and the second Z. However, if I send my callsign using Farnsworth spacing (“Z S 6 E Z”), especially if the timing is a little erratic, the effect is removed. Indeed, the longer the spacing, the less obvious it is that there is an “E” hiding between the digit and the last letter.

So: Use a memory keyer to send your callsign, and stick to the standard timing as Samuel and Alfred intended. Send it 10 times if you must, but not more than two or three times at once. First check whether it’s had the desired effect, and then send it again if necessary.

Use the DX station’s speed as a guide. QRN characteristics can differ. ON4UN describes “tropical QRN” in his book, describing it as more granular than the typical “white” QRN known in Europe. Depending on which kind of QRN is present, the optimal speed could differ. If the DX operator is worth his salt, he will select a speed that matches conditions. Follow his directions, and you’ll be fine. I have used “QRS” and “QRQ” on some occasions, to keep my own speed appropriate to the audience’s listening conditions while getting the callers to match my own conditions.

Here’s another observation: In the three-month period, while calling CQ, I did not listen on my own frequency, not even once. I take great pains to say “3UP” or “3U” or whatever at the end of every transmission. I even include those instructions in the middle of a CQ, to give listeners the chance to programme their splits before I start receiving. However, almost every time I’m active, someone calls on my frequency, making it difficult for everyone else. As fate would have it, these jokers often radiate high-angle signals, and are very loud in the target area.

Fortunately, although this effect is almost universal with the Cluster bunnies, it is less pronounced with people who actually find my signal for themselves. I take great pains to first work a few guys before I get spotted, so that I can give the astute listeners preference. Unfortunately, with the proliferation of the Reverse Beacon Network, if there is propagation, there will almost certainly be a Cluster spot from W3LPL within a minute or two. Perhaps the RBN wizards should find a way to report splits, too. At the moment, they only specify the transmit frequency, and they seem to entice a horde of call-first-worry-later hooligans onto the frequency. Most of them seem unable to hear the DX in the first place, or perhaps they don’t understand what “3U” means.

## So what?

The article is an attempt to show how the other half lives. Specifically, it explains things about noise levels in the southern summer (which happens to be your blissful winter) and about selective propagation.

One could easily conclude that these are useless trivia. Not so. If you take the lessons to heart, you could save yourself a lot of frustration. In fact, you might even work one or two new counters in the process.

Here are a few conclusions that I would offer, that could save you a lot of anguish:

- **Learn something about geography.** Africa is a big place. So are Asia and the Pacific. Making comparisons between stations is sometimes not only senseless—it is a clear illustration of the deficiencies in your mental geographic database.
- **The ON4KST Chat is a two-edged sword.** Use it to identify unanticipated openings, but don’t use it as a substitute for a two-way contact. Your inability to hear the other station will

be obvious to many of the spectators. Right now, as I write this paragraph, over 100 of your peers are logged in. You are not going to do your reputation any good by abusing the Chat.

- **Understand seasonal and geographic variation in static levels.** Understand that the operator at the other end may have up to 50 dB more noise than you have, due to seasonal variations, thunderstorm density and urban noise. You may be S9 and still be inaudible. If you want to compensate with power and produce the same signal to noise ratio, you'd better get yourself a broadcast transmitter and start using thicker wire for your antennas!
- **Far-away stations are far from everyone.** There is no "wall" or "curtain" that prevents you from being heard. Everyone is on a relatively equal footing. Everyone is far, and everyone is weak. Be patient, your time will come.
- **The guy at the other end is as keen as you are.** In general, other Top Band enthusiasts are as keen as you are to complete a contact. Unless you have really misbehaved badly at some stage, they will work you if they hear you. Don't look for malice where none exists!