On the Meteorology of the Coast of New South Wales during the Winter Months, with the desirability of issuing cautionary storm warnings, by telegrams to the various ports, from the Observatory.

By Marshall Smith, Master of the ship "T. L. Hall."

[Read before the Royal Society of N.S.W., 3 July, 1878.]

The periodical return of bad weather, of a most treacherous character, during our winter months—notably July, our worst storms in the past having occurred during that month, and which have generally caused more or less loss of life and property at sea—caused the writer to prepare this paper, with a view to elicit the views of those who may have better chances of procuring or compiling meteorological data, whether they are or are not preceded by certain atmospherical conditions and barometrical readings.

The writer's experience during six years as a shipmaster on this coast leads him to believe that the normal state of the weather is cyclonic; that is, areas of low pressure come up and follow each other quickly from the westward. The gales commencing in a northern quarter, veering with the sun's course through west and south-west, will blow hard for a time from the southern quarter, and gradually moderate, and, after a short spell of fine weather, again begin in the northern quarter, as another area of low pressure comes up from the westward. The barometrical conditions are, as we might expect, steep gradients on our coast; the lower readings being at our southern stations, the steepness of gradient between Newcastle and Eden, as a rule, denoting the strength or force of the coming gale. While the above conditions are in force, we have a continuance of comparatively fine weather, for these cyclonic winds bring very little rain with them, the clouds having probably parted with their vapour in passing over the high lands of the Australian continent. But nearly every winter we have a gale of an opposite character, namely, bad weather of an anti-cyclonic character, which comes up upon our coast from the eastward, bringing with it fierce gales, a heavy breaking sea, and a deluge of rain. These gales generally commence at some point between north-east and south-east, and they back against the sun's course more or less during the continuance of the gale.
In Knagg's Almanac we find that in July, 1866, the steamer "Cawarra" foundered, drowning all her crew save one, and fourteen coasters foundered or were driven on shore; and, again, in 1867, eight or nine more coasters followed. In July, 1876, the barques "Union," "Moneynick," and "Ann," with the whole of their respective crews, were lost, with several coasters; and in July, 1877, the "Yarra Yarra" foundered with the whole of her crew while endeavouring to re-enter the port of Newcastle.

The barometrical conditions preceding these storms (anticyclonic) we find in the storms of 1876 and 1877 to be of quite an opposite character, the barometer standing high at the various coast stations, and the gradients beginning to steepen in the reverse order, viz., the readings at the southern stations become the higher, and from observations of the barometer readings as given in the Sydney Morning Herald, the writer found that for some little time preceding the July gale of 1876, the barometer had been standing high at the different stations, with a steepness of gradient of about 20-100 of an inch between Newcastle and Eden, when then the gale burst upon us. Again, taking the gale of July last year, during which the "Yarra Yarra" foundered, the writer found that the barometer readings as given in the weather chart for Newcastle and Eden were as follows:

<table>
<thead>
<tr>
<th>Newcaste.</th>
<th>Eden.</th>
<th>Received in Observatory</th>
<th>Published in chart</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wednesday, July 11</td>
<td>30:43</td>
<td>30:56</td>
<td>July 11</td>
</tr>
<tr>
<td>Thursday, July 12</td>
<td>30:38</td>
<td>30:50</td>
<td>July 12</td>
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<tr>
<td>Friday, July 13</td>
<td>30:26</td>
<td>30:36</td>
<td>July 13</td>
</tr>
<tr>
<td>Saturday, July 14</td>
<td>30:10</td>
<td>30:30</td>
<td>July 14</td>
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From the above readings it may be seen that the readings had been very high at the coast stations for some time preceding the storm, and that on the Saturday morning (July 14) that the "Yarra Yarra" proceeded to sea, they were aware in the Observatory that gradients had steepened 10-100 of an inch between Newcastle and Eden—in itself a dangerous sign; and again, as in 1876, the difference between the readings at Newcastle and Eden was 20-100 of an inch, yet no cautionary storm-warning was issued from the Observatory that morning, or at least none was received in Newcastle, for had there been, the "Yarra Yarra" would probably have remained in port, and thus avoided her bad end. The inferences which the writer wishes to draw and place before the members of this Society for their free discussion (believing that by doing so he is best serving the cause of his fellow sailors) are:—1. That the normal state of the barometer during the winter months on the coast of New South Wales is low readings with steep gradients, the lowest readings being at the southern stations, with westerly winds of a cyclonic character and comparatively fine weather. 2. That when these barometrical conditions cease
to exist, and that instead of a set of low readings we find that—as in July, 1876 and 1877—the readings getting high at our coast stations, and the gradients beginning to steepen in the reverse order, I think we may fairly infer that an atmospherical disturbance of an anti-cyclonic character is threatening our coast, which may or may not reach our shores. 3. If the last inference is true (as the writer believes it is, and also believes that it is only by the careful study of meteorological data that this can be determined), but if it should be found to be so, then surely it would become our duty to urge upon the Government of New South Wales the necessity of issuing from the Observatory by telegraph to the various outports bad weather forecasts, when cautionary storm-warnings could be hoisted, and old and ill-found vessels would remain in port until the storm had passed over, or the atmospherical disturbance had passed away.

It may be said that the writer only gives the barometer readings preceding two gales, viz., those of July, 1876 and 1877, to substantiate this theory, and that this is not sufficient. In reply he can only say that they are the only ones; that he has been able (by being on the spot at the time) to look carefully over the weather reports, as during the gale of July, 1876, he was in Newcastle, and in July, 1877, he was off Wollongong, when the gale commenced, bound to Newcastle.

In conclusion, the writer would like to place before your notice the good that has been done on the coasts of Great Britain by the issuing of these storm warnings by the Meteorological Society, and the large percentage of successful warnings issued by them; and hopes that, by the careful study of data which we may possess, we may obtain some knowledge of fixed laws concerning these heavy storms which sweep upon our coast nearly every winter, and that warnings may be sent out, and the lives of our seamen be spared in the future; and as one of the means to this end, the writer would recommend the obtaining the logs of the vessels which may arrive after these gales are over, and most especially those vessels which may be en route to New South Wales from New Zealand ports, and so perhaps obtain information of their size, shape, and their progressive movement.

Discussion.

Mr. C. Stuart said: I consider that this is one of the most reliable papers upon this subject, or perhaps the only one we have had during this year. It shows the great value that nautical gentlemen set upon the observations from the Observatory. Although the writer is not a member of the Society, he hoped the paper would be considered of sufficient importance and sufficiently well written to be printed in our volumes at the end of the year. If it is necessary, I will move that the paper be printed.
The Chairman said this was not necessary. The printing of the papers read was a matter that rested with the Council. Mr. Kinloch asked what was meant by the steepness of the gradients, and coming in the reverse order. These storms interested him. Would Mr. Russell tell them if he had noticed the state of the atmosphere before these fierce south-east storms came on. He had generally been able to tell from the barometer and the state of the skin when they were coming on.

Mr. Russell said: Mr. Marshall Smith has raised a most important question, and I wish he had said more about it. I felt rather disposed to shirk speaking about it to-night, because it is a long subject to go into, and would take about an hour to explain, on the assumption that there are members present who do not understand it. The writer of the paper really raises a wide question as to the character of the atmospheric disturbances on our coast. In England they have clearly made out the cyclonic character of the storms that pass over Great Britain. In New Zealand the character of the storms is very much the same; but in America they have quite a different state of things—the storms travel there in a different way. Now, in order to trace out the cyclonic storms, you want daily observations by telegram from a large number of stations, and since I have received such telegrams at the Observatory, I have learned to correct some ideas I had formed about our weather; one of these, viz., that our storms are similar to those in England—that is, that they are cyclonic—I had to give up. I am convinced that our storms are not cyclonic, in the ordinary sense of the term. Now in fine weather we generally get winds from the northern points; but if the barometer begins to fall in the summer, the wind gradually veers round to the westward, and thence to the south, the barometer indicating the approach of the southerly wind by a steady rise. As the polar wind comes in the loss of pressure is made up, and the wind dies out, and with a high (about 30 inches) barometer we have a return of fine weather. Such is the ordinary fine weather course of the wind. The weather telegrams have taught me this—that, for some reason which I am at a loss to explain, the barometric waves which pass rapidly across the surface of the earth in this country generally come from some point between south and south-west. A rising barometer on the south or south-west coast indicates that the barometer will soon rise here. The effect is that if one of these waves comes on rapidly, we have an increase of pressure on the southern coast which gives rise to a strong southerly wind. This represents what Mr. Smith speaks of as a gradient. If you will refer to the daily weather map you will see that these gradients frequently exist, but until they rise to 6 or 7 they are not dangerous; that is until the difference of barometers
for every 60 miles is 0'06 or 0'07; but here we seldom have anything of the sort. In the "Dandenong" storm there was a gradient, but there was nothing like circular motion in it. It came in from the south-west coast, followed up the Murray, across the mountains to Bathurst, and reached Sydney by the easterly motion of the atmosphere. I was able to trace its speed. It reached Sydney—(I am speaking just now from memory)—about 10 o'clock p.m.; it was at Newcastle about 1 o'clock a.m. and was met by one of the A.S.N. Co.'s steamers off the coast beyond Port Macquarie. I traced that storm in almost a straight line for nearly a thousand miles. So that it could not have been a cyclone. It is very evident to me that the bulk of our south-westerly storms come on in that way. The more important question which Mr. Smith raises is that of the easterly gales; and here I confess myself at a loss. I have studied them closely for some twenty years, and I am obliged to say that there is no satisfactory warning of them. I know that there is a certain sensation felt before these gales. There is an intense dampness of the atmosphere; but this often occurred and no gale followed. Within the last twelve months I have obtained some scraps of information which show that sometimes the south-east gale did not "blow home," as the sailors say. That is to say, a heavy sea could be seen off the coast, but it did not come right in, and while a south-easterly wind was blowing hard out at sea, the wind here was west. The cause which brings in the south-easterly gale was probably some decrease of pressure in the interior of the country; or probably from the demand of the trade winds. But there is really a great deal to be learned about it; and I would be afraid to predict the approach of a south-east wind. In nine cases out of ten they do not blow home. Sometimes the stations report a heavy sea on the coast, though the wind is light; but I know from the telegrams that the south-east gale is blowing overhead at the time. If such south-east winds off the coast had a little more force, they would come in and make destructive gales. The barometer was always high before these gales came on, and generally fell as they continued. I fully believe that something ought to be done in the way Mr. Smith suggests, but it cannot be said off-hand what is best to be done. I expect to get a good deal more information from the daily weather study about the gradients than I have hitherto obtained. We seldom or never get a gradient here that represents a south-east gale. It is found in England that if a moderate gradient continues in one direction for some days, the wind blows in that direction with considerable force—more so than if the gradient had existed for only a short time. I think the number of gales of wind of at all a serious character on this coast are small compared with those that prevail in New Zealand or the Mother Country. (Applause.)
Smith, Marshall. 1878. "On the meteorology of the coast of New South Wales during the winter months, with the desirability of issuing cautionary storm warnings, by telegrams to various ports, from the Observatory." *Journal and proceedings of the Royal Society of New South Wales* 12, 71–75. 
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