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The Marine Observer

A quarterly journal of Maritime Meteorology

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THE MARINE OBSERVER

A QUARTERLY JOURNAL OF MARITIME METEOROLOGY PREPARED BY THE OBSERVATIONS VOLUNTARY (MARINE) BRANCH OF THE MET. OFFICE

VOL. 69 **No. 344** **APRIL 1999**

CONTENTS

COVER PHOTOGRAPH 'Sunburst' over Jbel Musa and Marsa Bay (Strait of Gibraltar) at 0930 UTC on 16 November 1997, photographed from the *Seki Cedar* by Captain P.W. Jackson.

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LONDON: THE STATIONERY OFFICE

Annual Report of the Observations Voluntary (Marine) branch for 1998

1. Voluntary Observing Fleet (VOF)

The UK VOF as a whole constitutes part of the WMO Voluntary Observing Ships scheme which currently comprises about 7,000 of the world's merchant vessels. At the end of 1998 the commercial vessels and other units of the VOF reporting in the SHIP code numbered 475 Selected Ships and 17 Auxiliary vessels. Additionally, there were 49 ships reporting in the MARID code while the offshore sector was represented by 39 rigs and platforms.

The VOF continues to make weather observations at main and synoptic hours or at other times as necessary and its vessels, which undertake the work voluntarily, are equipped by The Met. Office with meteorological instruments loaned for the purpose and are also supplied with relevant stationery as required.

The range of equipment loaned by The Met. Office is related to the class of observing work undertaken. Those ships recruited to work in the 'Selected' category report all elements of the Selected Ship's Code for which purpose they carry a precision aneroid barometer, marine barograph and a marine screen containing dry- and wet-bulb thermometers; for recording sea-water temperature they also carry a sea-water bucket with thermometer or are fitted with distant reading equipment. Those units working in other categories report fewer elements of the Selected Ship's Code and are issued with fewer instruments accordingly. 'MARID' ships are issued with the least amount of equipment as they concentrate on sea-water temperature alone although they also make non-instrumental observations of local weather conditions found on coastal passages in northern Europe. Their contribution is vital for the prediction of fog and, in appropriate meteorological conditions, icing. The offshore units provide data from the North Sea oil fields and other areas of exploration. Anemometers are not used by the UK VOF, the surface wind speed and direction being estimated from the sea state.

Vessels engaged in all classes of observing are serviced by a team of seven Port Met. Officers (PMOs) based at principal ports around the country, except for offshore units whose Offshore Adviser is based in the Aberdeen Weather Centre. PMOs and the Offshore Adviser regularly visit vessels and installations of the UK VOF to offer advice and to check instruments while the PMOs themselves liaise with counterparts around the world through the Manager of Marine Networks, at Bracknell, so strengthening international co-operation and encouraging more ships to become involved with observing. PMOs also visit ships of other countries' fleets, if required, to assist observing personnel.

The number of meteorological logbooks received in 1998 was 747 compared to last year's total of 837, the decrease in number being partially offset by TURBOWIN data which are received electronically. The logbook data undergo a series of computer quality control checks before they are permanently stored for use in such areas as marine climatology and climate research, while the logbooks themselves are destined to become permanent public records held in the National Meteorological Archive, at Bracknell.

Observations noted on the Additional Remarks pages of ships' met. logbooks have increased and as many as possible are published in *The Marine Observer*. Reports continue to be copied to the pool of relevant experts who voluntarily give their time and knowledge to comment upon sightings made at sea.

2. Automatic equipment

The programme to replace obsolete MOSS equipment with lap-top computers loaded with The Royal Dutch Meteorological Institute's TURBOWIN software continued. With its 200 built-in quality control checks, TURBOWIN creates correctly coded meteorological observations from data entered by observers, and the observation can then be downloaded to floppy disks for subsequent transmission ashore thence to Bracknell through the use of Inmarsat-C and the Global Telecommunications Network.

Throughout the year, foundations were being laid for the revival of the Automated Shipboard Aerological Programme (ASAP) which had been discontinued in the early 1990s. By the end of December, arrangements were in hand for the delivery to The Met. Office of a 10-foot container (adapted to house the launcher), and a suitable vessel had been sourced from Canada Maritime Services Ltd whose newbuilding, *CanMar Pride*, was offered as a carrier. After trials of the system by The Met. Office, the first operational voyage is expected to take place in March 1999 between the UK and Montreal (as part of the vessel's normal Thamesport-Antwerp-Le Havre-Montreal round trip route).

3. International and domestic activities

Among his marine-orientated activities, Captain Stuart M. Norwell (Head of the Observations Voluntary branch encompassing both maritime and land-based work) visited Toulouse in mid-September to participate in the finalisation of plans to fully implement the GMDSS on 1 February 1999. Later that month he visited Denmark to attend the Tenth Session of the ASAP Co-ordinating Committee, held in Copenhagen between 30 September and 2 October. Between 24 and 25 November he attended meetings in Bergen in connection with shipping forecasts for areas of the Norwegian Sea.

The programme to install e-mail capabilities at UK Port Met. Offices continued with the installation of lap-top computers loaded with Windows 95 and a secure dial-up system to connect to relevant servers. This was intended to be a temporary method of connecting remote sites to The Met. Office headquarters e-mail network pending the installation of new hardware to handle Windows NT in line with the gradual migration to Windows NT undertaken by the entire Office during the year. The change-over to the new system was achieved in the headquarters area of the Observations Voluntary (Marine) branch during November, with the remote sites still to be upgraded.

The post of Port Met. Officer for North-west England was filled following the appointment of Mr Colin B. Attfield to the Liverpool-based position on 17 August.

The long-standing vacancy for a Nautical Officer based at the branch's headquarters in Bracknell was filled on 7 December with the appointment of Miss Sarah C. North.

4. Publications

The contents of the brochure *Weather Services for Shipping* were revised and updated for publication as a new edition. By the end of the year, the new design was undergoing its proofing stage, with delivery expected early in 1999. Distribution of the brochure to UK Port Met. Offices and interested parties will commence from Bracknell immediately following publication. It is anticipated that the brochure will be updated annually, and its new design incorporates more loose-leaf inserts to simplify future reprinting requirements.

Arrangements were put in hand for the production of a calendar for 1999 for voluntary observers, both land-based and shipborne, which was subsequently distributed in November.

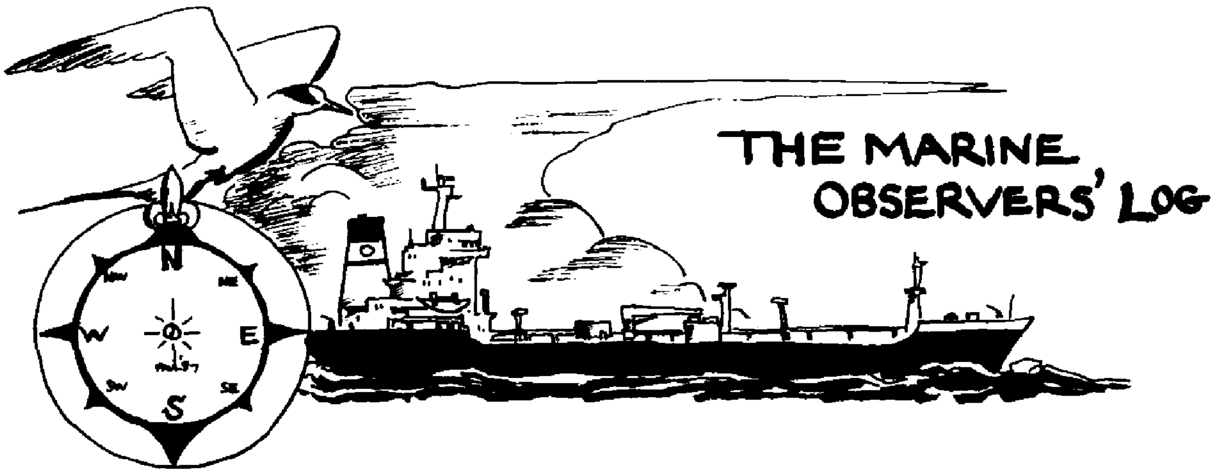
5. General

Presentations of barographs to long-serving shipmasters were made at Bracknell on 5 August and 8 October, the former occasion being arranged for one recipient from 1995 who was unable to attend the main ceremony in October 1997. At the invitation of Captain Norwell, the former presentation was made by Dr S.J. Caughey (Technical Director of The Met. Office) while the four for 1996 were made by Mr Peter Ewins, the Chief Executive.

Following normal practice concerning those with shorter observing careers to date, 300 nominations for Excellent Awards for 1997 were drawn from the names of Masters, Principal Observing Officers and Radio Officers contributing to meteorological logbooks received in that year and the contents of which were assessed as being of the highest quality; the letters of notification were sent at the beginning of August, with the despatch of book awards commencing shortly afterwards as nominees responded. The titles selected for this round of awards were *Collins Atlas of the World* and *Seabirds.* At the end of 1998 216 awards had been processed but responses were still being awaited from the remaining nominees.

Despite repeated appeals to observers, through the pages of *The Marine Observer*, to check for their names in Excellent Award listings, the number of unclaimed awards continued to cause concern. It was found that on average, 77 nominees per year from 1994 to 1996 inclusive, had not claimed their awards although the reasons for this were not confirmed. With storage space for unclaimed and new book titles at a premium the difficult decision was taken to recommend to nominees a deadline for the receipt of their claims by The Met. Office, and 30 April of the year following a given round of excellent awards was selected. Thus, future claims dated or received by 30 April will be honoured by a book award while those dated later than the deadline will be honoured by a certificate. Further, it was also decided that unclaimed books would then be carried forward to the supply of titles available for the next round of awards. The change in arrangements was announced in the letters of notification sent to award nominees on 3 August and in the October 1998 edition of this journal. These new arrangements are expected to be implemented with the current (1997) round of awards.

Preliminary discussions took place with the objective of updating the presentation of *The Marine Observer* with a view to giving it a new look for the millennium.



April, May, June

The Marine Observers' Log is a quarterly selection of observations of interest and value compiled from the meteorological logbooks of the UK Voluntary Observing Fleet and from individual observers' contributions. Responsibility for each observation rests with the contributor. All temperatures are Celsius unless otherwise stated. The standard international unit for barometric pressure is the hectopascal (hPa) which is numerically equivalent to the millibar (mb).

WINTERY SHOWERS

North Sea

m.v. *Putford Aries*. Captain I. Finlay. Offshore installation support duties. Observers: the Master and ship's company.

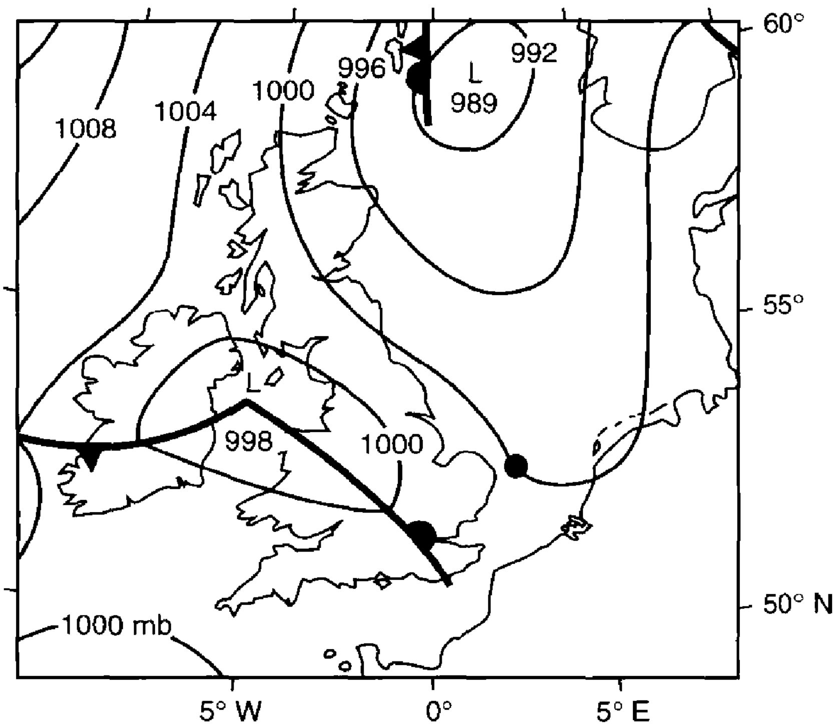
13–14 April 1998. The vessel departed Great Yarmouth at 1900 UTC on the 13th in conditions of light W'ly winds of force 1 or 2 with the cloud cover consisting of cumulus, stratocumulus, altocumulus and cirrus, all of which were gradually dissolving. At 2100 lightning was visible but was noticed to be confined only to the area of cloud cover formed by cumulus, the sky being made visible by the full moon. Throughout the morning of the next day the cloud built up and showers of rain followed; the cloud cover was now formed by large cumulus clouds accompanied by pannus, and by 0800 the wind had increased to SW×W'ly, force 6 or 7. Between 1000 and 1020 a hail storm replaced the showers and this was followed almost immediately afterwards by a reduction in visibility to less than 0.5 n mile thanks to heavy snowfall which continued until 1130.

This passed and the visibility recovered to at least 20 n mile as the cloud dissolved rapidly and the temperature rose steadily. By 1500 there were 6 oktas of cumulus and stratocumulus, there was bright sunshine and the wind was backing steadily; the sea was rippled and there was a low confused swell. At 1600 the dry-bulb temperature was 5.2° while the wind was SE×S'ly, force 2, and by the 1800 observation the temperature was falling and the clouds were building again. There were more heavy snow showers between 2000 and 2120.

The 'main man above the funnels' seemed to be getting His seasons slightly confused!

Position of ship: 52° 54′ N, 02° 24′ E.

Editor's note. The wintery showers affecting the *Purford Aries* were triggered by an unstable flow of air originating from polar regions. As the cold air flowed south around a complex area of low pressure partly centred between Scotland and Norway, it passed over the comparatively warm surface of the North Sea and was warmed in its lower layers, thus rising then cooling to form clouds sufficient in size and height to produce lightning and hail.



The chart shows the analysed synoptic situation for 1200 UTC on the 14th. Between this time and 0000 on the 15th, the small low developing over the Irish Sea moved to lie roughly over the Welsh borderlands, and its fronts were pivoted northwards to cause the mixture of conditions experienced at the vessel's position (indicated by ● on the chart) during that evening.

WATERSPOUT

North Atlantic Ocean

m.v. *Snow Cape*. Captain L.M. Colam. Antwerp to Luanda. Observers: the Master, C. Watson, Chief Officer and J. Taylor, AB.

12 April 1998. At 0650 UTC a small waterspout was observed to form during a period of 10 minutes, developing below moderate cumulus cloud based at about 1,200 feet. It grew down towards the sea but at its point of maximum growth it did not appear to reach the surface although the sea was whipped up below it to a diameter of about 5 m. Also noted by the observers was a clearly lighter section which rotated anticlockwise all the way up the waterspout, giving the impression that the centre was hollow.

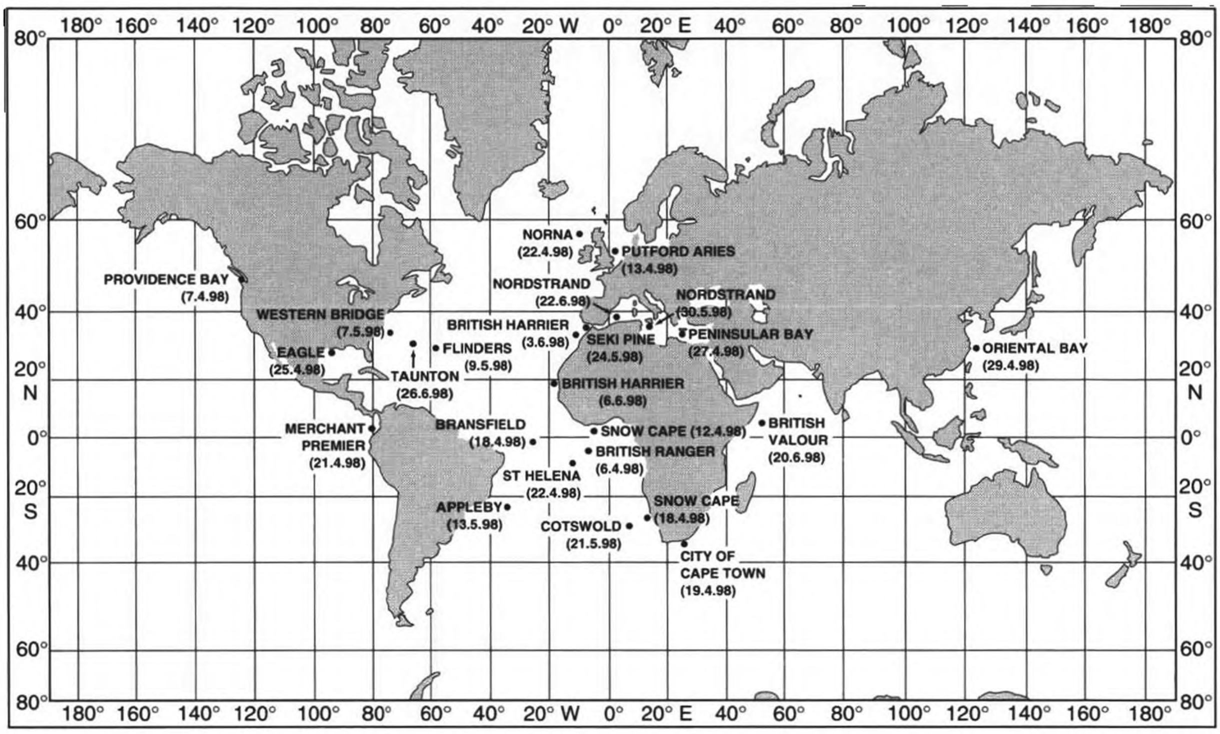
The vessel passed within 200 m of the area where the spout had disturbed the sea surface, but the disturbance ceased at the point below the cloud where the spout had appeared.

Position of ship: 02° 18.5′ N, 05° 27.6′ W.

Note. Mr Mike Rowe, of the Tornado and Storm Research Organisation, commented:

"This is a useful report. There is no doubt that not all waterspouts form below cumulonimbus; some form below cumulus congestus, and it is helpful to know that this is an example. The direction of rotation, anticlockwise, is correct for the Northern Hemisphere.

"As the sea was whipped up below the spout, it is clear that the vortex did reach down to the sea surface even if the lower part of it was not visible. This is because the humidity in the lower section was too low to allow condensation to take place."



Position of ships whose reports appear in *The Marine Observers' Log*.

CORPOSANTS

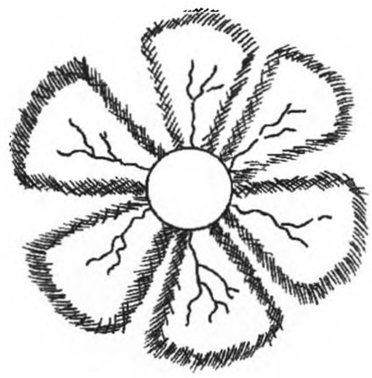
North Atlantic Ocean

m.v. *Flinders*. Captain R. Smedley. Philadelphia to Pennington. Observers: Miss R. Gunn, 3rd Officer and P. Conlon, Lookout.

9 May 1998. At about 0200 UTC the vessel had just passed through a weather front, experiencing pre-frontal gusts of wind up to 65 knots 'on the nose'. The watch had so far consisted of reduced visibility from heavy rain squalls with frequent and violent sheet lightning in the front itself. As the vessel passed through the front, green St Elmo's fire was observed to be glowing faintly from the ship's aerials.

At about 2310 it was also noted that a lever extending about 18 cm over the ship's starboard bridge wing to position a deck light, was also radiating light. This light was a pale violet glow extending in 'spokes' of 10 cm in length from the round end of the lever which was about 3 cm in diameter, see sketch.

There were six individual and uniform spokes shot through with brighter purple and white bolts resembling lightning. Over the noise of the wind a sharp crackling and hissing sound could be heard coming from the phenomenon.



The seaman was called to have a look at the light, he attempted to touch it but the light receded as his finger approached within 3 cm of it. The effect died away at about 2340 as soon as rain started to fall.

At the beginning of the watch it was also noted that the whole south-western portion of the sky was covered with mamma clouds extending below a towering cumulonimbus formation. Weather conditions at the time were: air temperature 21.4°, wet bulb 20.4°, pressure 1004.2 mb, wind SSE'ly, force 8.

Position of ship: 30° 37.6′ N, 58° 06.6′ W.

TIDE RIPS

North Atlantic Ocean

m.v. *Seki Pine.* Captain G.M. Railson. Newcastle-upon-Tyne to Barcelona. Observers: C. Eager, 2nd Officer and M. Simpson, Chief Engineer.

24 May 1998. At about 1400 UTC whilst approaching the Strait of Gibraltar from the west, a large area of breaking water in the shape of an arc roughly 5 n mile long was noticed approximately five or six miles ahead, lying across the vessel's intended track. It proved to be annular with an ovoid of glassy-smooth but turbulent water in the centre. Tide rips and current eddies were clearly visible. The western half of the annulus was part breaking water with waves of 1.5–2.0 m high, and about 30–40 per cent white water; the eastern half was much rougher with very confused waves of 2.5–3.0 m high, and approximately 80 per cent white water. The centre area, about 5–6 cables wide (from east to west) and 2 n mile long (from north to south) was also remarkable for having a large school of about 30 pilot whales which were mostly basking on the surface, accompanied by about 50 dolphins which mostly played in the eddies but occasionally leapt from the water, several of them also appearing to be playing 'tag' around the whales.

The west rim of the annulus was about 3–4 n mile long and 3 cables wide, while the eastern rim was about 5 n mile long and 6 cables wide. As the vessel crossed the western edge there was no reaction from the vessel, but it started to set to the south upon entering the centre area. At 1520 the Second Officer noted radar bearings, distances and GPS coordinates for a position fix and then went straight to the steering position to make the course alteration nominally due south of Tarifa. Just as he reached the helm, the bow moved into the broken water of the eastern half of the annulus, and the vessel suddenly sheered off 30° to port; the head went from 088° to approximately 055° in less than 5 seconds. A slight northward set was also noted while in the broken water.

Upon reflection it could not be determined if the bow went to port, the stern to starboard, or if there was a combination of the two (most probable). The interface between the centre area and the eastern half of the annulus was observed as the vessel passed through, and there was a very well-defined boundary of no more than 2 m wide. In contrast, the interface at the western side had been quite diffuse with a width of about 100 m and a relatively gradual change. Once through the eastern interface, the vessel was brought back to the proper heading and settled down quickly.

The effects of the vessel's movements were felt by the Master and several crew members below decks at the time, and the current shear was the strongest experienced by the Second Officer in over 30 years at sea.

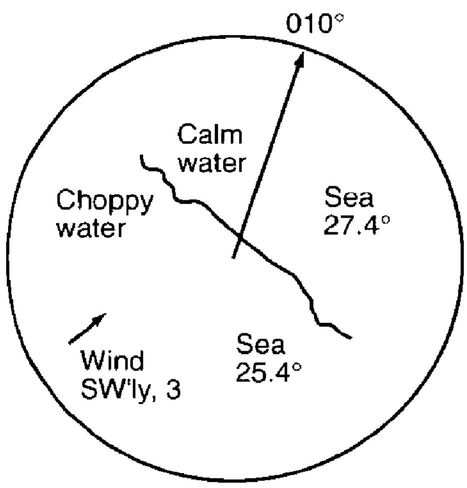
Position of ship at 1520 UTC: 35° 54.7′ N, 05° 37.2′ W.

DEMARCATION

Indian Ocean

m.v. *British Valour.* Captain J.N. Gregson. Durban to Fujairah. Observer: C. Vernon, 2nd Officer.

20 June 1998. At 0430 UTC whilst on a course of 010°, a definite line was noticed ahead on the 3-cm radar display; it stretched right across the vessel's track, as shown in the sketch.



3-cm display

On closer approach it was noted visually that there was a definite demarcation line verifying the radar display. There was a discernible ripple along the line; on the far side of it the water was flat calm as if there was oil on the surface, on the near side the water was choppy. Before crossing the line, the sea-water temperature was 25.4°, and this increased to 27.4° on the other side of it; the vessel also experienced a slight set to the west on crossing the line. At the time of the observation the wind was SW'ly, force 3.

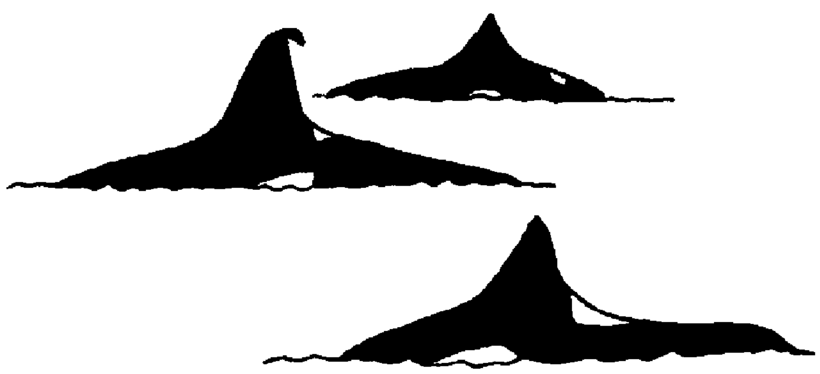
Position of ship: 02° 50.8′ N, 51° 18.3′ E.

CETACEA

North Pacific Ocean

m.v. *Providence Bay*. Captain K.W. Smith. In Vancouver pilotage area. Observers: the Master, J.C. Geddes, 3rd Officer and L. Cosgrove, Cadet.

7 April 1998. At 1727 UTC the vessel passed within 30 m of three black-and-white whales which were easily identified as Killer Whales by their large triangular fins and white flashes on the upper body. The largest whale in the group was 8–9 m long and had a slight kink in the tip of its dorsal fin. The second whale was slightly smaller, approximately 6–7 m long while the third one was a calf only 2–3 m long. The sketch shows their appearance.



Also seen throughout the pilotage were several pods of black-and-white porpoises 1–2 m long in pods of two to five individuals. These were identified as Common Porpoise by the Vancouver Pilot.

Position of ship: approximately 43° 00′ N, 123° 00′ W.

Equatorial Atlantic

R.R.S. *Bransfield*. Captain S.J. Lawrence. Falkland Islands to UK. Observers: R. Jackson, Chief Officer and members of ship's company.

18 April 1998. At 1200 UTC on the day that the vessel was to cross the Equator, two whales were observed moving slowly across the starboard bow at a distance of 150 m. Although moving on a diverging course the whales were watched for at least one minute, and good views were obtained.

The larger of the two was 6–7 m long with a defined beak but no protruding teeth were seen; its upperside colour was a light beige with noticeable scars on its back, no underside colour was seen, however. The dorsal fin was very distinct, noticeably 'hooked'. A calf perhaps only 2 m long accompanied the adult, and was significantly more grey than beige in colour. No blows were observed from either whale.

Whales of the World by Lyall Watson was immediately consulted and, by deduction, it was reasoned that the whales may have been Cuvier's [also known as Goosebeak] Whale. At the time of the sighting the sea temperature was 29.0°, the sky was overcast and the charted water depth was in excess of 3,000 m.

Position of ship: 00° 40′ S, 26° 13′ W.

North Atlantic Ocean

f.p.v. *Norna*. Captain N. McInnes. On patrol duties. Observer: R. Brownlee, 2nd Officer and members of ship's company.

22 April 1998. At 1222 UTC whilst on patrol 60 n mile west of Barra two Sperm Whales were sighted very close on the port bow, moving slowly across the ship's heading. They swam side by side, close enough to be touching, and appeared to be oblivious to the presence of the ship. In fact the ship had to be quickly brought round to port in order to avoid hitting them.

As the ship closed the whales they were only about 12 m away on the starboard bow at which point they made a very steep dive without lifting their flukes clear of the water. Before diving, the whales were observed blowing; the blow was quite distinctive, being single and emitted from very close to the front of the very square head while also angled forward at an angle of about 30° from the horizontal. The dorsal fin, which was very much like a knuckle, was sited approximately two-thirds of the way down the back, the length of the whales being about 12 m. The whales were heading in a south-south-easterly direction. Large shoals of Blue Whiting were known to be in the area at the time.

At the time of the sighting there was light cloud and sunshine, and the ship's course was 045° at 12 knots.

Position of ship: 57° 00.8′ N, 09° 29′ W.

Editor's note. We have also received reports of Sperm Whales from the following observers: C. Vernon, Second Officer and Z. Prezylgbski, Third Officer on board the *British Valour* who saw one apparently 'taking the sun' on 24 May in position 03° 10′ S, 47° 38′ E; Captain J.M. Milloy and R. Doshi, Third Officer on board the *Zetland* who saw two large whales on 30 May in the Indian Ocean; S. Fernandez, Third Officer and C. Canezo, GP 1 on board the *Duhallow* who watched a pod of five whales on 19 June in position 65° 40.4′ N, 02° 27′ W; Miss S. Cram, Third Officer and J.M. Winder, SM 1 on board the *Peninsular Bay* who watched three whales on 24 June in the western Mediterranean Sea.

Eastern North Atlantic

m.v. *British Harrier*. Captain C. Shoolbraid. Lavera to Cape Lopez. Observer: T. Ruttledge, 2nd Officer.

3 June and 6 June 1998. A lone pilot whale was sighted at about 1200 UTC; it was approaching the port side of the ship but then turned when between 10 m and 15 m away, swimming down the ship's side until its way was clear, then resuming its original course. The whale was about 4 m long and resembled a large dolphin; it had a snub nose and a very well-defined dorsal fin.

On the 6th at 0730 whales' blows were sighted approximately 2 n mile off the bow by S. Angove, Third Officer. As the vessel approached, the whales could be seen more easily; they were dark-grey in colour and more than 15 m in length. The relatively small dorsal fin, approximately 1–1.5 m tall, was situated about 3 m behind the blowhole. On average, each whale blew three or four times with an interval of 6–8 seconds before diving for a period. Seven individual whales were counted but several more additional blows were sighted in the distance.

At 0845, a further 10 of these whales were sighted, including a smaller young one about 6 m long. Both groups were moving in a northerly direction.

Position of ship at 1200 UTC on the 3rd: 34° 11.6′ N, 08° 23.2′ W.

Position of ship at 0730 UTC on the 6th: 19° 23.4′ N, 18° 06′ W.

TURTLES

Mediterranean Sea

m.v. *Nordstrand*. Captain J.W. Jackson. Newport to Gemlik. Observers: the Master, C.G. Walker, Chief Officer and members of ship's company.

30 May 1998. Whilst in the Malta Channel numerous turtles were observed in the calm sea conditions, their lengths estimated at being between 40 cm and 80 cm. The larger ones were seen to the west of the area of the sightings.

The first sighting, at 1200 UTC was in position 36° 35.6′ N, 15° 06.3′ E and the final sighting was made at 1730. It may be of interest to note that the vessel's speed against an adverse current between these times was 8.54 knots; after the final sighting the speed increased to 9.4 knots as the adverse current decreased.

It was thought possible that the turtles may have been using the current to assist them in their travels. In all, about 34 were seen, more in a single day than were sighted during the whole of 1997.

Position of ship at 1730 UTC: 36° 32.9′ N, 16° 07.2′ E.

22 June 1998. Whilst on passage between Istanbul and Warren Point, the Master and J. Deeney, Chief Officer sighted three turtles at 0800 UTC followed by two more at midday. They were all about 80 cm long and had a brownish top shell which became orange/brown at the upper edge, while the turtles' undersides were pale. The shells were clean, showing no trace of marine growth or seagulls' 'visiting cards', and their edges were ridged or scalloped. One question arose: why do turtles not suffer weed growth on their shells?

It was of interest to note that all the turtles attempted to dive by using their flippers to turn onto their right-hand sides so as to force their heads down at an angle. At the time of the sightings the weather was calm and there was a slight swell.

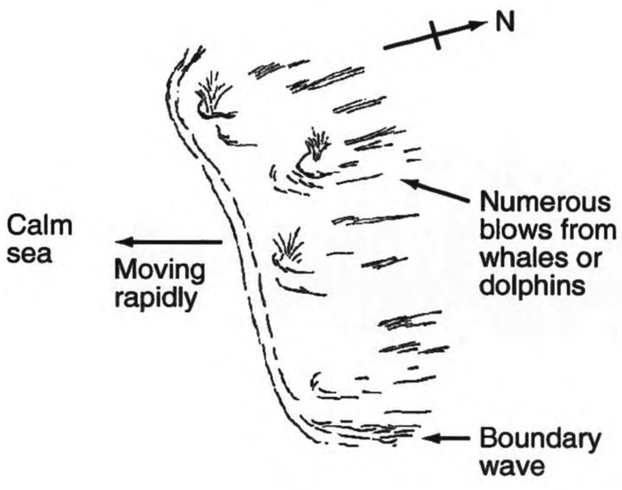
Position of ship at 0800 UTC: 37° 10′ N, 03° 09′ E.

MARINE LIFE

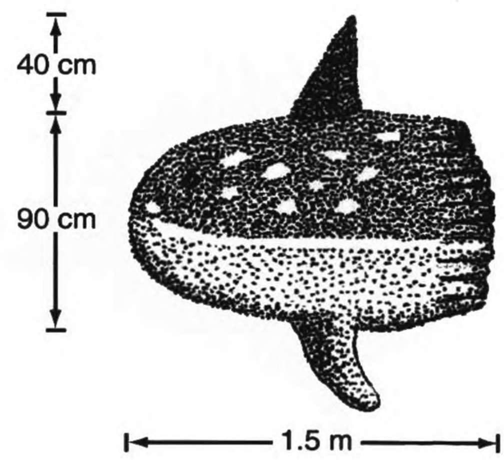
North Atlantic Ocean

m.v. *Western Bridge*. Captain I.C. Gravatt. Port Talbot to Hampton Roads. Observers: the Master, S. Ramesh, 2nd Officer, G.J. Terriza, Extra 2nd Officer and H.T.J.J. Wijesuriya, 3rd Officer.

7 May 1998. A disturbance in the sea at a distance of 1 n mile was first noticed on the radar by the Extra Second Officer at 1051 UTC. The disturbance was in the form of an oval some 30–40 m across at its widest part, with a clear leading edge, the whole moving rapidly from the north, see sketch (a). The distance of the disturbance from the ship decreased to 0.5 n mile (noted from radar display). Numerous 'blows' were seen in the water and it was assumed that there were either whales or dolphins fishing in a coordinated manner, the disturbance later being still visible on the radar at a distance of 3.5 n mile. At the time the sea was calm but slightly rippled, there was a long low swell from the south-east and the sky was partially covered, occasional fog patches were also present.



(a)



(b)

Later, at 1505 and in similar weather conditions, the Master and Third Officer spotted three sunfish on the starboard beam. As indicated in sketch (b) they were about 1.5 m long while the body depth was about 90 cm. Their upper bodies were greyish with whitish-grey speckles, while their lower bodies were lighter in colour, the two areas being separated by a pronounced white line. Another sunfish was spotted at 1818. This one passed by at about 20 m from the ship's side; it was black in colour with large white spots mainly around its lower jaw. It was turning and moving very slowly, remaining at the surface after the ship had passed. The sea-water temperature at both sunfish sightings was 17.0°.

Position of ship at 1051 UTC: 37° 03.6′ N, 72° 43.2′ W.

BIRDS AND MARINE LIFE

Gulf of Mexico

m.v. *Eagle*. Captain P.J. Chambers. At Galveston lightering position. Observers: the Master, R. Parker, 2nd Officer, C. Ryan, 3rd Officer, R. Leonard, 3rd Officer and ship's company.

25–30 April 1998. During this period the vessel played host to a wide range of avian life whilst at anchor awaiting the off-taking lighter. First to use the convenient floating island were two hawks which could not be identified. They were both about 33 cm long with a wing-span of 45–60 cm; they had brown upper plumage, fawn-coloured bellies with black speckles, and a black line running from the beak to just above the eye.

When the hawks left, the next visitors were egrets, up to 30 being on board during one particular night; also visiting were humming-birds with brilliant emerald plumage and ruby-red 'bibs', these birds were about 60 mm long with a wing-span of roughly 100 mm; there were also swallows or swifts.

Among the unidentified visitors were: medium-sized birds the size of a starling, having orange heads and black wing feathers edged with white; a small chaffinch-shaped bird which walked instead of hopping, and which had yellow-brown plumage with two fine black lines running the length of its head; three grey doves which were a dark-grey or brown with a slight purple sheen on their heads, also having a black half-collar at the front of their necks; a small sparrow-sized bird with black-and-white striped plumage; and finally, a wren-sized bird with a yellow chest, a thin pointed beak and yellow-brown feathers on its upper side.

3 May 1998. A solitary jellyfish was observed; it was unusual in shape in that the main 'sail' of the body was shaped like one half of a yin-yang symbol. The body was grey in colour towards the fatter end, turning gradually towards deep blue at the tail. A crescent of ribbed matter came out of one side, lying flat on the sea surface, it was grey with white ribs. As indicated in the Second Officer's sketches, there were tentacles which were purple or pink in colour, seeming to be surrounded by a small shoal of small fish; the jellyfish appeared to be chasing them.

The jellyfish was then observed to 'raise its sail' and head off along the length of the ship, with the main proportion of its tentacles lying to the lee side of its body, the sail acting as a keel or outrigger.

Position of ship: 28° 35.3′ N, 94° 39.7′ W.

BIRD

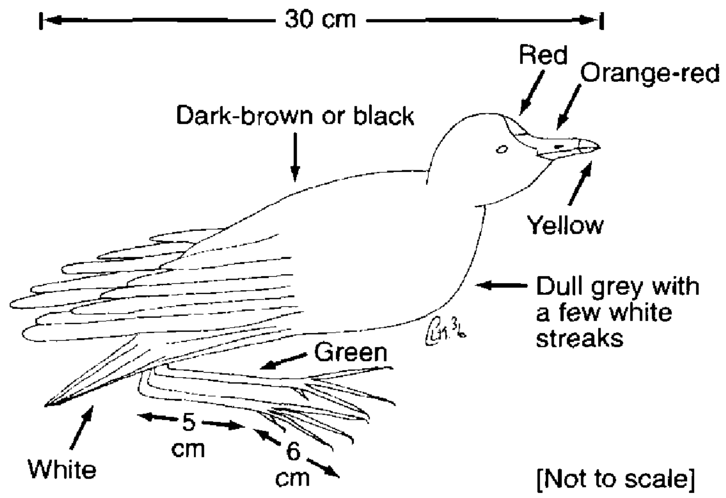
Mediterranean Sea

m.v. *Peninsular Bay*. Captain P.J.R. Manson. Suez Canal to Rotterdam. Observers: the Master, J. Poulter, Chief Officer, M. Stewart, 2nd Officer, Mrs C.L. Hickin, 3rd Officer and D. Atkinson, Cadet.

27 April 1998. On the morning 8–12 watch, the vessel having exited the Suez Canal the previous evening, a bird was spotted sheltering behind a vent at the back of the port bridge wing. It was decided that it would be best to leave the bird alone as it was probably just resting.

The following morning on the 4–8 watch, the Chief Officer placed some water near where it sat, to see if water would give it the energy to take off. Unfortunately, by the 8–12 watch the bird was lying on its back, feet in the air, being buffetted by the wind and presumed dead. It was decided to place the casualty in a box so that it could be sketched but as the Third Officer carefully picked it up, it turned its head and surprisingly was found to be still alive although not very active.

It was placed in the box and put in the Radio Room which was warm and quiet, the bird did not take any water, appearing to be too exhausted to do anything except sleep. After [the observers'] lunch it did take some water from a syringe, although only a little. Later in the day it was fed some raw fish, only taking a morsel, but it kept taking water and appeared to become a bit more lively. Sadly, this improvement was to be short-lived because during the evening watch it became very listless and seemed to start panting, finally drawing its last breath late in the evening.



The bird was about the size of a pigeon, about 30 cm from beak to tail and had a wing-span of 43 cm. It was a very dark-brown or black colour on its back whereas the underside of its body was a dull dark-grey with a few white streaks. A bit of white was also noted under its wings and tail feathers. The beak was quite long and orange-red in colour for the main part although the tip was yellow, and the colour turned a vivid red where the base of the beak extended towards the top of the head. The legs and feet were green, the toes accounting for 6 cm of the leg measurement shown in the Third Officer's sketch. There was sand on the bird's feet and so it was assumed that it had landed on board at some stage during the Suez Canal transit; as there were no injuries to it, exhaustion was thought the probable cause of death.

Position of ship at 0600 UTC on the 27th: 33° 06′ N, 26° 42′ E.

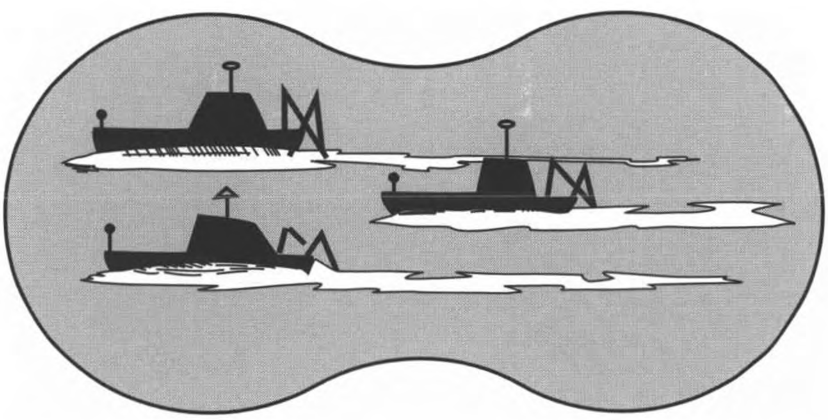
BIOLUMINESCENCE

East China Sea

m.v. *Oriental Bay*. Captain A.P. Talbot. Pusan to Kaohsiung. Observers: the Master, R.M. Barnsley, 3rd Officer, A. Milligan, Cadet and S.M. Cruickshank, SMS.

29 April 1998. At 1230 UTC a strange glow was noticed around the vessel as it moved through the water. Within minutes the glow became brighter until it was so intense it was as if search-lights had been placed on the vessel which, at the time, was passing through a fishing fleet of about 100 small boats. The watchkeeper pointed out that the boats looked rather strange, and on closer observation through binoculars, the remaining observers agreed. As the fishing vessels moved through the water they were leaving a very intense fluorescent-blue trail behind them, like a snail trail, and even though they were being lit up by their own deck lighting,

there was an intense blue glow all around each vessel which lit them up even more (helpful for collision avoidance measures). The Third Officer's sketch shows what was seen. The cadet had meanwhile retrieved a sample of sea water in a bucket; on arriving on the bridge, the sample did not look too special, just a few glowing particles in it. However, when the cadet disturbed the water with his hand, the water started to glow much more strongly and when withdrawing his hand, there were large numbers of glowing particles on it.



An hour later the vessel entered a thick fog bank, this only made the glow even more intense for not only the sea and the ship's sides glowed but the air seemed to be glowing too. This continued until 1530 when the vessel left the fog behind and unfortunately the bioluminescence too. The ship's course was 217° at 21.5 knots, and the sea-water temperature was 24.1°.

Position of ship: 27° 55.2′ N, 123° 06.7′ E.

Yellow Sea

m.v. *Newport Bay*. Captain R.B. Gurney. Hong Kong to Qingdao. Observers: the Master, H. Radha, 2nd Officer, C.W. Longmuir, 3rd Officer and E. Robson, SMS.

23 May 1998. For two hours prior to the observation, the glow of a type of bioluminescence often noted had been seen in the wake of the vessel. However, at about 1300 UTC the vessel approached what was thought to be a line of flashing fishing buoys which appeared right across its heading at a distance of about 3 n mile. On closer approach, the 'buoys' were found to be a large patch of bioluminescence the appearance of which was like hundreds of glittering lights, likened to a field of 'glittering diamonds'. The bioluminescence in the bow wave increased to vivid proportions and was of an intense light-blue or cyan colour as bright as the beam of a search-light.

The phenomenon lasted for roughly 15 minutes while the bow-wave bioluminescence ceased after 25 minutes. The ship's course was 002° at 21.5 knots.

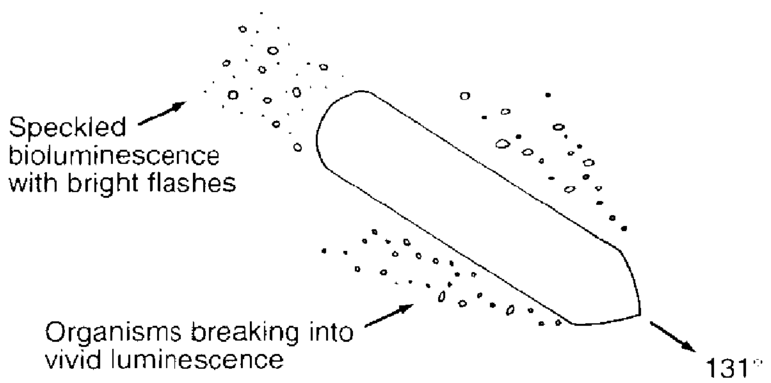
Position of ship: 32° 39.6′ N, 123° 59.5′ E.

Editor's note. Bright bioluminescence seems to be the order of the day according to UK VOF ships, for in addition to the two accounts above we have also received a brief report from the *Colombo Bay* in position 30° 07.7′ N, 123° 51.6′ E on 16 May 1998, detailing the appearance in the bow wave of bioluminescence which was a "bright electric-blue" colour according to A. MacKenzie, Fourth Officer.

South Atlantic Ocean

m.v. *Cotswold*. Captain J.H. Brierly. Norfolk, VA. to Richards Bay. Observers: R.T. Mattos, 2nd Officer and E.E. Mojica, AB.

21 May 1998. At 2345 UTC bioluminescence was observed in the water along the vessel's side and in the wake. Organisms seemed to breaking into vivid luminescence to each side of the vessel, while in the wake astern the water was speckled with bright flashes extending to a distance of 2–3 cables, see sketch. The light flashes each lasted for one or two seconds.



On collecting and stirring a sample of the water in a glass, small 'white' flake-like particles were observed although the flashes were missing.

At the time of the observation the wind was SE×E'ly, force 4 and the ship was on a course of 131° at 13.7 knots.

Position of ship: 28° 18′ S, 07° 14.3′ E.

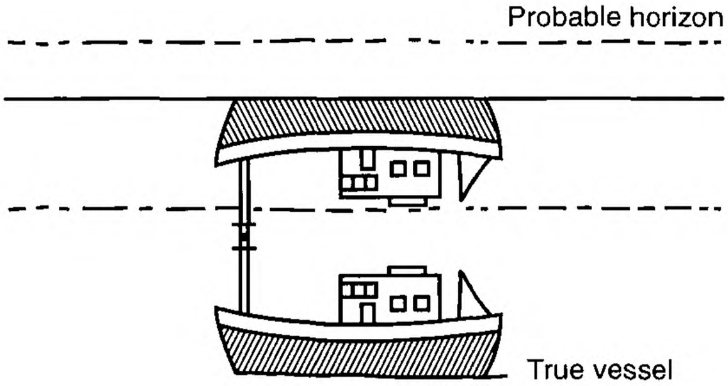
ABNORMAL REFRACTION

Indian Ocean

m.v. *Snow Cape*. Captain L.M. Colam. Luanda to Cape Town. Observers: the Master, V. Ramos, 2nd Officer and D.S.M. Griffiths, 3rd Officer.

17–18 April 1998. The evening watch on the 17th detected on radar the presence of what appeared to be low cloud at a range of about 15 n mile; the observation changed very little while the range did not change at all. During the late morning watch on the 18th, the detection moved closer to about 7 n mile and also appeared visually, resembling a sighting of land in the distance; the horizon was blurred but good visibility was evident as fishing vessels were being sighted.

At 1125 UTC the refraction (as it was understood to be) reached a visible maximum when small fishing vessels were viewed through binoculars and appeared as high as tower buildings. It seemed that the main area of refraction looked like either a very dense fog bank or an ice-floe (owing to its ragged edges), it also looked as if, in front of the 'fog bank', the sea water was at a much higher level. The refraction did reduce but remained all day and, at 1635, a small fishing vessel was observed with its exact 'reflection' inverted directly over the true vessel, as shown in the Third Officer's sketch.



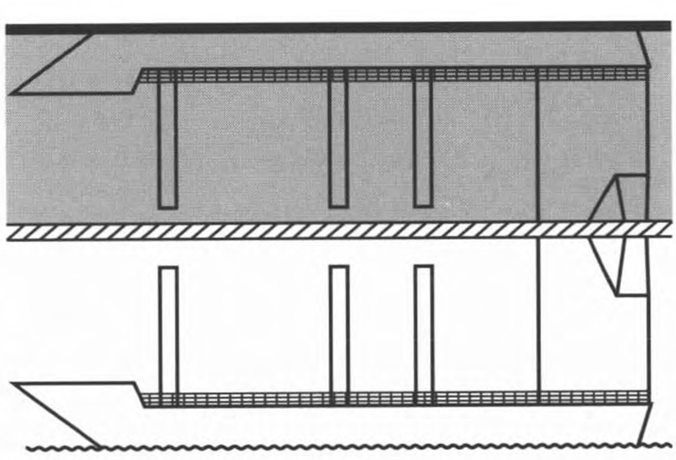
Weather conditions were: air temperature 20.0°, wet bulb 16.5°, sea 18.0°, pressure 1011.0 mb, wind SE×S'ly, force 3. The cloud cover was 3 oktas of altocumulus at more than one level (mainly above the area of refraction) and the visibility was in excess of 20 n mile.

Position of ship at 1635 UTC on the 18th: 24° 41.8′ S, 13° 50.9′ E.

Indian Ocean

m.v. *City of Cape Town*. Captain G.J.H. Peaston. Port Elizabeth to Durban. Observers: the Master, C. MacLeod, 1st Officer and members of ship's company.

19 April 1998. At approximately 1250 UTC while leaving Port Elizabeth to cross Algoa Bay, the observers watched the effects of abnormal refraction on the appearance of a number of vessels sighted at a range of about 15 n mile. As



indicated in the sketch, ships appeared to be vertically elongated and also showed an inverted mirror-image almost touching the object vessel in the accommodation area, the two being separated by the width of a narrow band of haze.

Other ships showed as many as three images, one above the other, and one ship was observed to be vertically stretched to the top of what seemed to be a shimmering heat-haze.

Weather conditions at the time were: air temperature 24.0°, wet bulb 21.0°, sea 21.0°, pressure 1013.3 mb, wind E'ly, force 3.

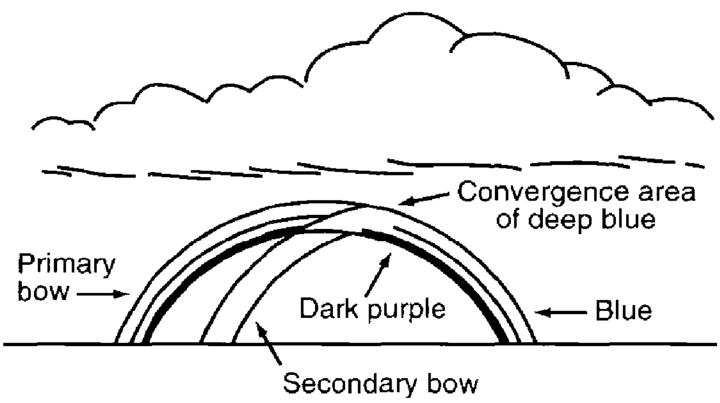
Position of ship 33° 55.4′ S, 25° 56.9′ E.

LUNAR RAINBOW

South Atlantic Ocean

m.v. *Appleby*. Captain A. Crofts. Long Beach to Port Talbot. Observers: A. Morton, 3rd Officer and L. Pathirage AB.

13 May 1998. At 2225 UTC when a light rain shower was falling, a rainbow was seen on the starboard side roughly 2–3 cables from the vessel. It was very clear for about six minutes and was accompanied by a secondary bow after about half that time. The secondary one did not make a complete bow but seemed joined to the primary bow at its highest point, in a convergence area of deep blue, as indicated in the diagram.



The colours were very clear, with blues and purples visible in both parts. Both bows began to fade at about the same time as the moon once again passed behind another cloud. The cloud types present at the time were cumulus and stratocumulus.

Position of ship: 22° 28.4′ S, 34° 13.2′ W.

METEORS

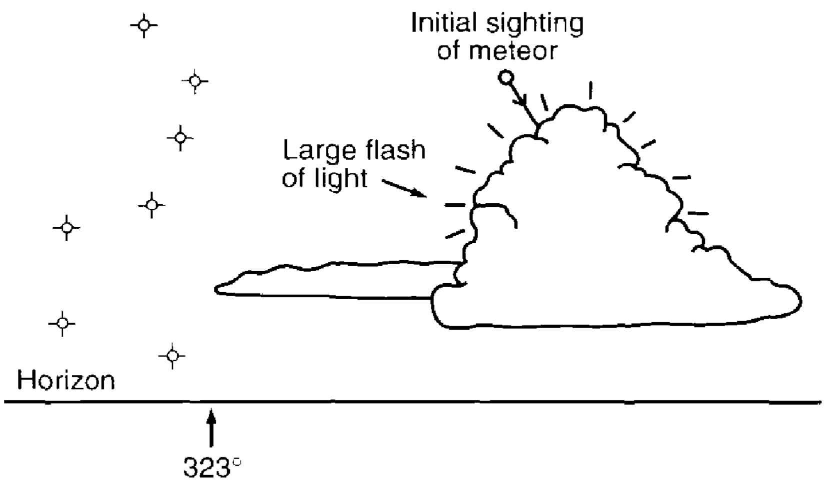
Equatorial Atlantic

s.s. *British Ranger*. Captain D. Lewis. Cape Town to Le Havre. Observers: S. Woodward, 3rd Officer, N. Hall, 3rd Officer and M. Hagan, Cadet.

6/7 April 1998. At 2305 UTC on the 6th Scott Woodward and Mark Hagan spotted a meteor travelling in a north-easterly direction parallel to the horizon and at an altitude of approximately 35°. It was very bright, whitish-yellow in colour and was visible for about six seconds. As shown in sketch (a) it appeared to consist of two parts and also had a long tail.

(a)

At 0110 on the 7th, Nicholas Hall, having been told of the earlier phenomenon, was surprised to observe a similar event. The ship's course was 323° and the meteor was on a bearing of 360°, travelling at a sharp angle (almost perpendicular)



(b)

to the horizon. It was also very bright, appearing brilliant-white in colour but was then hidden by cloud from behind which there followed a single spectacular flash, indicated in sketch (b), which could be compared to a piece of burning magnesium, presumably signifying the destruction of the meteor. The meteor was visible for only two or three seconds before passing behind the cloud.

Position of ship at 0110 UTC on the 7th: 03° 27′ S, 07° 20.3′ W.

South Atlantic Ocean

R.M.S. *St Helena*. Captain M.L.M. Smith. Ascension Island to St Helena. Observer: N. Mogg, 2nd Officer and members of ship's company.

22 April 1998. At 0105 UTC whilst the ship was on a course of 133° at 14.5 knots, a bright flash of white light was seen, and the Lookout reported an orange fireball in the sky astern. The sky was clear apart from 1 okta of small cumulus, the wind was SE'ly, force 4 and there was a moderate head sea.

Position of ship: 09° 13′ S, 12° 57′ W.

Eastern North Pacific

m.v. *Merchant Premier*. Captain C.W. Harvey. Balboa to Callao. Observer: A.J. Ghosh, 3rd Officer.

22 April 1998. At 0230 UTC a meteor was sighted falling at an angle of 45° apparently close to the vessel on the starboard beam. There was an accompanying green flash of light lasting for 3–5 seconds which seemed to illuminate the entire area. The ship's course was 190°.

Position of ship: 04° 30′ N, 80° 12′ W.

North Atlantic Ocean

m.v. *Taunton*. Captain J.A. Smeeton. Newport News to Richards Bay. Observers: D.S. Baweja, 2nd Officer, S. Singh, 3rd Officer and members of ship's company.

26 June 1998. At 0419 UTC some of the ship's staff were able to observe a visitor from outer space. During the course of handing over the watch at midnight, as if to contradict the 3rd Officer's statement that there was nothing around, the whole sky lit up as if to say, "There is something up there" as a fireball was observed approximately 2½ points on the starboard bow at an altitude of about 60°. Its colour changed from bright-yellow to bright-green just before the fireball disintegrated about 10° above the horizon. The entire event was over in three or four seconds.

At 0039 on the next night a sighting was made which appeared to show that the celestial sphere had been turned inside out. A meteor was observed roughly in the direction of east-by-south; it would have been just like any other meteor, burning up in about three seconds, except for the fact that it appeared to travel up into the sky rather than fall down. When first observed its elevation was about 10°; then it rose in an arc to disintegrate at an elevation of about 20° towards the east-north-east. Other meteors were later seen in the same area but all of them fell sharply before breaking up.

Position of ship at 0419 UTC on the 26th: 30° 21′ N, 65° 48′ W.

MISCELLANY ...

An additional mélange of maritime sightings

British Hawk. 8 May 1998. Captain G.M. Hallett, G. Reaich, Chief Officer and M. Strange, Cadet sighted about six dolphins around the bow and midships area whilst the vessel was passing over the Newfoundland Ridge. The dolphins were 1.5–2.4 m long, dark-grey in colour with lighter undersides, they had 'bottled' noses, and their dorsal fins were approximately 25–35 cm tall.

British Resource. 7 April 1998. At 1500 UTC a halo was observed around the moon. S. Magalotti, Third Officer and J. Deigh, AB noted that the sky was clearly darker within the halo and that the duration was 80 minutes.

Cap Blanco. 24 June 1998. Whilst on passage between Paita and Guayaquil, a large Humpback Whale about 12 m long was watched in the morning sunshine by A. Queally, Third Officer. The whale breached, leaping out of the water and tossing itself onto its back, displaying distinctive white flippers. The whale was about 2 cables away and continued to breach for 15 minutes as the vessel passed by; it did not appear to have any company.

Chrismir. 22 April 1998. At 0315 UTC bioluminescence was sighted in the wave crests created by the vessel and also along the full length of each side of it, and in the wake. The wind was N×W'ly, force 5 and the sea temperature was 21.3°. The ship's position was 15° 56.6′ N, 17° 52.7′ W.

Licorne Pacifique. 4 April 1998. A school of dolphins was sighted by Third Officer V.T. Flores at 1610 UTC. There were at least 30, estimated to be 1.2–1.8 m long with grey backs and white bellies. Most of them were leaping 1 m clear of the water, looking as though they were playing or catching small fish. They were accompanied by seven white seabirds which flew low over them. The ship's position was 01° 23.1′ S, 08° 44.2′ W.

Maersk Gannet. 28 June 1998. At 1820 UTC whilst on passage between Ascension Island and the Falkland Islands two whales were observed off the starboard bow by E. Guy, Chief Officer. Thought to be Humpback Whales, they were 9–12 m long, and one was slapping its tail on the sea surface, continuing to do so as the vessel passed. The ship's position was 23° 57.6′ S, 28° 07.2′ W.

Maersk Shetland. 11 June 1998. Whilst between Tarragona and Altamira, R.S. Payne, Second Officer and D. Munro, Cadet watched a pod of 20–25 dolphins 'lounging around' and occasionally bursting into activity. They, and another similar-sized group seen about 30 minutes later, were thought to have been Spotted Dolphins.

Orion Reefer. 8 May 1998. Two unidentified whales were seen while the vessel was between Lanzarotte and the Moroccan coastline. There was one adult of 12–15 m long which was accompanied by a young one of about 6 m long.

P&O Nedlloyd Liverpool. 6 April 1998. At 1000 UTC a very clear lunar halo was observed by N.J. Sharp, Third Officer and E. Lazaga, AB. Its radius was 22° and the moon's altitude was 66°; the halo was visible for more than three hours and was white in colour.

Petro Fife. 2 April 1998. Whilst on location at the Kittiwake oil field in the North Sea, D. Doyle, Second Officer watched a large seal at the base of the loading buoy; it was playing with a flat-fish it had caught (the depth of water at the buoy was 80 m). The seal was brown with black spots. On 19 June a Grey Heron landed on deck, later to depart again.

Putford Ajax. 21 June 1998. At 1800 UTC a Minke Whale between 6 m and 9 m long was seen near the vessel which was engaged in North Sea offshore installation support duties. A similar whale was seen earlier in the day.

Resolution Bay. 9 June 1998. The vessel was in the Bass Strait, off Wilson Promontory, when Captain A.M. Tweedie and Third Officer N.P. Mayers noticed patches of darker water ahead. As the vessel approached them, the water could be seen to be agitated or rippled and, when the ship passed through one of them, hundreds of small fish were seen at the surface. They were believed to be either sardines or pilchards, and 15 such patches were noted between 0830 UTC and 0845.

Seki Cedar. 16 May and 17 May 1998. At 0730 UTC on the 16th, whilst the vessel was off the Gulf of Lyons, Captain P.W. Jackson, G.K. Daw, CPO and G. Day, GP1 watched an adult female Fin Whale and her small calf. On the 17th at 1700 a 'fall' of birds occurred at the vessel when it was between Corsica and the

French mainland. Species and numbers noted were: Swallow (50+), House Martin (50+), Sand Martin (10+), Yellow Wagtail (2), Icterine Warbler (2), unidentified warbler (1). There was also one unidentified hawk.

Shenzhen Bay. 9 June 1998. A loud crackling noise was heard at 2030 UTC by D. Vickery, First Officer, S. Twitchin, Cadet and J. Norris, SM 1. Upon investigation, St Elmo's fire was seen emitting from the corner of the starboard bridge wing; the 'flame' was bright-blue and about 7 cm long. The First Officer raised his hands above his head causing fainter blue flames to form on his fingertips. He then went to the port wing to inform the Lookout of the phenomenon; however, when the two were in close proximity the latter received a painful static shock! The ship's position was 07° 05′ N, 108° 03′ E.

Singapore Bay. 8 April 1998. At 1515 UTC in position 34° 06′ N, 22° 57′ E a thin yellow band was noted just above the horizon from north-west to south-east. It was believed by G. Jackson, First Officer, to be fine sand particles in suspension and had dissipated about 45 minutes later having moved round towards the north.

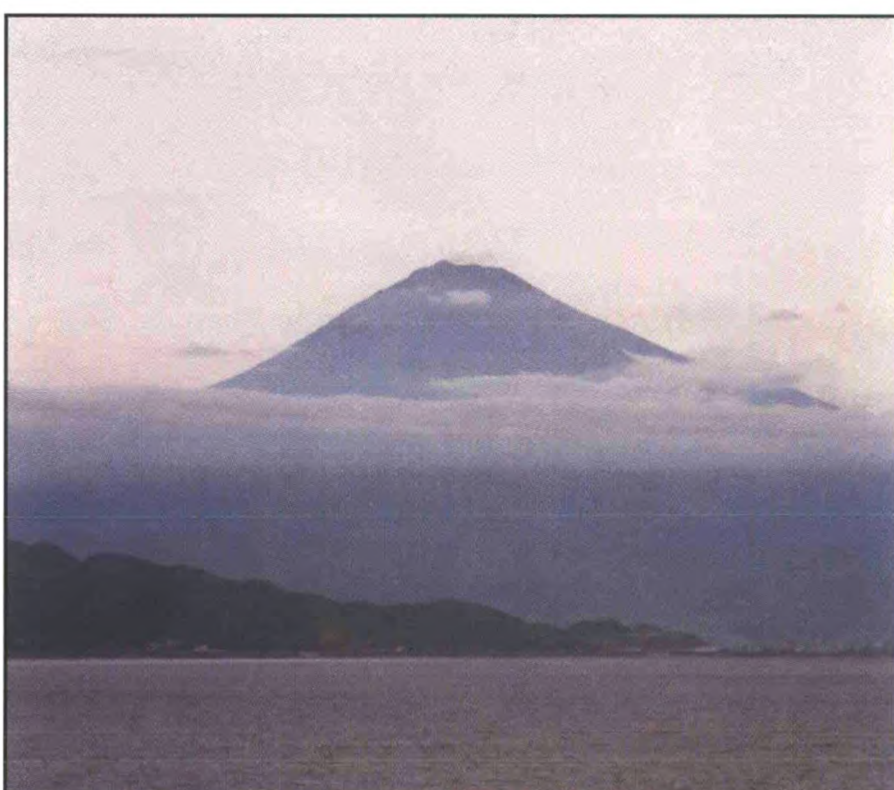
Towada. 28 June 1998. At 1630 UTC a dark-grey or black whale was seen on the starboard bow at the surface about 500 m from the ship. It was about 10 m long with a small dorsal fin and was thought likely to have been a Humpback Whale. Captain B.N. Jones and P. McBride, Electrician noted that it waited until the vessel had passed before diving. The ship was on passage from Yokohama to Panama, its position being 24° 45′ N, 114° 32′ W.

Waterford. 13 April 1998. At 1825 UTC in position 48° 30.3′ N, 61° 55.18′ W a thin layer of ice covering 1.5 n mile of the sea surface was sighted at 4 n mile bearing 30° on the starboard bow, the ship's course being 303°. At the time the air temperature was 0.3°, wet bulb –0.3° and the sea temperature was –0.5°.

SCENE AT SEA

Photographer unknown

Sea smoke at Ulsan anchorage on 7 January 1997, photographed from the *Maersk Sussex*.



Captain W. Yeo

A tranquil view of Mount Fuji at 0700 UTC on 10 June, 1998 taken from the *Baltic Breeze* upon departing from Shimizu.

SCENE AT SEA

Captain R.N. Jones

The waterspout shown above was one of several observed during one day by the Master and ship's company on board the *Towada*.

On 23 April 1998 at 1024 UTC the first one started to form, fading after 10 minutes; at 1048 it reformed to finally disappear at 1109. In the meantime, spout No. 2 had formed at 1052, lasting for five minutes, and then there was a pause until 1136 when spout No. 3 appeared, this one lasting 14 minutes. The 'morning session' of observations ended with spout No. 4 which formed at 1148 and dissipated at 1155. The 'afternoon session' comprised three spouts which all formed at around 1309, disappearing at 1317, 1320 and 1322.

The ship's position at 1024 was 32° 51′ N, 78° 17′ W.

Note. Mike Rowe, of the Tornado and Storm Research Organisation, said, "This is a particularly interesting report, as four waterspouts were observed forming over a period of time in the morning, and another series in the afternoon. Multiple sightings are not uncommon but the number observed here, and the long period of time, are relatively unusual. The detailed timings of each of the morning spouts are very useful."

The 1999 total solar eclipse †

Introduction

On the occasions when the moon is closer to Earth than its average of 237,000 miles, and its alignment with the sun and Earth is such that it eclipses the sun, the shadow of the new moon falls on the Earth's surface, and terrestrial observers within the path of this dark umbral shadow see a total eclipse. Observers outside this path see a partial eclipse from within the lighter penumbral shadow, those furthest from the path of totality seeing the least effects.

The annular eclipse is a slightly different animal, occurring in the same manner as does a total eclipse but because the moon lies at a greater distance than average from Earth, its apparently smaller size causes its umbral shadow to fall short of Earth's surface while the penumbral shadow does reach the surface. Therefore even at maximum eclipse, suitably located observers continue to see a ring of sunlight around the moon, and a partial eclipse is seen elsewhere, as described above.

11 August 1999

As we have often been reminded by such august bodies as the Royal Greenwich Observatory, not to mention the media over the past two or three years, on 11 August the alignment of the sun, moon and Earth will produce a total eclipse, and for the first time in many years parts of the UK are set to have a grandstand view as the path of totality (the track of the umbral shadow), just over 62 miles wide, passes over parts of Cornwall and south Devon having crossed the North Atlantic Ocean from a point about 248 miles south of Halifax (Nova Scotia).

The last time that totality was visible anywhere in the UK was in 1954 when, on 30 June, only the northernmost part of Shetland was in the path. One has to go back further to 29 June 1927 to find the occasion when totality was seen from a larger area. Then, parts of the Irish Sea and North Sea were favoured among marine locations.

Where to see the eclipse

For observers in UK waters the extent of totality increases with ever more southerly locations. Figure 1 shows what can be expected at a selection of sites around the coast and inland while Figure 2 shows an expanded view of the path of totality as it affects south-west England and the English Channel. For vessels engaged on North Atlantic routes Figure 3 shows the approximate path of totality between latitudes 42° N and 50° N, and from 10° W to 58° W (from data supplied by the Royal Greenwich Observatory).

Aside from the path of totality the eclipse will be partial across large areas of the North Atlantic region up to polar regions (excluding the Gulf of Mexico, the Caribbean Sea, and extreme western areas of the North Atlantic Ocean); all UK and European waters, the Gulf, the Arabian Sea, parts of the Indian Ocean and the Bay of Bengal. Neither the North Pacific nor South Pacific oceans will be affected by any form of the eclipse.

† [*Editor's note.* We recognise that there are cultures which do not allow the observation of an eclipse and that members of such will therefore have limited interest in this article.]

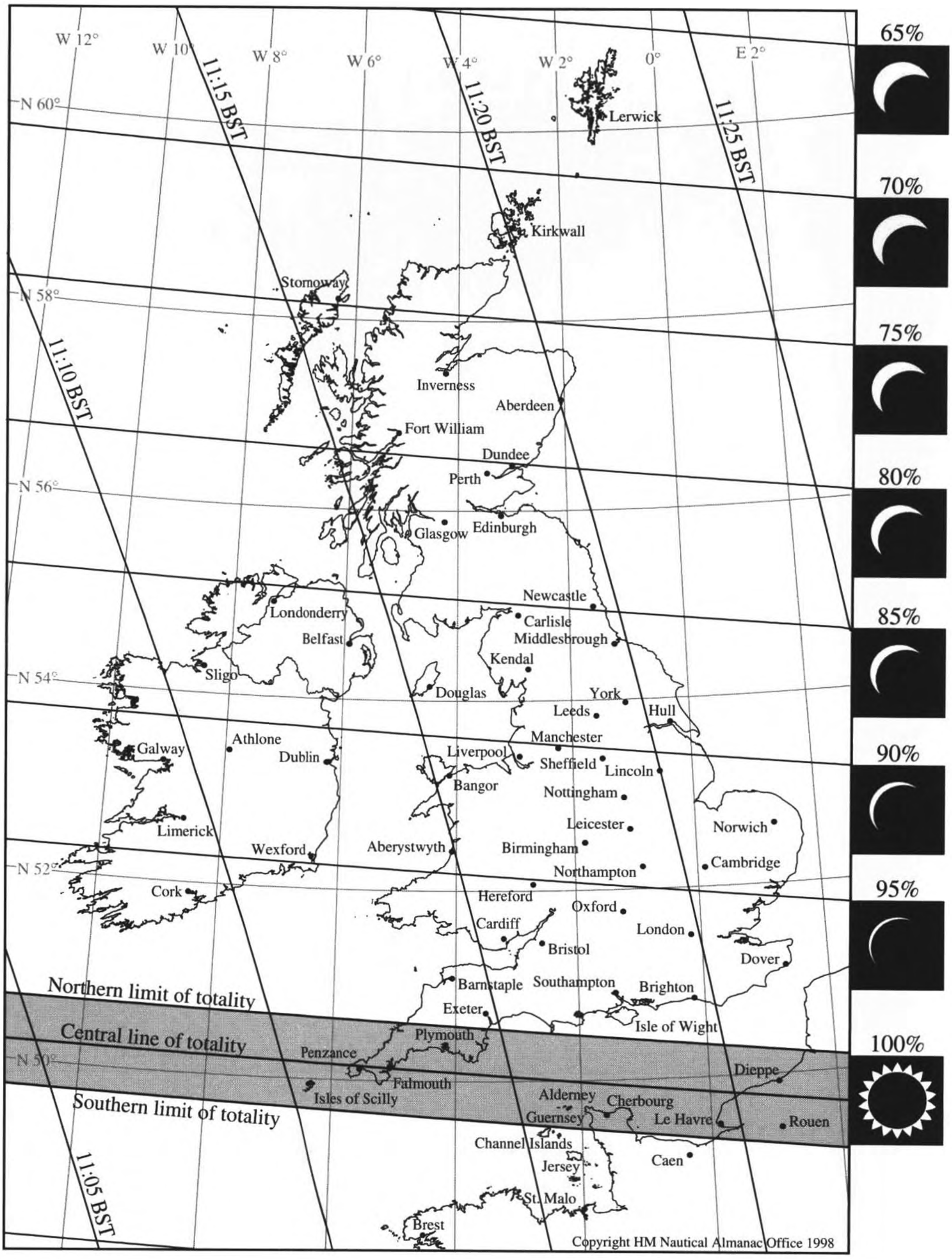


Figure 1. The circumstances of the eclipse for the UK mainland and the Irish Republic. The near vertical lines link sites having the same times of maximum eclipse whereas those running nearly horizontally link places experiencing the same degree of obscuration at maximum eclipse. Times of maximum eclipse are given in British Summer Time (BST) at five minute intervals. The appearance of the Sun at maximum eclipse is shown for the relevant obscuration on the right hand side of the diagram. The diagram for 100% obscuration simulates the appearance of the corona and streamers. The latitude and longitude lines and annotation are shown in grey. The shaded area is the path of totality. The northern and southern limits of the path of totality are indicated as well as the central line of the eclipse. [Copyright © HM Nautical Almanac Office]

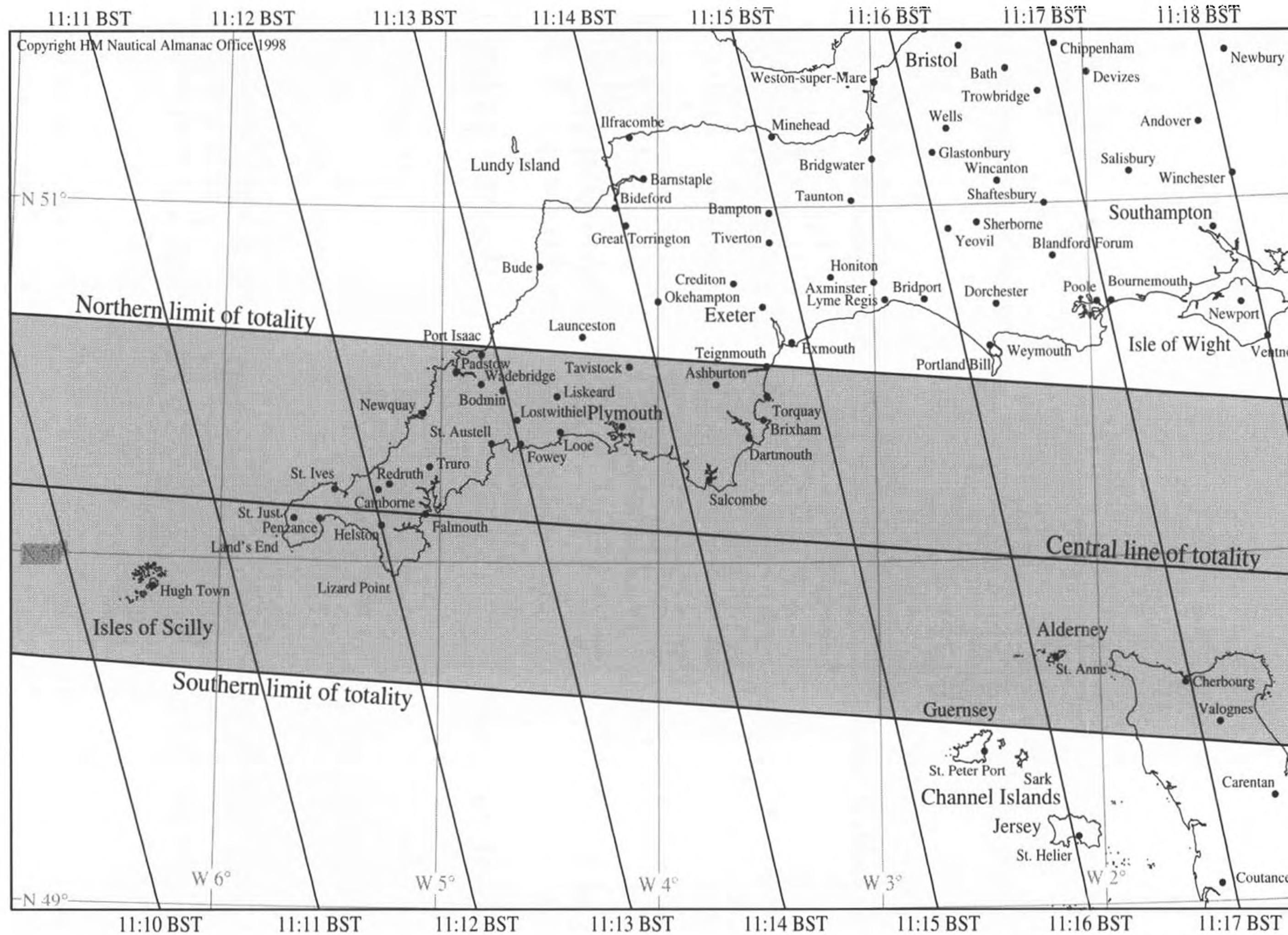


Figure 2. The path of totality over the Isles of Scilly, Cornwall, Devon, the Channel Islands and northern France. The lines crossing the diagram north to south link together locations sharing the same time of maximum eclipse. These lines are drawn at one minute intervals. The times of maximum eclipse, expressed in British Summer Time (BST), are given at the top and bottom of the diagram for each of these lines. The latitude and longitude lines and annotation are shown in grey. The shaded area is the path of totality. A total eclipse should be visible for all locations on the UK mainland south of a line between Port Isaac and Teignmouth, the Isles of Scilly, the Channel Island of Alderney and the northern tip of the Cherbourg peninsula will also experience totality. [Copyright © HM Nautical Almanac Office]

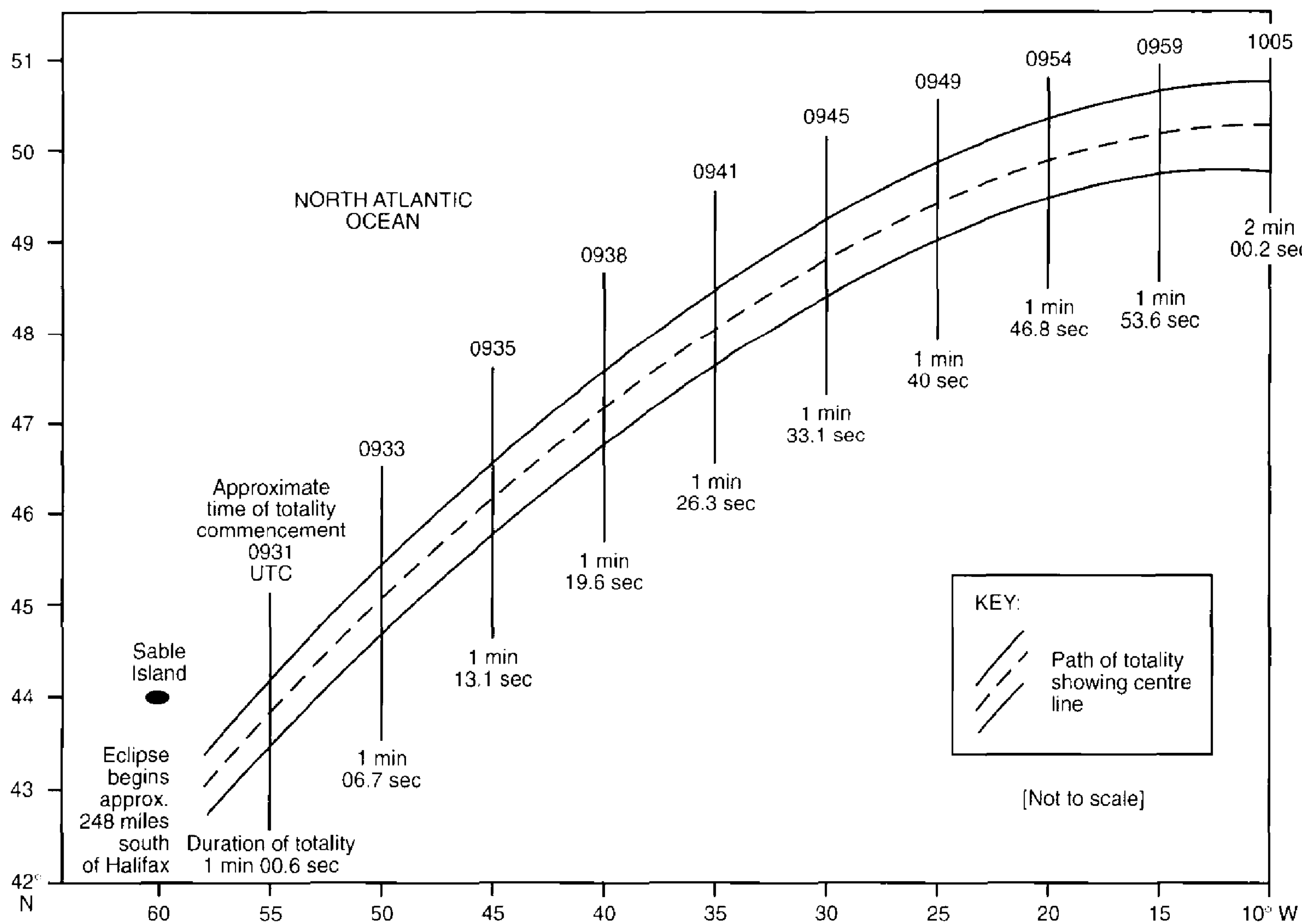


Figure 3. The path of totality as it affects the North Atlantic Ocean between 42° N and 51° N, and between 58° W and 10° W. [Extracted from data supplied by HM Nautical Almanac Office.] The hatched line is the central line of the eclipse: the northern and southern limits of the path of totality are also indicated. The vertical lines are drawn at intervals of 5° longitude and give the approximate time of the commencement of totality, and its duration.

What you may see

A total solar eclipse is without doubt one of nature's finest spectacles and there are notable features to look for as the event progresses. Even if the morning of 11 August proves to be overcast or wet (quite possible in an English summer), the low light levels around the time of the eclipse will be further decreased by the presence of cloud, and that in itself should prove a memorable experience. However, the following account of a total eclipse which was watched from the *Cunard Adventurer* on 30 June 1973, serves to illustrate what may be seen in clear conditions, (see 'Observing the Eclipse' for the recommended viewing methods).

The First Officer, J.S. Brooke, wrote:

"At 0600 the first contact was observed and the moon's shadow began to bite into the edge of the sun. The ship was stopped dead in the water at 11° 29′ N, 43° 04′ W and all the lifeboats on the port side were lowered to the rail so as not to interfere with the observations and photographs. All open decks were a mass of telescopes and cameras. Every passenger and nearly the entire ship's company were on deck by 0630, surely a sight never to be seen again. With the boats out and the decks packed we looked more as if our role was that of a troop transport rather than a cruise ship. The ship became deathly quiet as all air conditioning and fans stopped; in fact only one generator remained running for the bow thruster, gyro and essential services. Using only the bow thruster the sun was kept exactly on the port beam.

"As the time moved on towards 0700 the enthusiasm and excitement became contagious and was soon caught up by the ship's company. The sun had become a crescent getting smaller all the time as second contact approached and the last glimpse of the sun disappeared. The elevation at this time was about 19½°. An incredibly bright white light took its place instantaneously which in turn became a beautiful diamond ring and the sky began to darken rapidly. The diamond ring quickly shrank to become Baily's Beads, a phenomenon caused by the last couple of seconds of sunlight shining through the valleys between the moon's craters. These Baily's Beads were observed from 5 to 6 o'clock on the edge of the moon before they vanished to be instantly replaced by the corona extending in all directions from one to two sun's diameters. The corona threw a path of shimmering light briefly across the sea in the manner of a bright moon at night. Shadow bands, lasting a total of 42 seconds, ran from 12 to 6 o'clock, just fractionally ahead of second contact. They were faint, poorly defined, elongated and rippled. They were not sharp and colours were poor and indistinct.

"This was it. Totality. The time exactly 0700 SMT (1000 GMT). It lasted 4 minutes 1.3 seconds, the longest total solar eclipse for the next 177 years. The sky was not completely dark, perhaps slate-grey is a more apt description. The planets Mercury, Jupiter and Mars (which was particularly bright) were observed. Orion's Belt was also clearly visible as were most first magnitude stars. Many of the lesser stars were also sighted, especially above us; however, at lower altitudes no stars were visible at all. Faint rippling shadows were seen, by some, very briefly against the ship's white side at second contact. Totality, although over 4 minutes' duration, seemed to pass exceptionally quickly, giving way to third contact. This time the diamond ring was so bright on the limb that Baily's Beads were not observed. The planets and stars vanished and the sky rapidly lightened back to a normal clear sunny morning. Until then the silence had only been broken by the non-stop clicking of hundreds of camera shutters and cries of "Oh!" and "Ah!", but now there was a babble of excited voices all talking at once. On the bridge (and elsewhere I suspect) an excited interviewer gathered numerous people's impressions, feelings and opinions."

Observing the eclipse *

There are many ways to observe a total eclipse of the Sun. The primary consideration should always be safety. Jeopardizing your eyesight to watch the eclipse using inadequate precautions can never be justified by the rarity of such an event over the UK. **The only time it is safe to look directly at the Sun is during totality. At any other time, the ultraviolet and infrared variation will damage your eyesight even though you may not feel any discomfort. Do not stare at the Sun.** Be aware that the transition from totality to the partial eclipse phase occurs very rapidly. Observing the Sun with any form of optical aid is potentially **very** dangerous unless you know what you are doing. If you are not sure about what you are attempting to do, the best advice is not to do it at all!

There are several methods of observing the partial phases of the eclipse safely. The simplest method is pinhole projection which requires two pieces of stiff cardboard. A clean pinhole is punched in one piece of card. Standing with your back to the Sun, arrange the pieces of card so that sunlight passes through the hole in the first piece of card and is projected on to the second piece of card held about a metre from the first. An inverted image of the Sun will be seen approximately one centimetre in diameter. Make sure the pinhole is not too wide otherwise no image will be formed. The size of the image can be adjusted by changing the separation between the two pieces of card. Do **not** look through the pinhole at the Sun.

Projecting the Sun using binoculars can also give several people the opportunity to observe the eclipse simultaneously. Keeping the objective cover on one side of the binoculars, a sheet of cardboard is placed around the other objective lens of the binoculars. This acts as a shade for a second sheet of cardboard placed approximately 30 centimetres behind the eyepieces of the binoculars upon which the image of the Sun can be projected. Aligning the binoculars should be done by minimizing the shadow of the binoculars and **not** by looking through them. The image should be focused using the focusing knob and adjusting the distance between the binoculars and the projection screen. A similar method can be adopted for use with a small refracting telescope. Do **not** use the finder telescope to align the main telescope.

Solar viewers made of aluminised mylar may be used safely. However, they **must** be checked for flaws which might allow direct sunlight to reach your eyes. The best type of filter to use is one employing two layers of aluminised mylar film. This minimizes the possibility of an alignment of pinhole flaws in the aluminium coatings. Welder's goggles are also suitable for observing the eclipse as long as they have a rating of 14 or higher and have been checked for their infrared transmission characteristics (see Amendment 3 to BS679:1959; "Filters for use during welding and similar industrial operations"). More specialised camera and telescope filters are also available which are generally expensive and only available from specialist suppliers.

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* Extracts from *The RGO Guide to the 1999 Total Eclipse of the Sun* reproduced, with permission, from data supplied by HM Nautical Almanac Office.

Sunglasses of any type **must not** be used for looking at the Sun. They do not block those wavelengths of light likely to damage your eyes nor do they provide the necessary reduction in the intensity of incoming light. The damaging radiation from the Sun is also unaffected by polaroid sunglasses. Smoked glass can provide some protection if the glass is large enough and the density of the carbon deposit is sufficiently high. Unfortunately, making a uniformly dark filter is difficult and the degree of protection cannot be guaranteed. As a result, this method is **not** recommended. Fully-exposed and developed film should **not** be used. Colour film and chromogenic black and white films are totally unsuitable as harmful infrared radiation is not blocked by the coloured dyes used in these preparations. Under **no** circumstances should gelatin neutral density filters be used. Standard 35 millimetre negatives of any type are physically too small to be used as solar filters. However, certain types of fully exposed and developed black and white film using metallic silver can be used as solar filters. Two layers of film must be used for brief views of the Sun amounting to less than about 30 seconds duration. If you are unsure about the type of film you have, do **not** use it!

Recording the eclipse *

For people who wish to retain some record of the eclipse, videography and photography are possible. Like the eye, the detector in the average video camera will be destroyed by exposing it directly to full sunlight. In general, exposure times and aperture settings are dealt with automatically by the electronic metering system within the video camera. However, some form of aluminised mylar or glass solar filter capable of cutting the amount of light and heat down by a factor of approximately 100,000, corresponding to a neutral density of 5.0, is required during the partial phase of the eclipse to allow suitable exposure times and aperture stops to be set by the metering system of the camera. During totality, the filter should be removed. Caution **must** also be exercised when aligning the video camera with the Sun.

Many people will try to photograph the eclipse. A normal camera lens with a 50 millimetre focal length will produce an image of the Sun some 0.5 millimetres in diameter. Consequently, a telephoto lens is necessary to give an acceptable image size. A 500 millimetre lens would produce an image of nearly 5 millimetres across. To capture the Sun's corona on film, a lens of approximately 1000 millimetres represents the best compromise between the necessary field of view and an acceptable image size. Photography during partial phases will require some form of filtering. As in the case of videography, a filter which cuts the amount of light and heat down by a factor of 100,000 or so is recommended. Care **must** be exercised when setting up the camera because using the optics in the camera view finder, as you would do for normal photography, will damage your eyesight. A similar warning applies to the use of a single lens reflex (SLR) camera as you are using the camera lens to view the scene you are about to photograph. Exposure times will depend on the amount of filtering. Since there is plenty of light, a film speed of ASA 50 to 100 is suitable. Experimenting on an uneclipsed Sun is a good way to gauge exposure times and using a filter of neutral density 5.0 with ASA 100 film at f/8 would probably require an exposure of 1/125 of a second.

Photography during totality does not require a filter. Assuming you are using ASA 100 film at f/8, prominences could be photographed with an exposure of about 1/60 of a second. To capture the corona would require an exposure of between 1/8 second and 1/2 second. The key to successful photography is to bracket your exposure by several f-stops. No single exposure is the correct one. The Sun is not the only object you might photograph during the eclipse. Many photographers try to capture the effect the eclipse has on their surroundings.

Here are two pieces of advice from veteran eclipse watchers. If this is your first total eclipse, it is better to watch it rather than to try and photograph it. Professional photographs will be available after the eclipse of a quality exceeding anything most amateurs might achieve. Secondly, for those people who own a camera with a built-in automatic flash gun, don't use it. You will only cause consternation amongst your fellow eclipse watchers when their dark adaptation is ruined by the discharge of a flash gun triggered by the low light levels during totality.

It has been calculated that, on average, a total eclipse will be visible at a given location on the Earth every 400 years or so. It is therefore an opportunity not to be missed. Give yourself time to stand and take in the awesome spectacle. If this is your first total eclipse then watch the eclipse rather than succumb to the temptation of trying to take photographs of it. Wherever you go to watch the eclipse, enjoy this once in a lifetime event but above all else take care.

Conclusion

This total eclipse will present the first and last opportunity for most of us to witness such an event from the UK. With luck however, the infants born this year who survive to 23 September 2090 will be able to see the next one which will be total over a similar area of the country. It just remains for the elements to play their part and produce clear skies.

Acknowledgment

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The use of electronic media in public weather services *

By Carlos Fuller

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Introduction

What constitute the "electronic media"? As communication technology develops by leaps and bounds, the lines separating the various forms of communication are becoming blurred. Newspapers are no longer confined to a paper format; they can now be found on-line on the Internet. Soon, we will no longer need a computer to access the Internet; it will be available on our television sets through WEBTV.

In this article, the news media will be defined as newspapers, radio and television. The electronic media will be defined as facsimile, dedicated computer networks, electronic mail and the Internet's World Wide Web.

Facsimile

Electronic media have been used to disseminate weather information to the public since the 1980s, when the use of telephone facsimile became popular. It is a convenient method of transmitting public weather forecasts to the news media, especially radio stations and newspaper publishers. Television stations also use the information to produce text messages and crawlers across the screen. Besides using facsimile to transmit important warning messages to safeguard life and property, national Meteorological and Hydrological Services (NMSs) also use this medium to transmit general and specialized forecasts to promote an enhanced quality of life, improve human comfort, reduce losses arising from adverse weather and increase agricultural yield by transmitting relevant information. The special interest groups receiving these products include agriculture, aviation, forestry, marine interests and tourism.

It is important to note that facsimile provides point-to-point service, i.e. the message goes to only one customer. If that customer is the news media, however, then the message is eventually disseminated to a larger audience. Other customers can also assist in disseminating weather information. It is quite common for hotels to display weather forecasts, especially in tourist resorts. In St. Maartin in the Netherlands Antilles, for instance, the meteorologist has become a local celebrity; marina operators and fishing cooperatives display similar products; amateur radio network operators broadcast the information they receive through this medium.

Facsimile transmission offers NMSs the opportunity to charge for services. This has become an important consideration in an era of open economies and at a time when governments are downsizing and requiring many of their agencies to justify their existence and recover some of their operating costs. Even if this is not true in every country at present, NMSs would be well advised to be prepared for such an eventuality: poll their subscribers, look for new customers and examine what kind of rate structure their markets could support.

One factor not given much prominence is the use of this medium to promote the NMSs themselves.

When NMSs put their logos on their products, they are advertising themselves. As their customers and audience see these symbols every day and sometimes two

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or three times per day, they become ingrained in their memories. After a while, a logo can become as familiar to them as the Nike swoosh or McDonald's arches — NOAA's seagull may become just as familiar! With the advent of private weather providers, this can be used as another method for NMSs to consolidate their markets and possibly make inroads to others.

With early telephone facsimile machines, each customer's telephone number had to be dialled individually. As the technology improved, machines could be programmed to store dozens of numbers and dial them automatically, thus freeing personnel. Fax/modems are now quite popular; the forecaster can prepare his forecast on a PC using a prepared format where he fills in only the relevant information. At the touch of a button, the product can be sent directly from the computer to all customers whose fax numbers have been programmed into the computer.

Alternatively, there is commercial facsimile software with voice-mail capability, that can be used to store a variety of products. The user can call the telephone number and is asked by an artificial voice to select the desired product. At the touch of a button, the user obtains satisfaction. The advantage is that the user pays for the call, reducing the expense to the NMS, which has only to update the messages.

Computer networks

In the late 1980s, several NMSs, especially in Europe, began experimenting with the use of computers to transmit weather information to their customers. In Finland, customers can be connected to the Finnish Meteorological Institute's videotex system by: a specific videotex terminal; a television modified to a videotex terminal with a modem and keyboard; a television set with a built-in videotex system and program; or a personal computer with a modem and a videotex program. Videotex is menu-driven and thus easy to learn. Digital information can be transferred efficiently and a lot of information can therefore be transferred quickly. Videotex is not time-dependent and so is available at all times of the day or night. It is a two-way system, so users can communicate with each other and seek clarifications and updates. Because the information is transmitted by the national telecommunication carrier, the system can be economical. Cost recovery and revenue generation are intrinsic elements.

There are two major disadvantages, however. Firstly, there are relatively few users and the messages do not therefore reach a large audience. In addition, subscription costs can be relatively high, since operating costs must be shared among a limited number of customers. If the number of users increased, the cost could be shared by many and the price would fall.

Secondly, the production of the displays is time-consuming. Staff may have to be assigned to this endeavour full-time to keep it operational. With only a few customers, the venture may not be cost-effective.

Yet, Météo-France makes extensive use of their system called MINITEL. It is estimated that 60 million French citizens have access to it, i.e. 90 per cent of the population. The system is now available internationally through the Internet.

Electronic mail

Through the use of e-mail, NMSs can send their products to a list of clients who have requested them. They may be specialized products, so the information must be tailored and packaged to meet the needs of each special interest group. Because these clients are getting what they want, they would more readily accept the fact that they may have to pay for the service. In fact, there are those in the business community who are more confident in a product for which they have to pay.

This system of delivery is similar to that of the facsimile. There is a fixed audience, the information is tailored to meet a group's needs and it is possible to charge for the service. However, there are two significant advantages. The information is only sent once. The service provider then delivers it to all the subscribers whose e-mail addresses have been entered. As a result, the resources of the NMS are not tied up. Secondly, it is possible to send the information to an audience that has not subscribed to it. Therefore, warning messages can be sent to all subscribers of an e-mail provider. Samples of other products can also be sent. However, this practice — known as SPAMing — is discouraged by service providers, because it can clutter up the system and subscribers can find it irritating.

Internet

Weather sites are some of the most popular sites on the Internet. Weather information is provided by NMSs, universities, private weather companies and individuals. These individuals are people for whom the weather is a hobby. The information is provided in a wide array of formats. NMSs should be encouraged to visit as many of these sites as possible to see what is out there and to emulate the best features of each. There is much that can be learned about presentation techniques from these sites.

A large variety of information is available, including raw data, forecasts and warnings, specialized products, charts, satellite imagery, radar images and educational information.

Unlike e-mail, where the provider has to transmit the information to the user, the user logs onto the website to get the product. As a result, distribution is free and encourages the unrestricted flow of information. It is possible, however, to hold back special information and request either registration or payment before releasing it.

The availability and use of search engines help users find information. For example, a person wishing to find out about the weather in Brazil could type in the key words "Brazil and weather" into search engines such as Alta Vista or Yahoo. These services would then provide a list of websites that might have that information, together with a hyperlink to that site, which connects the user immediately. It would be wise for NMSs to investigate the criteria used by search engines to prioritize the sites; they could then programme their homepages to ensure that theirs are listed among the first and thus ensure a hit.

A recent survey conducted by WMO concluded that some 400 sites provided weather information. However, only 150 provided original data. The very nature of the Internet to promote the free and unrestricted flow of information encourages this phenomenon. The ability to hyperlink from one site to another facilitates the process.

The Internet is the latest communication means to evolve and NMSs must make full use of this facility. All members should be encouraged to establish a homepage with all types of information. With modest resources, a country can establish a highly effective homepage. In Colombia, for example, the NMS provides weather forecasts, warnings, river conditions and environmental information with an impressive homepage. The Webmaster has acknowledged, however, that it is a difficult system to maintain because it is not automated; the information must be updated manually. This raises an important point: if information is not updated regularly, you will lose your audience. Nothing is more frustrating than going to a site and seeing outdated information.

This is one of the drawbacks of university Web pages. They are maintained primarily by students on a voluntary basis. They are not in the business of manning a 24-hour service, seven days per week. It is thus possible that a severe weather warning might not be updated frequently at night or at weekends. This could be disastrous for people who rely on these sites for their advisories.

It was this possibility that prompted the Miami Hurricane Center to put all its tropical cyclone advisories on its homepage. The site is now extremely popular, registering more than 800 000 hits in one day during the 1996 hurricane season. They have since upgraded their system to accept one million hits per day. Work is now under way to put a mirror site on NOAA's main communication computer in Washington, DC.

Several Caribbean countries became concerned when they learned that the Hurricane Center had placed the advisories on the Internet. They were afraid that their traditional users might bypass the local Weather Service and seek information directly from the Hurricane Center. However, their fears were soon allayed when they were exposed to some of the possibilities of the Internet and how they could become players.

For example, the Hurricane Center has agreed to advise its audience to look at the advisories being issued by the local Weather Services whose countries have issued tropical cyclone watches and warnings. It has also offered to insert hyperlinks to other NMS homepages on its Web page.

On the other hand, specialists at the Hurricane Center confessed that they had not advertised Mexico's homepage because it was so important to them. They were afraid that if it became popular, it would get overloaded and they would have a difficult time logging on. Mexico's Meteorological Service had in fact placed radar images of hurricanes in the Pacific on their Web page and were updating them every 15 minutes. The Hurricane Center specialists found that these data were more accurate than the satellite pictures available to them; they were able to see details and wobbles in the hurricane tracks that were not evident on the satellite images. As a result, using these additional data, the Hurricane Center was able to issue more accurate and timely warnings. Mexico is now working on generating a loop of these radar images on its site so that the hurricanes can be seen in motion.

NMSs must use their positions as generators and owners of unique regional and local data and information to promote their services. When the Mexican NMS placed radar images on the Web, it was providing data that no one else on Earth could do. Other Webmasters could capture these images and share them with their own audiences through hyperlinking technology. If the original provider (in this case, Mexico) placed its logo or name on each image, then it would get the recognition it deserved. All NMSs with radars should endeavour to put their images on the Net.

The radar does not have to have a digital display. Digital cameras are now available for about US$ 500. These cameras can take digital images of the radar display and the files can be loaded onto the website. The US Weather Service is developing a pilot project to provide Region IV (North and Central America) countries with such cameras to investigate their feasibility.

Another unique product that most NMSs can provide on the Web is satellite imagery. Most NMSs now have automatic picture transmission (APT) receiving equipment with PC displays. The image captured is a unique shot centred on the APT antenna that no one else can duplicate. Like a radar image, this satellite image can also be displayed on the NMS's website. Again, it is important that the NMS's logo be placed on the image so that, if it is copied, viewers will know who provided the original picture. Naturally, besides images, NMSs should also place their forecasts, river stage and other unique products on the Web.

There are several options that NMSs can consider for hosting their websites. One is to put it on their own computers. Depending on the size and state of development of the Service, this can be an expensive and time-consuming operation. Problems of security can also arise. Managers should ensure that the computers used as the Internet servers are not the same ones that are used operationally to store or process their data. If they are part of a network, they should also ensure that adequate security is provided. The second option is to put the site on the service provider's computer. Many of these providers rent space on their computers at reasonable rates. The information is updated electronically by the NMS from its own computer. The users would not call the NMS's computer for information but the service provider instead. This frees the NMS's computer and reduces the manpower required to maintain the homepage, since it becomes the responsibility of the service provider.

Another attractive option is for the NMS to use the Web page of a sister agency. For example, if a country's economy is dependent on tourism, the tourism authority or ministry may have a Web page, which may be the most popular Web page in the country. It would therefore be wise for the NMS to create its presence on that homepage. The same would be true for any major sector of the economy, be it agriculture, fishing or mining.

Finally, NMSs can consider placing their Web pages on servers outside their own countries. This is an option now being considered in Region IV. The US Weather Service is investigating the possibility of hosting some of the Caribbean Web pages on one of its computers and providing Internet access through the new WAFS/STAR4 telecommunication circuit. Besides having the computer resources, its telecommunication infrastructure is greatly superior and this is a most important consideration.

The further one is away from the Internet backbone, the slower the telecommunication connection. NMSs should know the capacity of their telecommunication connections and the size of their audiences. An NMS that has limited communication and computer resources would soon lose its audience if communication was frustratingly slow. The national telecommunication carrier may suffer from a similar problem. In that case, it may be more prudent to place the Web page on a host abroad located nearer the backbone of the Internet.

Conclusion

The Internet is the latest medium of communication to evolve. One segment of the population connected to the Net enjoys and prefers the option of logging on to obtain its information. With the advent of WEBTV, other segments of the population will soon join that group. There are parts of the world not yet connected to the Internet. The telecommunication infrastructure in some regions is not as reliable as one would like it to be. Computers are not as common in developing countries as in developed countries. However, like facsimile and the PC only 20 years ago, the development and availability of computers and the Internet are growing and growing. It is imperative that NMSs utilize this medium to the maximum, if they are to live up to their responsibilities of safeguarding life and property and promoting the socio-economic development of their countries, which is the ultimate objective of the WMO Public Weather Services Programme.

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The southerly buster *

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There's a wind that blows out of the South in the drought,
And we pray for a touch of his breath
When sirocos come forth from the Nor'-West and North,
Or in dead calms of fever and death.
With eyes glad and dim we should sing him a hymn,
For depression and death are his foes;
Oh, it gives us new life for the bread-winning strife
When the glorious Old Southerly blows.

From *The Southerly Buster* by Henry Lawson
(in *Lawson [1918]* 1979).

The southerly buster is a particularly abrupt form of cold front which affects the New South Wales south coastal region, ranging from about Gabo Island to Port Macquarie. Basically, it is associated with the passage of a cold front across south-east Australia, and propagates up the coastline from south to north. In its stronger forms it is often characterised by a spectacular rolling cloud formation perpendicular to the coast, which appears from the south and coincides with a strong southerly wind change and an abrupt and substantial fall in temperature. It is an important feature of weather in the Sydney area, particularly for sailors. There may be about 30 southerly buster occurrences in a year, but the number of severe cases is about three or four.

An example of a southerly buster cloud formation is shown by the photograph in Figure 1, and examples of the recorded wind change and temperature change are shown in Figures 2(a) and 2(b).

The first recorded encounter with a (probable) southerly buster is given in the accounts of the first voyage of Captain Cook. In the early days of Sydney, these

* Baines, P.G. and McInnes, K.L. 1997. In: *Windows on Meteorology: Australian Perspective*, ed. E.K. Webb, (CSIRO Publishing: Melbourne) pp. 246–252. Reprinted with permission from the authors, Editor and CSIRO Publishing.

Figure 1. Southerly buster clouds. 1984, at Myall Lake, close to the coast 200 km north-east of Sydney. [*Bureau of Meteorology*]

storms were called 'brickfielders', because of the cloud of reddish dust which they raised from the brickworks in the Brickfield Hill area, and the 'brickfielder' is mentioned in the 'Weather Book' of Admiral Fitzroy (Hunt 1894).

Southerly busters in the Sydney area are most likely to occur in late evening, having progressed up the south coast during the heat of the day, at typical speeds of about 12 m/s. They are also much more common and stronger in summer, when the daytime heating is greatest. Southerly busters are mesoscale events, which means that it is not easy to obtain a good description of them — they are too small to be described satisfactorily by the standard Bureau of Meteorology synoptic network, and too large to be captured by a modestly funded small-scale experiment.

Studies of the dynamics of the southerly buster effectively began with a paper (Baines 1980) which put forward a relatively simple dynamical model that explained all the major features. This work was followed by some observational studies employing extra pilot balloon stations and the instrumented CSIRO F27 aircraft (Colquhoun *et al.* 1985; Coulman *et al.* 1985). These studies gave the first descriptions of the phenomenon which did not rely on the relatively sparse standard synoptic network, and gave some details of the flow near the frontal line. More recently, numerical modelling studies have been carried out by Howells and Kuo (1988), McInnes and McBride (1992), McBride and McInnes (1993) and McInnes (1993). The various features of the southerly buster which emerge from these studies are outlined below.

Each southerly buster has its own individual character, but the archetype or 'true form' may be regarded as part of a cold front which has interacted with the south-east part of the Australian continent. The interaction consists mostly of blocking by the Great Dividing Range of the cold low-level air which follows the front. Thus, as this air flowing from a roughly southerly direction approaches the south-east side of the mountain range, it is deflected to the right. This results in a characteristic S-shaped deformation of the front, as seen in an example of pressure patterns reproduced in Figure 3, from Baines (1990).

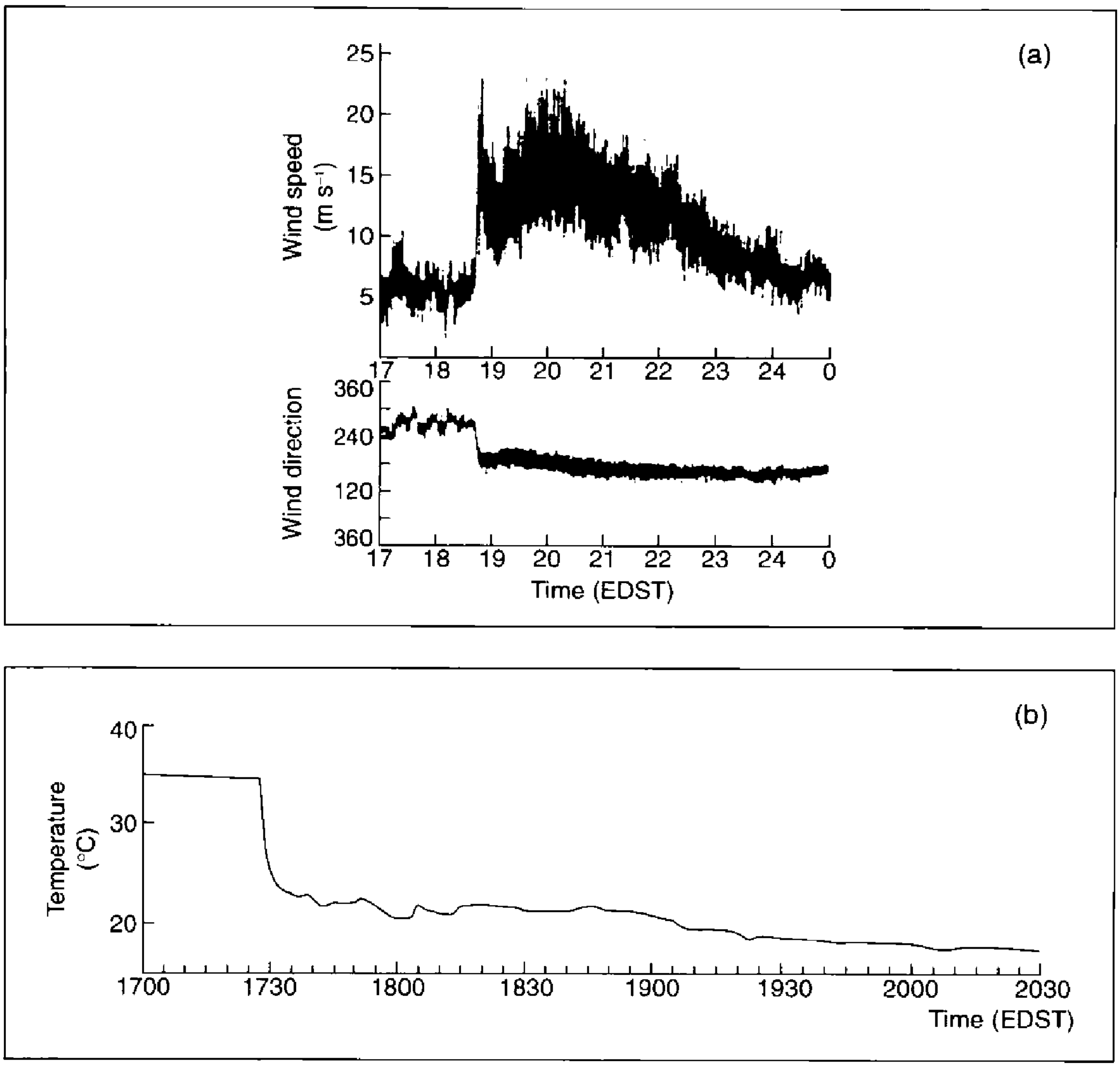


Figure 2. Recorded traces registering the passage of southerly busters (EDST is Eastern Daylight Saving Time, one hour ahead of Eastern Standard Time): (a) wind speed and direction recorded at Sydney (Kingsford Smith) Airport on 11 December 1972; and (b) temperature recorded at Gore Hill, some 6 km north-north-east of Sydney, on 20 November 1973. [*From Colquhoun et al.* (1985).]

Initially the frontal line is roughly perpendicular to the mountain range, and this means that in the deflected air the wind blows approximately at right angles to the frontal line, rather than at a smaller angle as in a 'normal' front. Consequently the cold air is accelerated by the local pressure difference across the front, from the cold dense air (higher pressure) to the warm lighter air (lower pressure). This can produce gale-force winds from the south, blowing approximately parallel to the coast, within about 150 km of the mountains.

Figure 4, from Howells and Kuo (1988), shows surface temperature and wind fields for a numerical model simulation of a cold front crossing south-east Australia. The same type of frontal deformation is apparent as in the observations shown in Figure 3. The situation modelled in Figure 4(a) is at 10 p.m. Australian Eastern Standard Time on 30 November 1982. The effects of continental heating on the cold air over land (before sunset) are clearly seen in the increased temperatures behind the front. Figures 4(b) and 4(c) show the situation 12 hours and 21 hours later. The S-shaped deformation of the front due to the mountains is apparent, with the cold air flooding up the coast behind a large temperature gradient (Figure 4(c)), while further out to sea the front assumes a relatively

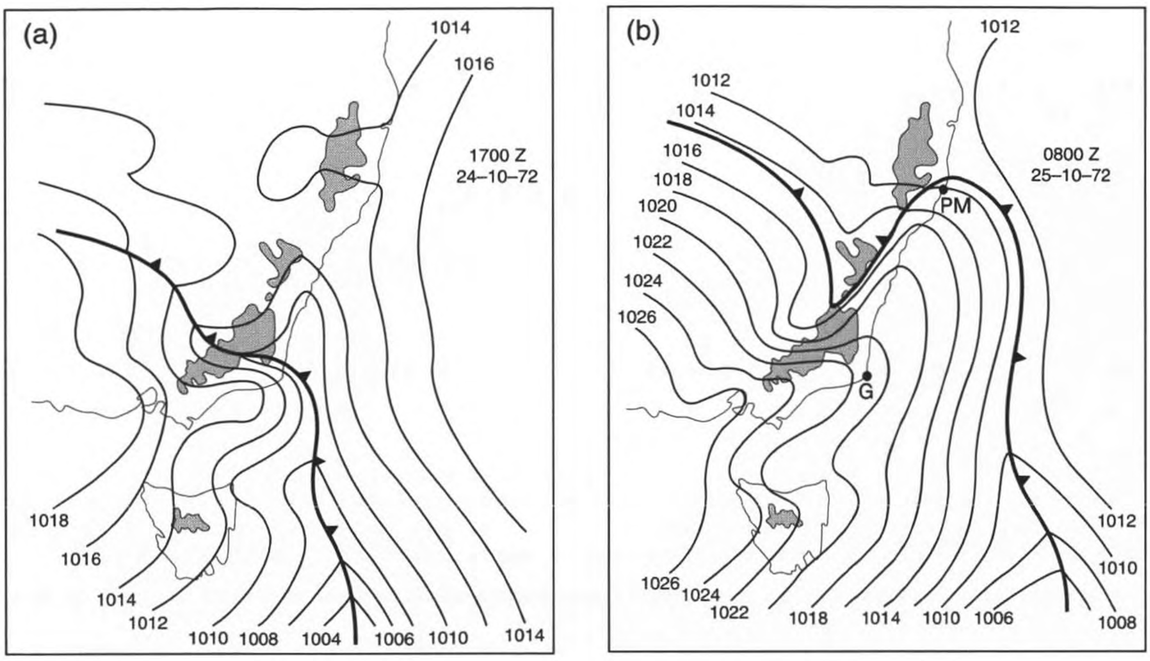


Figure 3. Analysed surface pressure observations of a typical southerly buster event [*From Baines* (1980).] (a) 0300 A.E.S.T. on 25 October 1972; and (b) 15 hours later.
The shaded area represents heights above 3,000 feet in the Great Dividing Range. In (b), G indicates Gabo Island and PM Port Macquarie.

undisturbed structure. Figure 4(d) shows a vertical south–north section through Nowra at the same time as Figure 4(c). Low-level northward motion of the cold air up to the height of the mountains at around 800 hPa can be seen, but there is also a return flow which covers the whole depth of the troposphere.

Numerical sensitivity experiments described by McInnes and McBride (1993) show that the major contribution to the S-shaped deformation is due to the presence of the mountains. There is also a contribution from differential friction — the land is rougher than the sea — which is manifested only through a greater retardation of the front on the inland side of the range; while surface heating has a minor effect on the deformation, but in the reverse sense — it increases the movement of the front overall, but by a greater amount further inland.

In McBride and McInnes (1993) the structure of the numerically simulated front is examined in detail, and the results in Bass Strait show a frontal structure and movement which is consistent with the simple dynamical picture advanced in Baines (1980). However, the situation was found to be more complex on the New South Wales coast, after the flow has 'turned the corner' near Gabo Island. This was pursued further by McInnes (1993), who conducted idealised topography experiments to examine separately the roles of the southern and eastern sections of the Great Dividing Range. The southern section of the coastline was found to play a major role in blocking and channelling the flow around to the east coast. Model simulations of several other fronts, of which only some produced southerly busters, were also conducted. The feature common to all southerly buster cases was flow along the south coast which had a marked onshore component. The mountain range along the south coast appears to play an important role in blocking the onshore flow and channelling it around to the east coast to provide an ongoing source of cold air to the leading edge of the front as it progresses northwards along the coast.

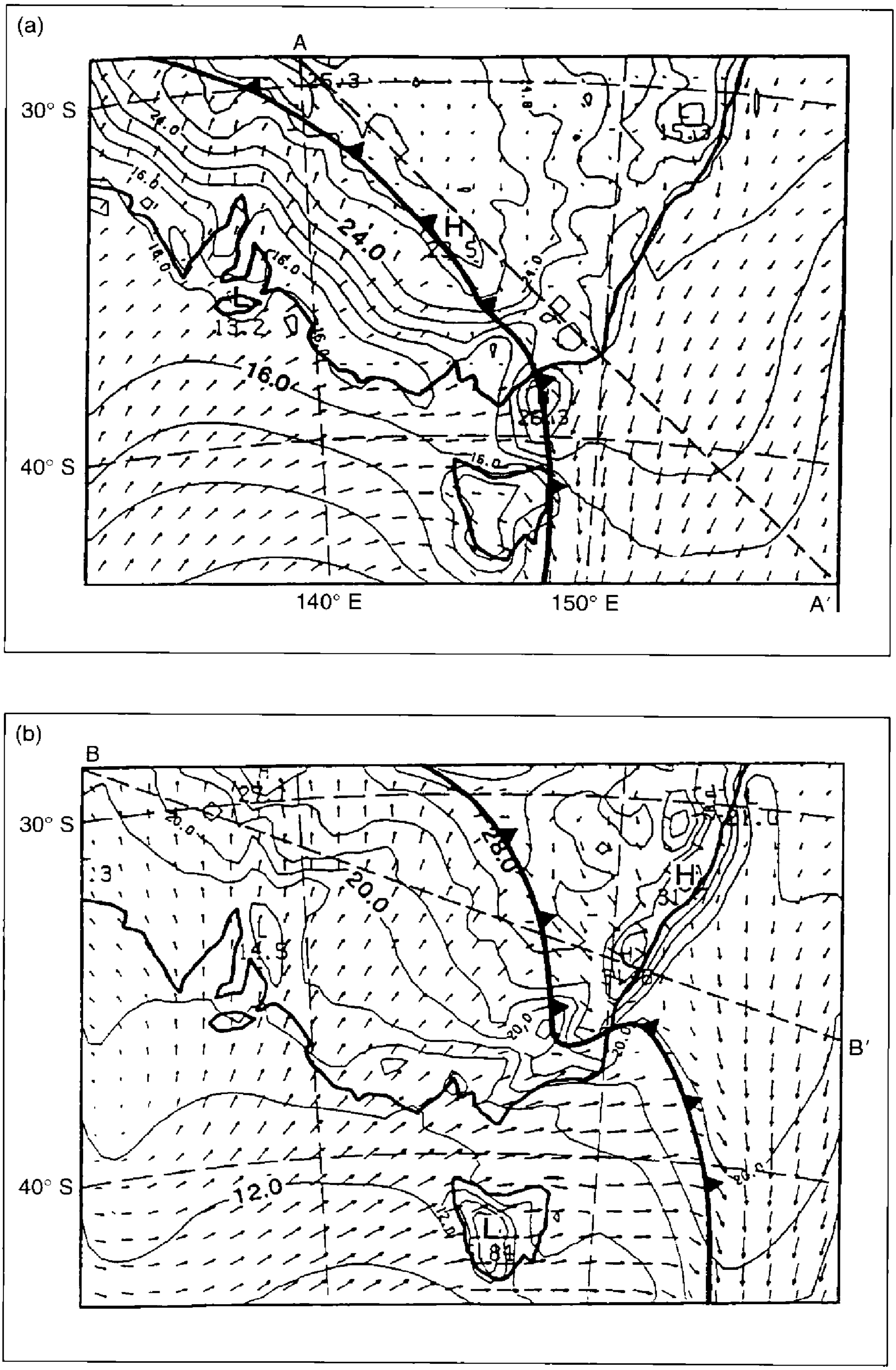
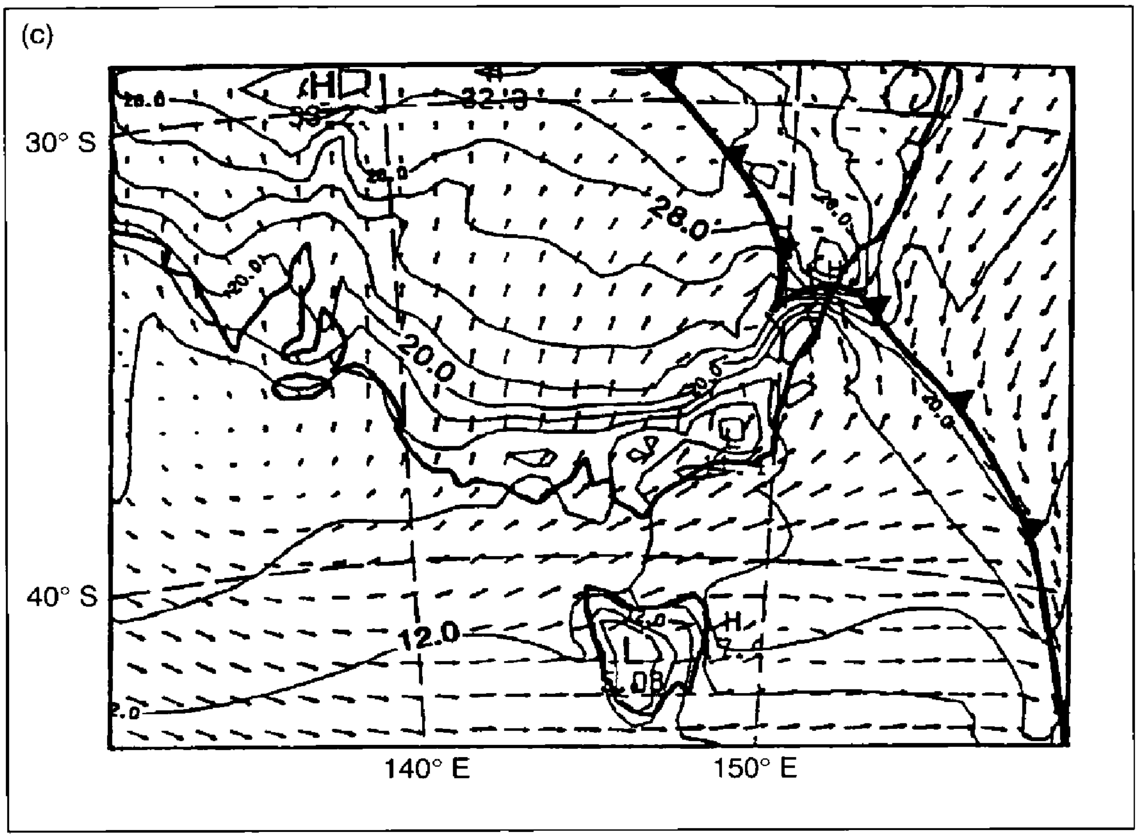
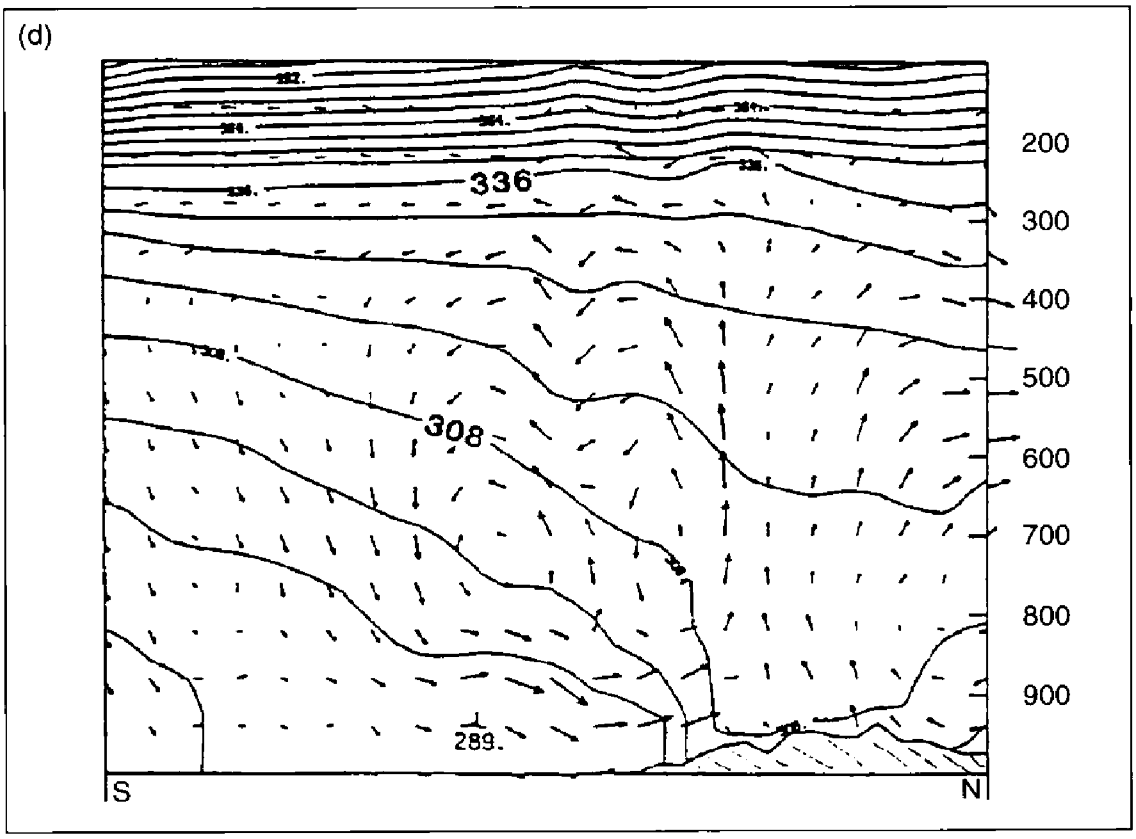


Figure 4. Mesoscale numerical model simulation of a cold front crossing south-east Australia, by Howells and Kuo (1988). The spacing of the velocity vectors gives the scale of resolution of the model: (a)–(c) show surface wind field and isotherms (with temperatures in deg. C) at (a) 10 p.m. A.E.S.T. on 30 November 1982; (b) 12 hours after (a). [Continued overleaf.]





[Figure 4 (continued)] (c) nine hours after (b). (d) a vertical north-south section through Nowra (on the coast) looking west at the same time as (c) showing wind vector components in this vertical plane, and potential temperature contours in Kelvin with 2 K contour intervals.

While the theoretical, observational and modelling studies have all contributed to a developing picture of the southerly buster, uncertainties about the nature of the modified front still exist. This applies particularly to the complex southerly buster front on the east coast. The limited resolution of these studies, and the vagaries of nature, together imply that there are still details to be resolved.

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Letters

'Green flash'

I was interested in the observation of the green flash made from m.v. *Jervis Bay* as reported in *The Marine Observer*, Volume 68, No. 342, October 1998, particularly the Editor's note and the anecdote told by Dr Frank Evans.

I cannot recall the date, not having made a note of it but I too have been privileged to observe multiple green flashes.

I was in Holyrood Park, Edinburgh, on the lower slopes of Arthur's Seat with a good clear sky. The sun was setting behind the top of the David Hume tower block of Edinburgh University, which is about a mile away, when I saw a green flash. Realising the geometry of the situation I ran back up the slope until the sun was again visible above the tower block. Again as it set behind the building there was a green flash. I was able to repeat the phenomenon by a second run up the slope. One was required to move only so much as would bring the upper limb [of the sun] just above the top of the tower block to cause a repeat of the green flash as the sun sank down.

I have not repeated this particular experiment but have observed the green flash on a number of occasions under suitable sky and horizon conditions from locations in the United Kingdom and also from Sri Lanka.

R.J. Livesey, Director of the Aurora Section of the British Astronomical Association.

Book Review

A New Voyage Round the World, The Journal of an English Buccaneer by William Dampier. 242 mm × 163 mm, x+294 pp., *illus.* ISBN: 0 9532918 0 4. Published by hummingbird press Broadway Studios 28 Tooting High Street London SW17 0RG. Price: £17.45.

This book was first published in 1697 and has been out of print since 1927. Thus it is most likely that there will not be many readers who have already come across this remarkable account of seventeenth-century voyaging and exploration. William Dampier was born in about 1651 and, following his schooling was apprenticed to a shipmaster in Weymouth after having shown great interest in the world which lay beyond his home shores.

Dampier first started to keep a journal in the early 1670s but the body of the title under review concentrates on his observations between 1679 and 1691 during which time he travelled with buccaneers, although not acting as one, on voyages that would take him around the world and see him included in the first recorded English party ever to set foot on Australian shores.

Any journal compiled in 'real time' over a continuous period will probably comprise significant events and activities punctuated by uneventful interludes. Dampier's original work was apparently no different in this respect, being interrupted by frequent topographical descriptions. In an Editorial Introduction, the Editor of this edition takes the view that a reader's attention should not be detracted from the 'meat' of the work by such descriptions which would probably be of interest only to specialists. Therefore, he states that most of these passages have been omitted from what has been published previously, likewise a section of 20 pages containing what he considers to be repeated detail. Whether or not these omissions are to the detriment of the reader's enjoyment is difficult to ascertain, this reviewer not having access to a copy of the earlier edition; the reader must simply accept that he/she would not have found the material of interest.

However, there is no doubt that the story of Dampier's travels is a fascinating read (perhaps this statement does indeed justify the omission of material that may otherwise have slowed down the narrative). Taking passage with buccaneers at a time in history when Spain was the dominant force in the Americas and elsewhere, he writes of skirmishes, plunder and rogues from the Caribbean eastwards to the Philippines and further, and also speaks of mutinous crews and of his own planned desertion of a ship. However, interwoven with these sometimes rather gory accounts, and the descriptions of the perils of a buccaneer's life, are observations of native peoples and their cultures; the weather; natural history; oceanography and anything else of interest to his ever inquisitive mind.

There are numerous illustrations only two of which appear directly attributable to Dampier himself; the remainder, either of later or earlier origin, contribute to the overall atmosphere of this era of discovery. The book contains no index since each of the 20 unheaded chapters is prefaced by its own contents, but there is a glossary of words and phrases, and also a gazetteer listing old place names alongside their modern ones. Additionally, there is an Appendix containing Dampier's writings on various plants, birds and animals encountered during his travels.

The work is both a unique travelogue and an insight into the unofficial exploration of the world decades before Captain James Cook would make his more famous voyages.

J.F.

Notices to Marine Observers

Excellent Awards 1997

Many nominees for the 1997 round of Excellent Awards have yet to claim their award books. Masters and Observing Officers are advised to check the following list, and are asked to contact us direct or through any UK Port Met. Office if their names appear and their claim forms have **not** already been sent to us.

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Should colleagues of any of those named above know how they may be contacted, we would be pleased to hear from them. All correspondence concerning the awards should be addressed to: The Met. Office OV(M) Scott Building Eastern Road Bracknell Berkshire RG12 2PW United Kingdom

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