

# Faster and safer

Weather routing can make a huge difference to passage times and race results. Rupert Holmes reports on the tech to help you make good decisions

The ability to download weather data and run routing software to optimise long-distance routing is becoming increasingly accessible, powerful and affordable. It's no longer the preserve of the best-funded race teams or the largest cruising yachts.

For those whose voyage start dates aren't decided years in advance by a racing programme or rally timetable, weather routing software also includes a useful departure date function. This can be used to figure out the best day on which to leave port at the start of a longer passage, to minimise the risk of headwinds,

calms, fog or gales. This makes for a very powerful combination that can transform the experience of passage making, leading to trips that are faster, safer and more comfortable. It applies just as much to a Channel crossing, where intelligent use of routing has the potential to slice a couple of hours off crossing times, as to longer voyages, such as to Ireland, across Biscay or across an ocean.

## Data sources

Windy's excellent web platform and apps have introduced many more sailors to a wider range of weather models over the past couple of years. It's always worth comparing data from different sources where

ABOVE  
Viewing a GRIB file prior to setting off on the ARC

possible – a high level of agreement shows a forecast in which you can have a lot of confidence. On the other hand, a lack of correlation indicates greater uncertainty, which can also be useful knowledge for decision making.

It's important to have an appreciation of the intrinsic differences between some of the models. Global models, such as the ECMWF (9km grid size) and GFS (22km grid), give a good 'big picture' analysis of what's expected to happen over a period of several days. However, they lack the finer-grained data that's needed to make more accurate predictions in the shorter term.

## Leaving it to the experts

Racing yachts can't accept outside assistance, but cruisers and raceboats on delivery aren't bound by these restrictions, which means they can engage professional weather routers. These will help identify suitable weather windows and suggest a broad strategy for the start of a voyage. This is followed by detailed advice on each day of the passage that will help route around weather features where necessary, or smooth your progress through fronts. As these updates are text only, they can be very small, which keeps data costs to a minimum and therefore goes a long way towards paying the typically modest costs of these services.

That's where smaller-scale forecasts such as the French Arome (2km grid) are particularly useful over a period of up to 18-24 hours. The UK's Metoffice produces a well regarded global model, as well as excellent small-scale models, with grid size as small as 1.5km. However, unlike other operators, it does not make this data available at a price that's affordable for the relatively small sailing market.

The key data that routing software needs to run its algorithms and to display data visually on screen, can be downloaded as GRIB files. These pack a huge amount of information into a compact file size, but it is important to be aware of their limitations.

Firstly they don't show weather fronts. This means it's worth downloading old-school synoptic weather charts – a black and white file will download fine over even the

slowest satellite connections. If this is not possible then rainfall GRIBs will give an indication of where and when fronts might be expected.

GRIBs are also notorious for over-estimating wind speed in light airs and under-estimating stronger winds. The latter problem often appears accentuated because when we're looking at a wind instrument while sailing we tend to remember the peak gust speeds, not the lulls or the mean value. It's therefore worth downloading GRIB gust data where possible – this can be 50 per cent or more above mean wind speeds. SailDocs offers an easily automated service for emailing compressed synoptic chart files.

Finally GRIB data is raw model output without any interpretation by a human forecaster. For much of the time that's not a big issue, though that's the reason GRIBs don't indicate fronts. However, smaller



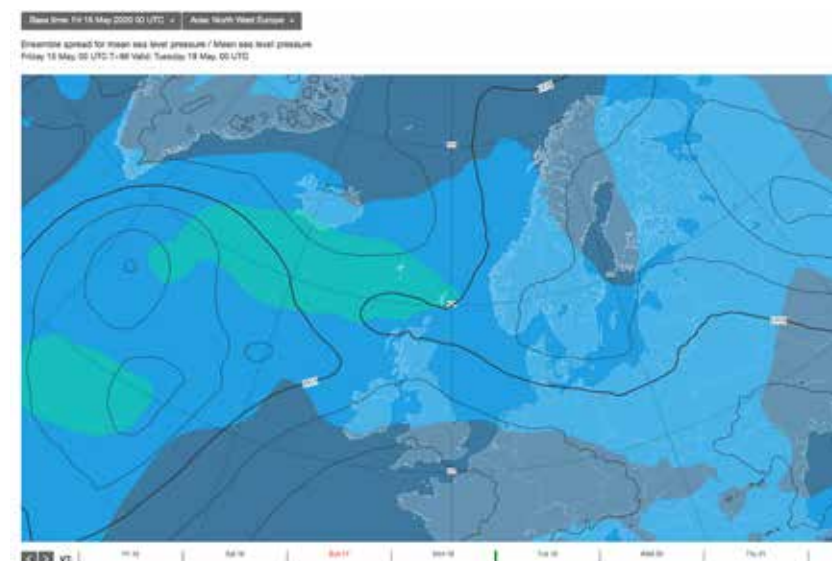
ABOVE  
The latest plotters can handle in-depth weather data

BELOW LEFT  
Big picture analysis: ECMWF for north west Europe

weather features such as stronger winds around major headlands and funnelling in places like the Needles Channel can be missed entirely as a result of the grid size.

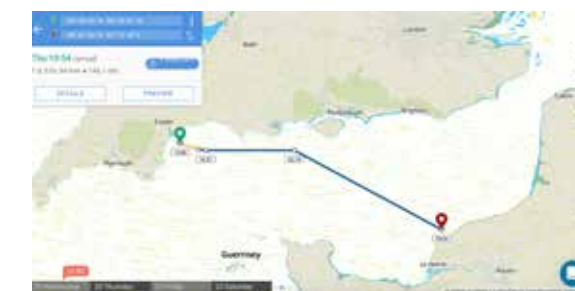
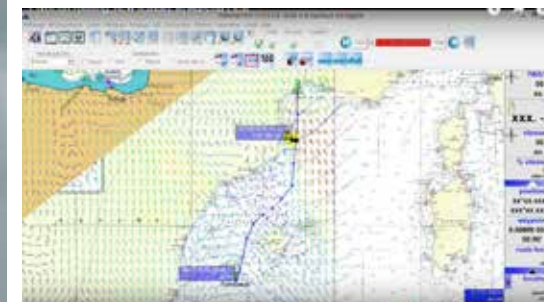
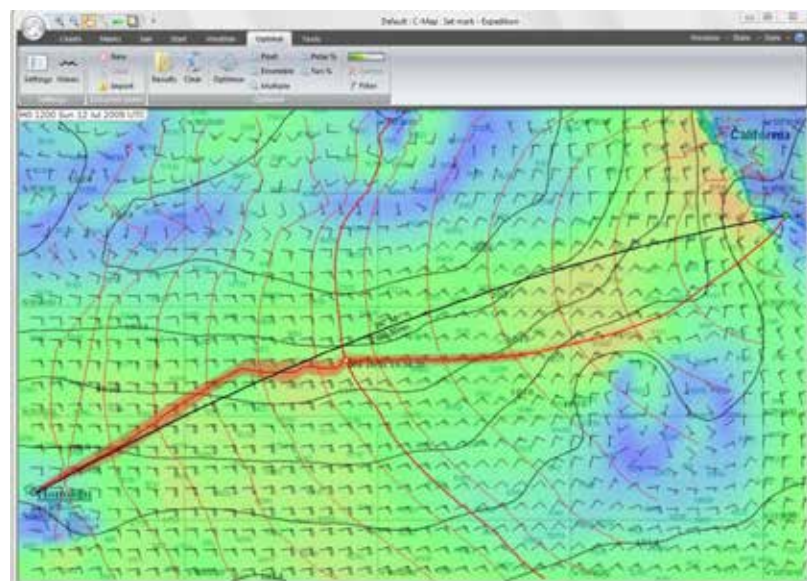
When further offshore, and therefore downloading only coarse-grained data, it's even possible for entire weather systems to be missed. This was the case last year for me on the out-bound leg of the MailASail Azores and Back Race, where Storm Miguel, which subsequently brought 80 knots winds to the French coast that killed three lifeboat crew, crossed our path as a newly formed secondary depression.

However, we had also downloaded the GMDSS High Seas forecast. This is a useful tiny text file that warned us of the rapidly developing storm and its predicted track, so we were able to tack in the safe water behind its path.



## PTT handsets

This is a relatively recent class of satellite phone that effectively operates in much the same way as radio communications. The operator simply presses a button, in exactly the same way as for a hand-held VHF, to broadcast to a pre-defined group of users. Early users of this technology were primarily in the international aid sector, but handsets have recently been targeted at leisure users. Note that some of these handsets are PTT-only devices that can't be used for conventional satphone communication.



### Satellite communications

Once out of the range of a conventional mobile phone network, data has to be downloaded via a satellite connection. While superyachts and round the world racers can accommodate the equipment that's required to stream live video, pay the colossal airtime bills, and generate enough electricity to run it, that's not true for most of the rest of us, with the result that expectations about file sizes have to be recalibrated.

The problem is one of super-slow data speeds, thanks to the use of satellites that were designed more than two decades ago, partly as a result of unexpected delays in getting new hardware in the sky. Most below 50-60ft therefore have a 2.4kbps connection – that's just five per cent of the speed of the old-school dial-up terrestrial internet that was first established in the UK 30 years ago.

To make matters worse, on all systems other than Inmarsat, the "handshake" between satellites as they pass overhead is not always

reliable. As a result, even with an external antenna, the largest file sizes that can typically be sent are around 100kb (yes, 0.1 megabytes) and 50-70kb is more reliable – and even that can take several minutes.

This of course impacts how we approach gathering the data for weather routing at sea, especially in the early stages of a passage, where two weeks or more data may be needed. The key is to download a number of files, starting with relatively fine-grained data over a small area for the first 24-36 hours, moving through coarser data over a wider area for the next three days and then a daily forecast on a low-resolution grid size for the following weeks.

### New developments

Fortunately in the past couple of years things have started to change on a number of fronts and looking

**ABOVE LEFT** The Expedition programme is popular among top racing yachts, offering multiple routing options

**BELOW** Leaving the Azores on the MailASail AZAB last year, in which we avoided a fatal storm after viewing the depression on a GMDSS High Seas forecast

further ahead the industry is poised to undergo its biggest ever revolution.

Inmarsat's FleetOne offers an initial data speed of 100kbs – 20 times faster than existing small format systems, though still horrendously slow compared to a 4G mobile phone data speed. Yet it's sufficient to transmit low resolution video files (though not live footage), and a compressed 50kb still photograph suitable for social media takes around two minutes to upload. It's also just enough for text-only web browsing using Chrome or Opera browsers.

For cruisers this makes it far easier to keep in touch while away, whether with friends and family, or to oversee business interests. For racers the faster download speed translates directly into less 'wasted' time sat at the nav station waiting for files to download. It also opens up the possibility of more easily downloading ensemble forecasts, that provide a greater indication of uncertainties, for routing.

A FleetOne antenna is small enough to go on the aft rail of a boat 40ft or over – it's 22cm in diameter and weighs 2.5kg. Hardware costs are around £3,000, while power consumption is greater and airtime plans are a lot more expensive than for a basic system.

The new Iridium Certus constellation is now in operation and offers faster data speeds of 352kbps for marine installations.

However, the hardware is heavier and more expensive than Fleet One systems.

IEC Telecom has long been a supplier to the leisure marine markets and is about to expand this with a new office in Lorient, at the heart of the French boating and offshore racing scene, which it hopes to impact in a big way.

The company expects big take up for its One Gate Compact system, which offers a powerful, yet lightweight and compact product. The new system includes an embedded 3G/4G module, enabling automatic switching from Satcomms to a conventional mobile phone network when there's one available.

It can also be set up to give individual passcodes to crewmembers thus keeping their data use separate. IEC adds: "With the help of the virtual dashboard,

IEC Telecom can access the vessel's onboard system in real time. So any connectivity or system problems can be resolved immediately and directly because our experts are able to see what is actually happening for themselves, rather than relying on those onboard to describe it to them or, worse, the ship's systems having to limp along until an IT engineer can board the vessel.

"In addition, OneGate enables the streamlining of system upgrades, adaptations and repairs, thereby avoiding complicated logistics. In the past if a vessel owner wanted to change or upgrade part of their system, they would have needed to check where the next port was, order the hardware to be delivered there, then send a technician to that destination to meet the vessel and install or update the system. For a whole fleet this often took the services of an entire logistics department to do that!

"Today, thanks to its virtualization, OneGate virtual machines can be deployed in 20 minutes."

For a long time the market was dominated by Inmarsat and Iridium, but Thuraya and Globalstar, whose

**ABOVE LEFT** AdrenaFirst predicts conditions and winds along your predicted course

**ABOVE RIGHT** Route prediction with Savvy Navvy

**BELOW** SailGrib can display GRIB files from multiple sources

**BELOW LEFT** NKE's multidisplay offers a range of functions

9.6kbps data speed is expected to be increased, are making inroads. Both are worth considering and may offer more cost effective options, providing your planned itineraries don't coincide with the huge gaps in their coverage.

Looking ahead, there's a new race to provide low-cost satellite internet across the planet led by companies backed by Elon Musk and Richard Branson. Musk's Starlink system already has 420 of a planned 10,000 satellites in operation and private beta trials are scheduled to start later this year. Data speeds of up to 600kps are reported to be possible.

### Routing software

Most racing yachts covering long distances run PC-based software to crunch the data. Expedition is the most popular among English-speaking sailors, though Adrena is strongly favoured by the successful French racers. Mac users might also like to investigate LuckGrib.

For cruising and races on a smaller budget, SimSail is a free PV based system that includes both chartplotting and routing options and has a streamlined interface. There's also a growing number of increasingly good apps for smartphones and tablets.

The development of Savvy Navvy into a useful tool is continuing. As more of founder Jelte Liebrand's vision gets to be implemented this will become a progressively stronger tool that, unlike most others in the market, won't require users to spend large chunks of time to learn the system. Calculations are performed on the device, so it's ok to use when racing

SailGribWR remains one of my favourite apps, only available for Android. It can be used with a number of models and calculations are performed on the device.



### Satellite messengers

Devices such as the Globalstar Spot X and Garmin InReach offer a very low-cost option for occasional users. They incorporate tracking with short messaging functionality, by text or email.