OpenSeaMap (english)

HYDROGRAPHISCHE
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OpenSeaMap –
die freie Seekarte

Monitoring of sand and gravel
mass movements at a dredging
pond using multi-beam sonar

»Die Hydrographie stellt geo-
topographische Referenzdaten
für alle Gewässer bereit« –
Ein Wissenschaftsgespräch
mit Dietmar Grünreich

Kartenkunst
von Matthew Cusick

DHyG
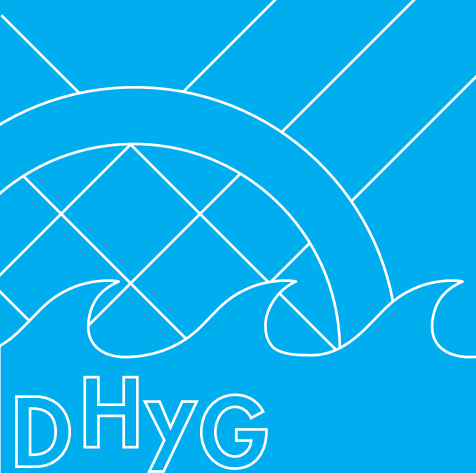
OpenSeaMap – the free nautical chart

by Markus Bärlocher
taken from the Hydrographische Nachrichten (Hydrographic News)

Preview

Nautical charts are expensive and in many countries data is not always up-to-date. OpenSeaMap is free for everybody worldwide. Following the example of Wikipedia the data is collected by volunteers and added to charts within a few minutes. The chart is the skipper's work tool and comprises weather data, harbour pilots, lists of light and much more.
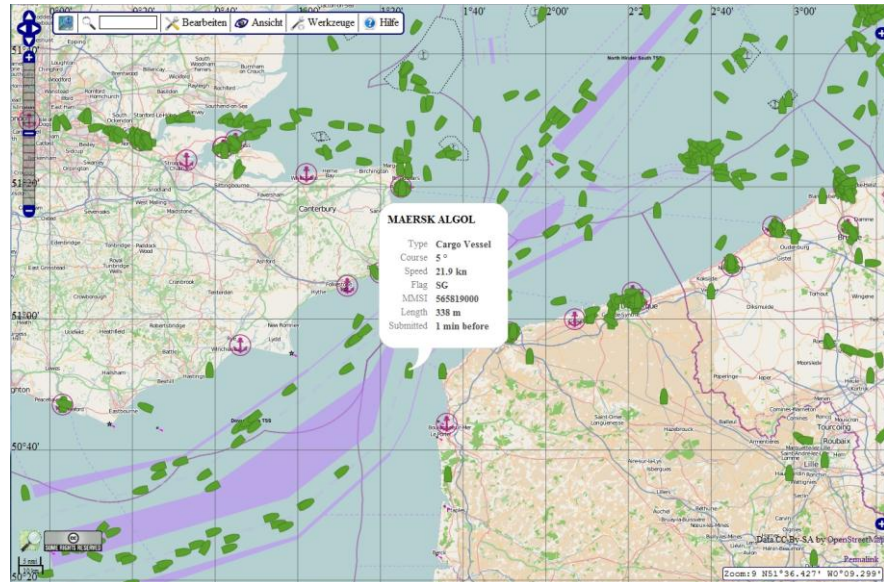
OpenData philosophy

In 2009 two experienced skippers were complaining about expensive printed nautical charts that were outdated the moment they had bought them. They believed in the OpenData philosophy and started a project called "OpenSeaMap" with the aim of creating a free electronic nautical chart that is published online and can be taken onto the ship, laptop or an iPad and used offline. With a chart like this all yachtsmen would have access to not only free but also up-to-date data at all times.

Meanwhile, the idea has developed into a project with many volunteers, amongst others experienced mariners, programmers and thousands of data collectors worldwide.

OpenData is supposed to initiate developments that are socio-economically profitable by giving everybody access to data. Open data is all databases that can be accessed, used and propagated freely in the interest of the public. Geographical information is also part of this data. After a successful pilot project that showed aerial photographs the state of Bavaria (in the south of Germany) offered to share its databases on geographical information. Other states will follow its example and share even more detailed data.

Special chart from OpenStreetMap

OpenSeaMap is part of OpenStreetMap, a project that collects free geographical information. Everybody who likes to contribute something can do so – just as with Wikipedia. There are three sources of data to choose from: 500,000 amateur photographers studiously collect geographical data in their home country and abroad using a GPS device. And authorities and organisations that increasingly embrace the idea of OpenData give data voluntarily. Available satellite and aerial photographs from Yahoo, Bing, local authorities and organisations with incredible resolution are copied manually and rendered into vector data of geographical information. The dimensional and positional accuracy are then combined with information on the locality and special nautical data. This is how the best world map is developed: detailed, highly precise and up-to-date.

A lot of specialised maps for a variety of usages such as bicycle, trail or routing maps for certain interest groups (car and lorry drivers, bikers and walkers) are derived from OpenStreetMap and so are maps of global electricity grids or maps about historical settlement development etc. And of course there is OpenSeaMap the nautical chart.

Nautical, river and topographic chart

OpenSeaMap is a three-in-one nautical, river and topographic chart. The nautical part contains relevant information on: navigation lights, buoys, beacons, traffic separation schemes, restricted areas, warnings, harbours and much more. The model for OpenSeaMap are the official maps of the Federal Maritime and Hydrographic Agency with which we have already developed good contacts. It goes without saying that OpenSeaMap cannot replace the official sea chart, but it can be used to make plans. The river chart shows inland waters including inland waterways as well as wildwater stretches in upper reaches of rivers ideal for kayakers. The topographic map is famous for its high level of detail. It will show you the way to the harbour and the ice-cream parlour there or a motorbike rental service – and if required the local shipyard and the sailmaker. For more detail, attributes are allocated to object data using an editor. A lighthouse for example needs a dozen attributes to correctly capture and map its sector lights with nautical correctness. To obtain more detailed nautical data a user friendly graphical editor was developed specially. It can even be used to map objects from the water sports sector that cannot usually be found in nautical charts.

The electronic nautical chart covers the oceans of the entire world. It has 18 zoom levels that range from a view of the world to detailed harbour plans in 1:2000 scale. The OpenSeaMap homepage [1] shows the development of the project and a detailed description of the map and its possibilities. Just one click leads the user from the homepage to a full screen view of the map [2] that shows up-to-date data.

"All-in-one workplace"

Up to now, skippers had a stack of paper charts, a list of lights and several harbour pilots in their navigation corner to plan and monitor trips. They had to look for the appropriate documents for each situation and were faced with varying degrees of currentness and quality of the printed media.

OpenSeaMap now offers an integrated electronic system that is aiming to become a modern "all-in-one workplace" for the skipper. In addition to nautical data, the following elements are integrated in the map: a harbour pilot, a weather chart including a weather forecast, bathymetric data, level measuring sites and AIS data. Soon skippers will not have to climb down to their navigation corner to check instruments or install an expensive secondary display. They can access and read important data, check the chart and the course by simply using a smartphone or tablet from anywhere on the boat.

Layer concept

The basis of OpenStreetMap is the topographic map. In addition, further information can be shown as a layer in the menu "Ansicht" (view).

The **navigational aids layer** shows navigation lights, lateral and cardinal marks, isolated danger and special marks as well as traffic separation schemes, restricted areas, natural reserves and much more. Depending on the zoom level the most advantageous combinations are depicted: with low zoom levels the big navigation lights and traffic separation schemes are shown, with high zoom levels the image becomes even more detailed.

The **harbour layer** shows 5000 harbours and
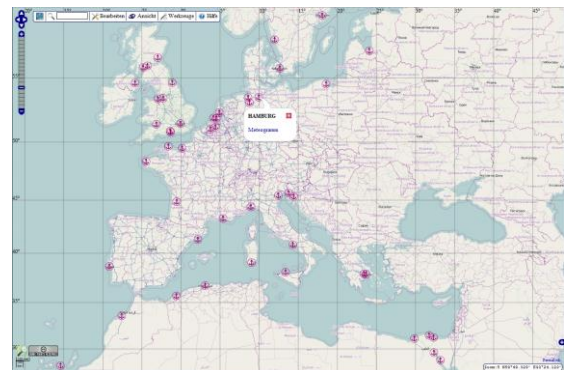
more than 1000 marinas. By clicking on the symbol the harbour pilot opens with detailed descriptions of the harbours. Mediawiki is used as a content management system that contains the most important information on ports but also addresses of repair workshops, shopping facilities, tourist attractions, restaurants and much more – sometimes even with illustrations.

The **weather layer**
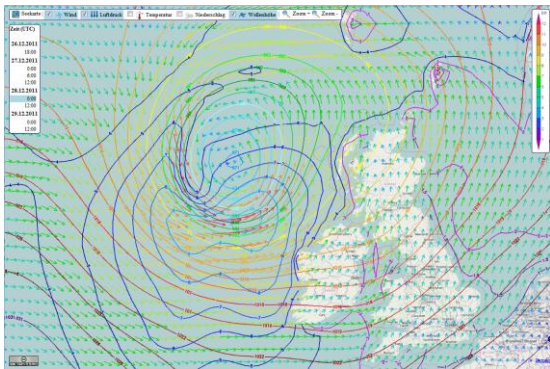
shows weather maps of the world including parameters such as wind direction and wind force, air pressure, temperature, precipitation and the height of waves. It also offers a 3-day weather forecast and updates three times a day. Moreover, every location that can be activated with a click shows a meteogram for nine consecutive days for eight meteorological measurements.

The **water depth layer** shows the ridges and
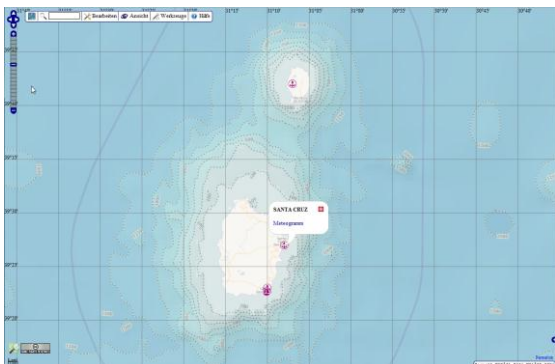
trenches of the seas in 23 different shades of blue using a Hillshade tool. All data was provided by GEBCO and rendered by OpenSeaMap. With high zoom levels additional labelled depth contours are shown. Thus, children in schools all over the world can see how varied the underwater world actually   is.

The layer **ship tracking** shows the positions of

all ships equipped with an AIS transmitter in real time. A popup window appears containing the name of the ship, the MMSI number, course and speed, type and length of the ship as well as the final destination. The AIS (automatic identification system) transmitter, which is similar to a radar, sends the ship data via VHF (range: 30 nautical miles) to inform other ships in the area about its position and possible risk of collision. This data reaches many coastal towns and villages. collected by a project at the University of Athens and made available to OpenSeaMap. (OpenSeaMap runs its own receiving station in Nuremberg at the Main-Danube Canal.)

In this layer ships with a satellite tracking device can be seen as well. Everybody can show their position with a small transmitter even when they are in the middle of the Atlantic Ocean. Shipping companies deploy the system for fleet management purposes, charter and insurance companies use it as well. It is also useful for offshore regattas and affordable for private individuals. For inland waters there is a system that works with GPRS. Amateur radio operators at sea have been using short-wave transmitters for years to transmit their position.

The **level layer** shows water levels of coasts
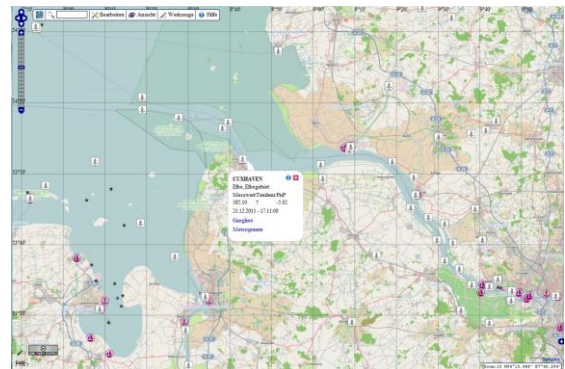
and rivers. We invite all regions to make their level data available, because that would be a way of showing flood data in transnational context for the first time. The data for Germany is provided by the Federal Waterways and Shipping Administration (national water levels provided by Pegelonline). Regional water levels can also be added to this level without any problems and soon there will be tide calculations available worldwide.

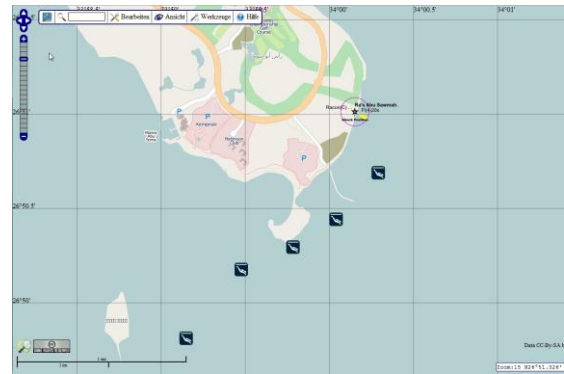The **aerial photograph layer** shows the world

in high-resolution satellite and aerial images. The images are provided by *bing*, a web search engine from *Microsoft*. This cooperation has been made possible by Steve Cost, the founder of OpenStreetMap, who now works for Microsoft. These aerial photographs are also available to receive geographical data by copying them.

Chart for water sports enthusiasts

OpenSeaMap is interested in everything "blue" in the world – and that is 70 % after all. Skippers and motorboat operators make use of it. And now even divers, surfers, kayakers, anglers and other water sports enthusiasts want to benefit from OpenSeaMap. That is what the sports layer is for. Here you can find great diving spots, diving schools and places where you can fill up or rent scuba tanks.

The **Wikipedia layer**

has 1,7 million Wikipedia articles integrated. Chart users get comprehensive data on the respective location and readers of Wikipedia articles intuitively find geographically connected information in the map. Just one click will lead you to the corresponding article. They contain additional valuable information in 160 languages and can be accessed 24/7 from anywhere in the world. Alternatively, the articles can be shown as a gallery in the chart. The cooperation of OpenSeaMap and Wikipedia wants to exploit synergy effects and make an educational contribution.

River chart for kayakers
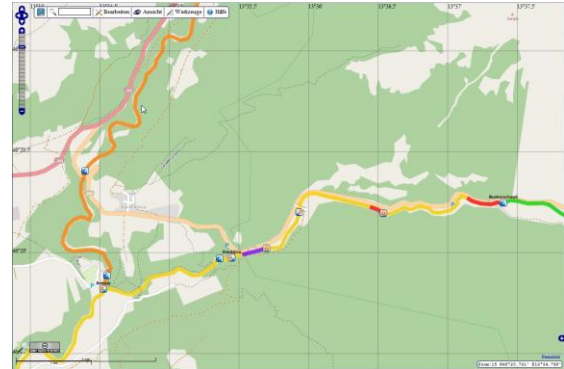
Kayakers can find all rivers of the world in the sports layer. Kayaking routes are marked with different colours depending on the degree of difficulty. You can find entry and exit points as well as obstacles and spots where kayaks need to be carried. It is also possible to add kayak rental stations, car parks and campsites. In Germany the level layer also shows the latest water levels of rivers. If other countries provided the data, we could also offer this service for them.

Trip planner
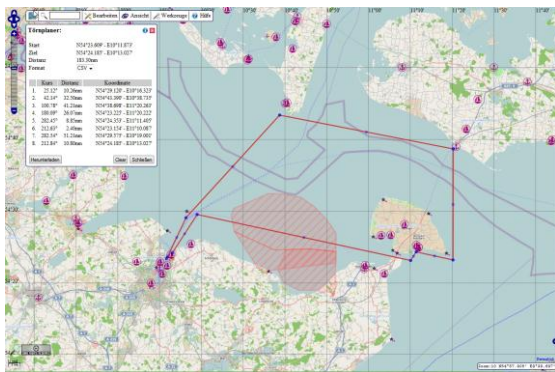
The trip planner calculates courses and distances. You can simply put together routes with a few mouse clicks. The individual sections are shown as a list with waypoints, the course to be steered and the distance. This list can be exported to different formats, e. g. as a route for the GPS device or to control an autopilot. Naturally, the total distance is calculated (loxodrome and orthodromic distance).

Offline chart
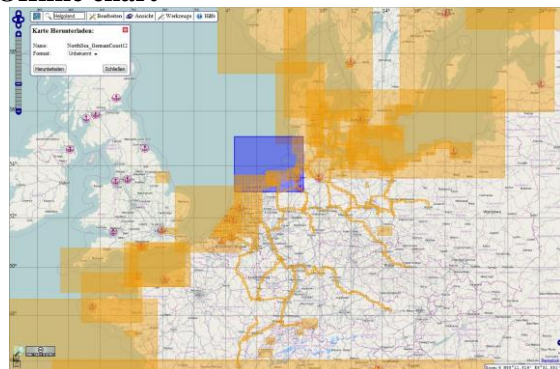
The „Karte herunterladen" (download chart) functionality offers hundreds of charts for offline usage on laptops, smartphones and tablets in many formats and for various navigation programmes and operating systems (e. g. Windows, Android, iOS). It is possible to choose individual sections and formats from an overview map and download them for free. Available for download are oceanic charts, navigation charts, detailed harbour maps as well as river charts for the most important waterways. The number of charts is growing constantly and Europe is covered almost completely.

Chart for organisations

OpenSeaMap is increasingly used by communities at the coastline that want to offer greater value to guests and tourists. Thanks to OpenData you can integrate the chart easily into your own website for free. [3] This is also true for commercial applications for ship owners, charter companies, organisations for the protection of the environment, oceanologists, schools and universities. The users can add layers of their own such as images of protection zones, construction projects, wind turbines, distribution of fish species and many more.

## Shallow water depths data with 'crowdsourcing'
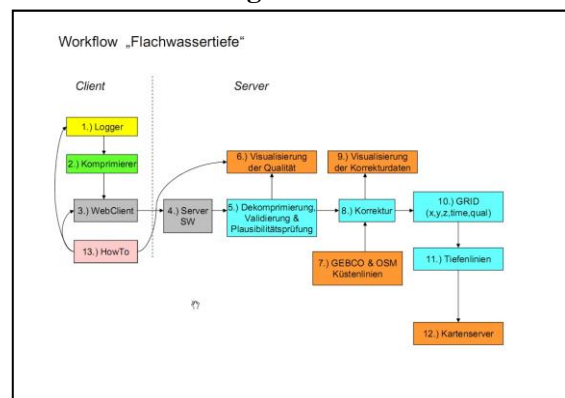
Mariners are clear about one thing: A chart without water depths is useless. Unfortunately, data on water depths is not OpenData in most of the countries. That is why OpenSeaMap wants to measure the seacoasts with 'crowdsourcing'. Everybody can contribute and collect depth data.

Most ships are equipped with GPS and sonar systems. This makes data collection easy: The devices write the data on an NMEA bus. The data is then stored on a USB stick using an NMEA data logger that was developed specially for the project. It can then be transferred from any computer with access to the internet to the central server. The raw data will be corrected (fed with tide data) and calculated to create a terrain model. From this depth contours will be derived and shown in the chart.

Practical trials have already been conducted. For example the Brombachsee near Nuremberg is measured. The data is recorded by the DLRG (German lifeguard association) during rescue operations on the reservoir. Afterwards a terrain model is created from the data and the depth contours derived from them.

In the next issue of the Hydrographic News we will report in detail about the technical background of the project "water depths data with crowdsourcing".

Extensive data collection will be starting in the sailing season 2012. People who want to share their own depth data from ship voyages or contribute to and support the project in a different manner are welcome to contact the author directly.
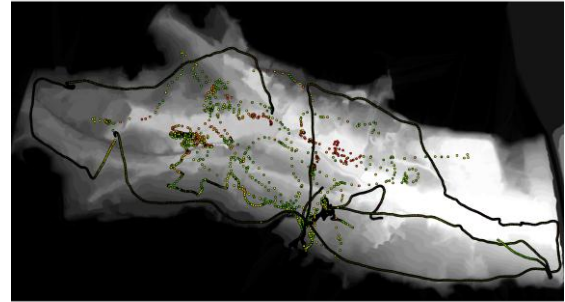
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Key terms
OpenSeaMap | nautical chart | ENC | ECDIS | OpenData | …

Links
[1] Website: www.OpenSeaMap.org
[2] nautical chart: www.map.OpenSeaMap.org/map/
[3] implement in Website: http://wiki.openseamap.org/wiki/de:OpenSeaMap_in_Website

Images
Ports: 5000 ports and 1000 marinas
Weather: Gale off the coast of Ireland
Water depths off the coast of Gibraltar
Ship tracking: Real-time AIS
Level lines/hydrographs
Aerial photograph: Fukushima (in high resolution)
1.7 million Wikipedia articles as gallery
Chart for divers
River and kayak chart
Trip planner (with orthodromic distance and loxodrome)
Offline charts for downloading
Water depth data with Crowdsourcing