

**REPORT BY E-SURFMAR**  
**EUCOS-SURFACE MARINE PROGRAMME**  
**2007**

## **1. INTRODUCTION**

On 1<sup>st</sup> April 2003, an optional programme, E-SURFMAR, was established by the European Meteorological Network (EUMETNET) within the framework of its Composite Observing System (EUCOS). Its main objectives are to co-ordinate, optimise and progressively integrate the European activities for surface observations over the sea – including drifting and moored buoys, and voluntary observing ships. Seventeen out of the twenty two EUMETNET members agreed to participate in the five next years of the programme (2007-2011): Belgium, Croatia, Cyprus, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden and United Kingdom.

According to a Memorandum of Understanding, signed in 2004 between the European Group on Ocean Stations (EGOS) and E-SURFMAR, it was agreed that, from 1<sup>st</sup> January 2005, E-SURFMAR would assume overall responsibility for the moored and drifting buoy networks managed by EGOS. The responsibilities of EGOS members have been transferred to an E-SURFMAR Data Buoy Technical Advisory Group (DB-TAG). E-SURFMAR was adopted as an action group of the DBCP, replacing EGOS at the DBCP twentieth session (Chennai, India 18-22 October 2004).

Financial contributions to the programme are shared among the participants according to the GNI of their respective country. For data buoys, the E-SURFMAR budget includes : the funding of a part time Data Buoy Manager; the purchase of drifting buoys; funding of drifting buoy communication costs from 1<sup>st</sup> January 2006; compensations for the amortization and the maintenance of 4 moored buoys; and the contributions of participants to the DBCP fund.

## **2. PROGRAMME MEETINGS**

- The first E-SURFMAR Data Buoy Technical Advisory Group (DB-TAG) meeting took place immediately following the closure of the final meeting of the EGOS Management Committee (Geneva 18-19 January 2005).
- The second DB-TAG meeting was held in Hamburg 31May to 1 June 2005.
- The third DB-TAG meeting was held in Galway 13-14 June 2006.
- The fourth DB-TAG meeting was held in Larnaka 15-16 May 2007

### 3. OPERATIONAL PROGRAMME

#### 3.1 Drifting buoys

| Year         | SVP-B      | SVP-BW    | FGGE      | FGGE-W    | Other     | Total      |
|--------------|------------|-----------|-----------|-----------|-----------|------------|
| 1996-97      | 13         | 0         | 17        | 13        | 0         | 43         |
| 1997-98      | 28         | 7         | 14        | 4         | 0         | 53         |
| 1998-99      | 30         | 4         | 21        | 6         | 6         | 67         |
| 1999-00      | 41         | 5         | 15        | 6         | 2         | 69         |
| 2000-01      | 19         | 2         | 7         | 4         | 0         | 32         |
| 2001-02      | 36         | 5         | 8         | 0         | 0         | 49         |
| 2002-03      | 45         | 5         | 8         | 2         | 0         | 60         |
| 2003-04      | 26         | 3         | 4         | 0         | 0         | 33         |
| 2004-05      | 51*        | 1         | 4         | 0         | 0         | 56         |
| 2005-06      | 56*        | 1         | 0         | 0         | 2         | 59         |
| 2006-07      | 92*        | 3         | 0         | 0         | 0         | 95         |
| <b>Total</b> | <b>437</b> | <b>36</b> | <b>98</b> | <b>35</b> | <b>10</b> | <b>616</b> |

**Table 1.** The number of drifting buoys deployed for according to buoy type  
(Reference period : 1<sup>st</sup> Sept to 31<sup>st</sup> Aug.)

As shown in table 1, **95 drifting buoys** were deployed between September 2006 and August 2007 including (\*) **50** upgrades of SVP drifters. Four out of the SVP-B were fitted with GPS and Iridium transmitter. The 3 SVP-BW drifters are a contribution of Environment Canada.

Many of the deployments in 2006/07, as in previous years, were carried out by research vessels, voluntary observing ships, and ships of opportunity plying the Atlantic Ocean from ports including Halifax (Canada), Reykjavik (Iceland), Foynes (Ireland), Le Havre (France), Fos (France), Brest (France), London (UK), Fairlie (UK), Charleston (USA), Boston (USA), Trondheim and Aalesund (Norway), Setubal (Portugal). Three drifters from OGS, (Istituto Nazionale di Oceanografia e Geofisica Sperimentale, Italy) upgraded with barometers were also deployed in the Western Mediterranean Sea. Forty five drifters from GDP upgraded with barometers were deployed by ships plying from USA to Europe and Iceland.

Although the E-SURFMAR area of interest is mainly up to 70°N (i.e. to the ice limits), the EUCOS area actually extends to 90°N. Three ICEB buoys and four SVP-B (2 with Iridium transmitters) will be deployed by September 2007 in the Arctic for IPY (International Polar Year).

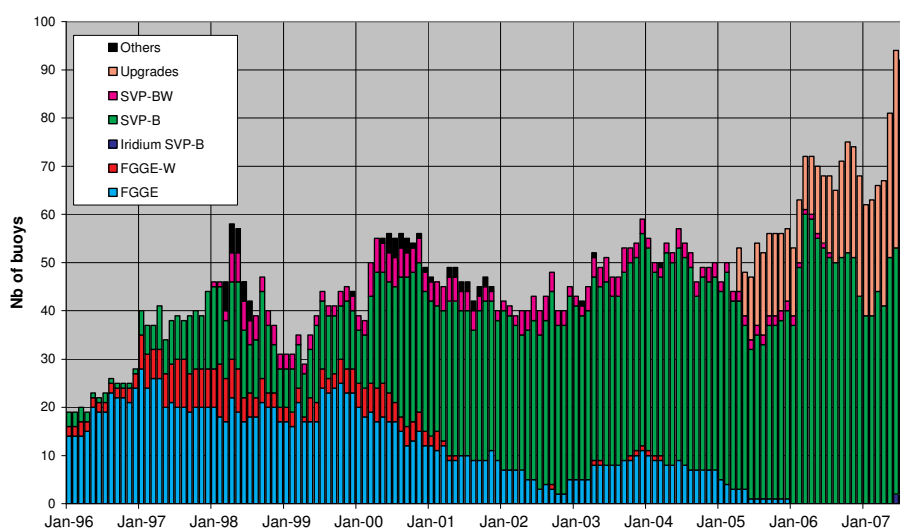
| Year         | 1997-98   | 1998-99   | 1999-00   | 2000-01   | 2001-02   | 2002-03   | 2003-04   | 2004-05   | 2005-06   | 2006-07   |
|--------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| <b>Ship</b>  | 39        | 45        | 46        | 24        | 39        | 50        | 33        | 56        | 57        | 95        |
| <b>Air</b>   | 14        | 22        | 23        | 8         | 10        | 10        | 0         | 0         | 2         | 0         |
| <b>% Air</b> | 26%       | 33%       | 29%       | 25%       | 20%       | 17%       | 0%        | 0%        | 3%        | 0         |
| <b>Total</b> | <b>53</b> | <b>67</b> | <b>69</b> | <b>32</b> | <b>49</b> | <b>60</b> | <b>33</b> | <b>56</b> | <b>59</b> | <b>95</b> |

**Table 2.** The number of drifting buoys deployed for EGOS/E-SURFMAR according to deployment method  
(Reference period : 1<sup>st</sup> Sept to 31<sup>st</sup> Aug.)

The number of operational buoys providing Air Pressure (AP) measurements, generally comprised between 40 and 50 from 2000 to 2005, is now about 95. The deployment of SVP-B drifters has been growing every year, further increased by the use of barometer upgrades from 2005. In contrast the deployment of FGGE type buoys has been decreasing (see Figure 1) and this kind of buoy is no longer used within E-SURFMAR. The minimum number of operational drifting buoys at the end of each month in 2006-2007 was 62 (in January 2007) and the maximum was 95 (in August 2007).

The mean lifetime (for Air Pressure) of the SVP-B drifters was approximately 12 months (384 days) if we exclude the 8 early failures; 350 days if we include them. The average age of the network was 323 days by the end of August 2006 and 287 days by the end of August 2007. Sixty seven buoys failed to report air pressure measurements.

Most of drifting buoys use the Argos system to report their data. The evaluation of the Iridium communication system began as a contribution to the DBCP drifter Iridium Pilot Project. This will improve the data timeliness at a lower transmission cost.



**Figure 1.** The number of operational EGOS/E-SURFMAR drifting buoys by the end of each month from 1996 to 2007

The availability, timeliness and quality of drifting buoy data continues to be carefully monitored.

The availability of data depends on the number of buoys operating in the EUCOS area. The number of reports received within 50 minutes remains stable (500 per day on average) until July 2007. We can note an improvement from July 2007 with about 800 messages per day. More than 2000 hourly observations per day had been reported on the GTS since June 2007.

The data are processed from 5 satellites by CLS Argos. About 70% are received by HH+100.

The AP differences from the French model outputs showed that the target of 1% of Gross Errors was easily being achieved. The RMS of AP differences had a significant seasonal variation, being higher in winter than in summer ( maximum 0.9 hPa in February 2007, minimum 0.5 hPa in July 2007). This could be due to less accurate measurement in rough seas and also to more low pressure systems crossing the North Atlantic in winter.

Real time observations from drifting buoys are subject to routine quality monitoring. Besides monthly statistics provided by various meteorological centres for individual buoys, tools are used by Météo-France to identify buoys reporting dubious data as quickly as possible. Among these tools is a blacklist computed over the previous 14 days which is available on the web at: <http://www.meteo.shom.fr/qctools/eblackap.htm> .

### 3.2 Moored buoys

In 2004 the E-SURFMAR design study recommended that four moored buoys were needed to meet the EUCOS requirements, i.e. providing a suitable network to improve the quality of regional NWP over Europe, and for the validation and calibration of satellite wind and wave measurements. The four E-SURFMAR moored buoys are operated by UK, Ireland, France and Spain. (i.e. three K-pattern buoys and one SeaWatch buoy respectively).

In accordance with the MOU between EGOS and E-SURFMAR the monitoring of the previous EGOS moored buoy network has been continued. The availability, timeliness and quality of moored buoys data are carefully monitored. By the end of August 2007, 16 K-pattern buoys and 14 Oceanor buoys were operating.

#### Operating EGOS moored buoys (K-pattern)

| WMO          | Name        | nobs       | Wi       | AT       | AP       | dP       | ST       | Wa       | Ws | Dr | Sb | U        | SS | O        | Start_end        | Lat          | Lon           |
|--------------|-------------|------------|----------|----------|----------|----------|----------|----------|----|----|----|----------|----|----------|------------------|--------------|---------------|
| 61001        | Cote d'Azur | 708        | X        | X        | X        | X        | X        | X        | -  | -  | -  | X        | -  | O        | 0108-3108        | 43.40        | 7.80          |
| <b>61002</b> | <b>Lion</b> | <b>742</b> | <b>X</b> | <b>X</b> | <b>X</b> | <b>X</b> | <b>X</b> | <b>X</b> | -  | -  | -  | <b>X</b> | -  | <b>O</b> | <b>0108-3108</b> | <b>42.10</b> | <b>4.70</b>   |
| 62001        | Gascogne    | 746        | X        | X        | X        | X        | X        | X        | -  | -  | -  | X        | -  | O        | 0108-3108        | 45.30        | -5.00         |
| 62029        | K1          | 745        | X        | X        | X        | X        | X        | X        | -  | -  | -  | X        | -  | O        | 0108-3108        | 48.70        | -12.50        |
| 62052        | Ushant      | 735        | X        | X        | X        | X        | -        | X        | -  | -  | -  | X        | -  | O        | 0108-3108        | 48.50        | -5.80         |
| 62081        | K2          | 746        | X        | X        | X        | X        | X        | X        | -  | -  | -  | X        | -  | O        | 0108-3108        | 51.00        | -13.20        |
| 62090        | M1          | -          | -        | -        | -        | -        | -        | -        | -  | -  | -  | -        | -  | -        | -                | 53.10        | -11.20        |
| 62091        | M2          | 725        | X        | X        | X        | X        | X        | X        | -  | -  | -  | X        | -  | O        | 0108-3108        | 53.50        | -5.40         |
| 62092        | M3          | 744        | X        | X        | X        | X        | X        | X        | -  | -  | -  | X        | -  | O        | 0108-3108        | 51.20        | -10.50        |
| 62093        | M4          | 744        | X        | X        | X        | X        | X        | X        | -  | -  | -  | X        | -  | O        | 0108-3108        | 54.70        | -9.10         |
| 62094        | M5          | 553        | X        | X        | X        | X        | X        | X        | -  | -  | -  | X        | -  | O        | 0108-3108        | 51.70        | -6.70         |
| <b>62095</b> | <b>M6</b>   | <b>736</b> | <b>X</b> | <b>X</b> | <b>X</b> | <b>X</b> | <b>X</b> | <b>X</b> | -  | -  | -  | <b>X</b> | -  | <b>O</b> | <b>0108-3108</b> | <b>53.10</b> | <b>-15.90</b> |
| 62105        | K4          | 729        | -        | X        | -        | -        | X        | X        | -  | -  | -  | X        | -  | O        | 0108-3108        | 55.80        | -11.40        |
| 62108        | K3          | 738        | -        | X        | X        | X        | X        | X        | -  | -  | -  | X        | -  | O        | 0108-3108        | 53.50        | -19.50        |
| 62163        | Brittany    | 743        | X        | X        | X        | X        | X        | X        | -  | -  | -  | X        | -  | O        | 0108-3108        | 47.50        | -8.40         |
| <b>64045</b> | <b>K5</b>   | <b>742</b> | <b>X</b> | <b>X</b> | <b>X</b> | <b>X</b> | <b>X</b> | <b>X</b> | -  | -  | -  | <b>X</b> | -  | <b>O</b> | <b>0108-3108</b> | <b>59.10</b> | <b>-11.70</b> |
| 64046        | K7          | 737        | -        | X        | X        | X        | X        | X        | -  | -  | -  | X        | -  | O        | 0108-3108        | 60.70        | -5.20         |

Comments:

- EUCOS moored buoys are presented in bold characters.

#### Operating EGOS moored buoys (Seawatch and Wavescans)

| WMO          | Name               | nobs | Wi       | AT       | AP       | dP | ST       | Wa       | Ws       | Dr | Sb | U | SS       | O        | Start_end | Lat          | Lon          |
|--------------|--------------------|------|----------|----------|----------|----|----------|----------|----------|----|----|---|----------|----------|-----------|--------------|--------------|
| 13130        | Gran Canaria       |      | X        | X        | X        | -  | X        | X        | X        | -  | -  | - | -        | O        |           | 28.18        | -15.82       |
| 13131        | Tenerife Sur       |      | X        | X        | X        | -  | X        | X        | X        | -  | -  | - | -        | O        |           | 28.00        | -16.58       |
| 61196        | C. Begur           |      | X        | X        | X        | -  | -        | X        | X        | -  | -  | - | -        | O        |           | 41.92        | 3.65         |
| 61197        | Mahon              |      | X        | X        | X        | -  | -        | X        | X        | -  | -  | - | -        | O        |           | 39.72        | 4.42         |
| 61198        | C. de Gata         |      | X        | X        | X        | -  | X        | X        | X        | -  | -  | - | X        | O        |           | 36.57        | -2.33        |
| 61199        | M. Alboran         |      | -        | -        | -        | -  | -        | -        | -        | -  | -  | - | -        | -        |           | 36.23        | -5.03        |
| 61280        | Tarragona          |      | X        | X        | X        | -  | X        | X        | X        | -  | -  | - | -        | O        |           | 40.77        | 1.47         |
| 61281        | Valencia           |      | -        | -        | -        | -  | -        | -        | -        | -  | -  | - | -        | -        |           | 39.47        | -0.27        |
| 62024        | Bilbao-Visc.       |      | -        | X        | X        | -  | X        | X        | X        | -  | -  | - | -        | O        |           | 43.63        | -3.03        |
| 62025        | C. de Penas        |      | -        | X        | X        | -  | X        | X        | X        | -  | -  | - | -        | O        |           | 43.73        | -6.17        |
| 62082        | E. de Bares        |      | X        | X        | X        | -  | X        | X        | X        | -  | -  | - | X        | O        |           | 44.07        | -7.62        |
| 62083        | Villano-Sis.       |      | X        | X        | X        | -  | X        | X        | X        | -  | -  | - | X        | O        |           | 43.48        | -9.22        |
| <b>62084</b> | <b>C. Silleiro</b> |      | <b>X</b> | <b>X</b> | <b>X</b> | -  | <b>X</b> | <b>X</b> | <b>X</b> | -  | -  | - | <b>X</b> | <b>O</b> |           | <b>42.12</b> | <b>-9.40</b> |
| 62085        | G. de Cadiz        |      | X        | X        | X        | -  | X        | X        | X        | -  | -  | - | X        | O        |           | 36.48        | -6.97        |
|              | C. de Palos        |      | X        | X        | X        | -  | X        | X        | X        | -  | -  | - | X        | O        |           | 37.65        | -0.32        |
|              | Dragonera          |      | X        | X        | X        | -  | -        | X        | X        | -  | -  | - | -        | O        |           | 39.56        | 2.11         |

Comments:

- GTS BUFR data monitoring tools are not yet available. This explains why the number reports and the observation period are missing.
- The snapshot for Seawatch and Wavescan buoys is dated September 3<sup>rd</sup>, 2007
- The EUCOS buoy is presented in bold characters.

The INM (Spain) is reporting data from the Cabo Silleiro buoy (as well as others operated by Puertos del Estado) to the GTS in BUFR code. The messages received in Toulouse RTH are forwarded to Exeter and Offenbach. However, these data are apparently not yet being processed or used by forecast meteorological centres. INM is working to modify the BUFR code they use to the BUFR template proposed by the DBCP.

At present, of the 4 E-SURFMAR moored buoys, only Cabo Silleiro is able to provide directional wave spectra data. Lion is providing omni-directional wave spectra. Development work has been undertaken by the UK Met Office to permit the K series buoys to report directional wave spectra using Iridium as the transmission system. A spectral wave system is expected to be installed on K5 soon. Once proven on K5 the system will be procured and installed on the M6 and Lion buoys. M6 deployed in deep water (3000 m) on the end of September 2006 replaced M1 (moored in 100 m water depth) as E-SURFMAR buoy in order to provide wave data unaffected by the continental shelf. M1 was kept in place by Ireland.

The availability of moored buoy data depends on the number of buoys operating. An average of more than 200 hourly observations per day have been reported on the GTS from the initial EUCOS buoys. About 70 messages per day were reported from the 3 K-pattern E-SURFMAR from September 2006 except in May 2007 (50) and June 2007 (55) due to problems on Lion buoy.

More than 95% of data were received by HH+50 minutes (to be compared to the timeliness of the EUCOS target 85%) for the K-pattern buoys.

The Air Pressure (AP) differences with the French model outputs shows the target of 0.5% of Gross Errors is generally achieved except in March 2007 where K5 reported 66 Gross Errors (GE). The RMS of AP differences are between 0.4 to 0.9 hPa.

Real time observations from moored buoys are subject to routine quality monitoring in the same way as drifting buoys.

## **4. PLANS**

### **4.1 Drifting buoys**

The E-SURFMAR design study has recommended the deployment of an average of 175 SVP-B type drifters per year. For financial reasons (buoy and transmission costs) this will take several years to achieve. However, the drifting buoy component has been fully funded by E-SURFMAR since 2006, i.e. in addition to the drifting buoy purchases, all the communication costs are funded by E-SURFMAR. Within the allocated budget about 100 buoys (including 30 upgrades) will be deployed in the E-SURFMAR area of interest in the coming twelve months.

The transmission of drifting buoys data through Iridium will be more and more used as an alternative to Argos (about 50% planned in 2008).

E-SURFMAR will continue to evaluate the contribution to the International Polar Year. The main challenge with the ice buoys is their ability to survive after being released from frozen ice. If it could be proven that NWP over Europe benefits from buoy data in the Arctic region (studies to be carried out), then E-SURFMAR could consider the regular deployment of such buoys.

### **4.2 Moored buoys**

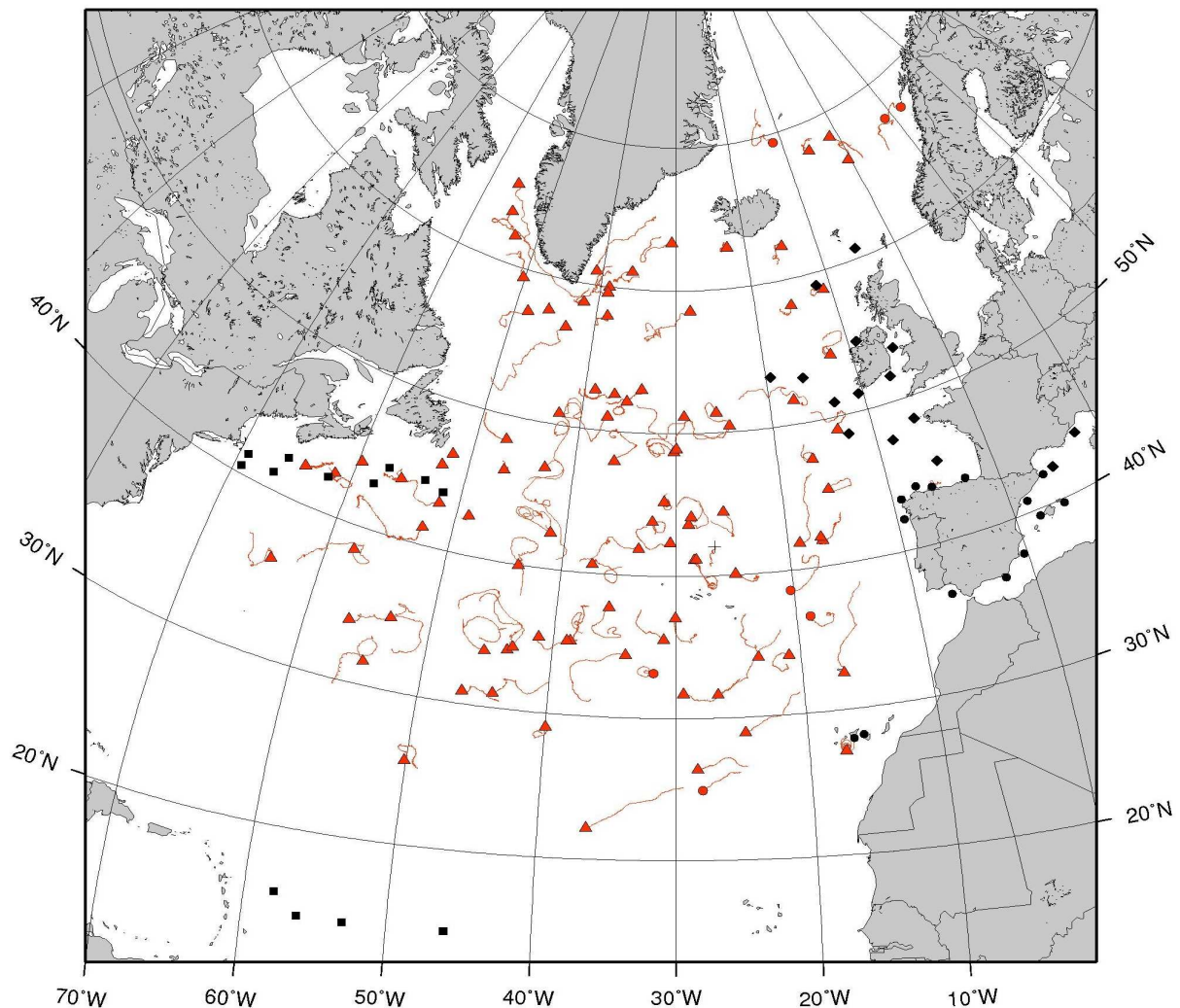
K5 (59.1N – 11.5 W), Cabo Silleiro (42.1N – 9.4W), Lion (42.1N – 4.7E) and M6 (53.1N – 15.9W) are designated as E-SURFMAR moored buoys.

The E-SURFMAR design study has recommended that directional wave spectra should be provided by all four buoys. By fall 2007, K5 buoy should report directional wave spectra data through Iridium 4 times each day at the main synoptic hours. Once proven the system could be procured and installed on the M6 and Lion buoys.

## 5. INFORMATION ON E-SURFMAR

The new EUCOS management team (DWD) opened the EUCOS website (<http://www.eucos.net>). Under the heading "EUCOS Public" in "EUCOS networks" there is information about E-SURFMAR. This site is intended to be the official public site for E-SURFMAR. A link will be provided from this site to provide access to publicly available documents such as the reports.

In addition there is a restricted working area web site for E-SURFMAR participants (<http://esurfmar.meteo.fr>), it is based on a collaborative scheme which allows the participants to easily create and modify certain pages on the site.



**Figure 2.** Operating Buoys in E-SURFMAR area  
Drifting buoy trajectories and moored buoy positions  
(August 2007)

- Drifting buoys AP
- Drifting buoys wind
- ▲ Esurfmar drifting buoys AP
- ▲ Esurfmar drifting buoys wind
- Moored buoys
- ◆ EGOS moored buoys
- EGOS Spanish moored buoys