

8.2. Sea temperature, wave heights and ocean currents

Sea surface temperature, wave heights and ocean currents are important environmental factors that can severely affect oil prospecting and oil production at sea. Sea temperature (Fig. 8.8), especially at the surface influences safety of personnel, ice accumulation on structures and degradation of oil products in case of oil spills.

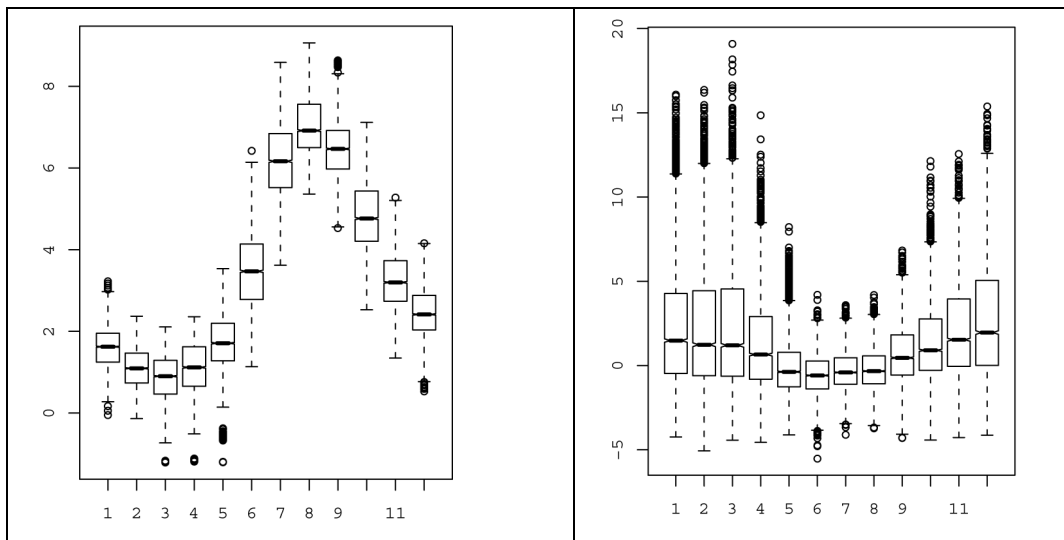


Figure 8.8 Reconstructed sea surface temperature in °C by month (left) and difference between air and sea temperature (right) at 68°30' N and 9° W for the years 1958-2001 according to ERA-40 database. Half the values are inside the boxes and the median is indicated with the horizontal line. The dispersion of the other half of the values is shown by the vertical line and individual outliers are marked with circles (Ásdís Auðunsdóttir et al. 2007).

Heavy waves can interfere with measurements, drilling and production operations, cause accidents and damage to structure and equipment. All decisions regarding the kind of equipment that suits drilling operations, oil production and preventing pollution must consider this. It seems that the waves in the Dreki area are generally significantly smaller than in the area south and west of Iceland (Fig. 8.9) or at the west coast of Norway (Fig. 8.10). In the Dreki area the wave height reached once in 100 years is about 12 m, which is comparable to the wave heights off northeast Iceland. Off the south and west coast the corresponding wave heights are 16 to 17 m and 14 to 16 m off the west coast of Norway (Gísli Viggósson et al. 2007, NTS 1999).

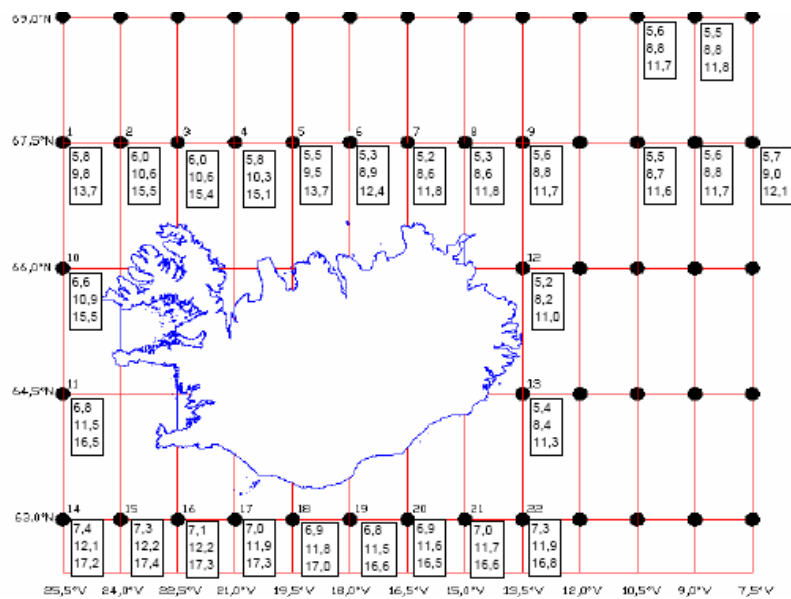


Figure 8.9 Potential wave heights in meters in Icelandic waters based on model calculations. Upper Value gives waveheight reached in 98% of cases. Middle value the mean of the highest wave height reached once a year and lowest value gives a highest wave height reached once during a 100 years period (Gísli Viggósson et al. 2007).

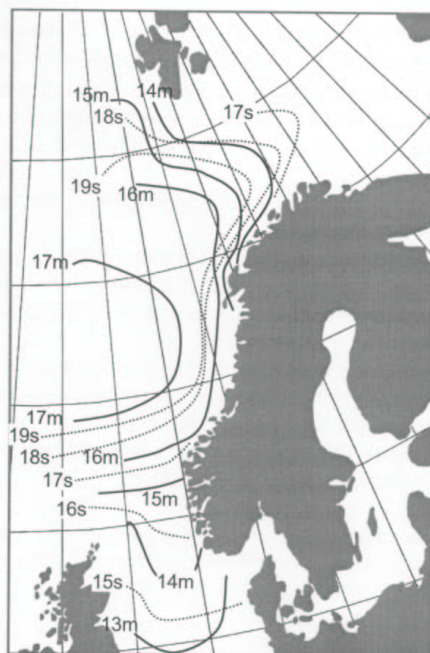


Figure 8.10 Hundred year potential wave height and frequencies off the Norwegian west coast (NTS 1999)

Ocean currents both at the surface and below are important in dispersing pollutants. In case of oil products spilling into the ocean it is important that a good knowledge exists of the surface currents. The surface currents are largely affected by wind and models simulating drifting of

oilfilm on the surface of the ocean must be able to accommodate for the wind. Both public authorities and oil companies have to possess information about these oceanographic parameters for the oil prospect area and account for them in their planning and development.

What kinds of observations are necessary for each phase in oil prospecting and exploitation needs to be evaluated. Also one has to consider what data is needed, what research has to be conducted, what kind of monitoring has to take place, what information service is needed and what are the different roles of government institutions and private companies.

A general overview of the surface currents is presented in figure 8.11. The Dreki area is in the north-eastern part of an extensive counterclockwise current circulation between Iceland and Jan Mayen. This circulation is fed with cold polar water of the east-Greenland current from the west and Atlantic water from the Norwegian Sea from the southeast and east. If this current system dominates it may keep oilspills trapped in the area for extended periods.

There are, however, no direct current measurements from the Dreki area and therefore knowledge of the current system is presently only based on indirect evidence from density gradients, satellite altimetry and modelling using limited data.

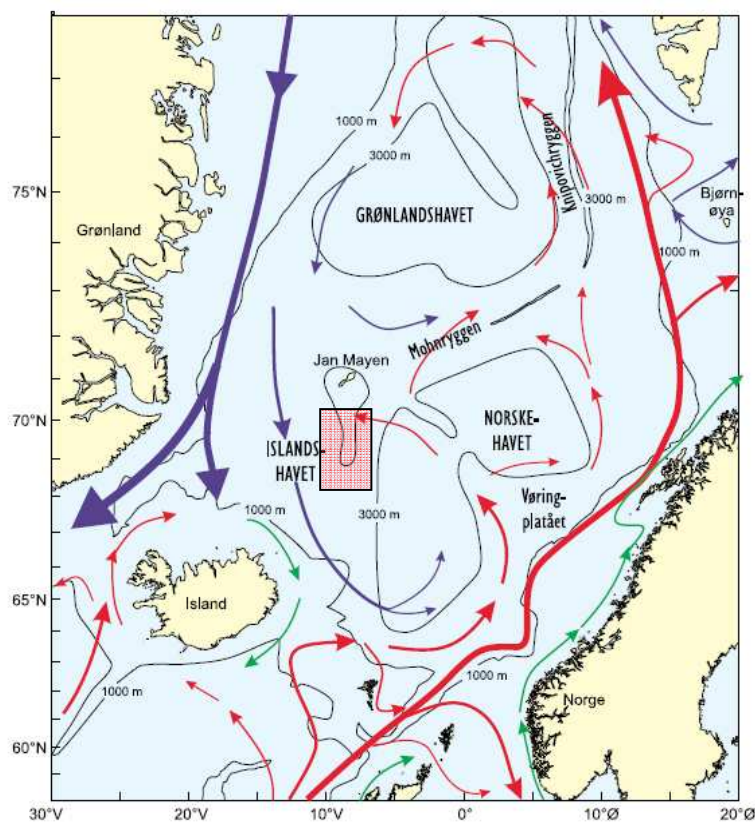


Figure 8.11 General current systems of the Nordic Seas. Shaded area shows the approximate location of the northern part of the Dreki area (Marine Research Institute 2007).

It is considered necessary to mount ADCP current profilers on the seafloor for a period of one year to get a more reliable knowledge of the ocean currents in the prospect area. In addition, profile measurements with a ship-mounted ADCP on transects along and perpendicular to the Kolbeinsey-ridge should be made three times; i.e. when the seafloor-mounted current profiler is

deployed and recovered and once in between. This would make modelling of currents in the area easier and much more reliable.

It would be advisable to use similar moored-buoy mounted installations for weather and wave monitoring to gain at the same time further knowledge of the climate and the general oceanography in the area.