Sea Conditions Guide:

The North, Norwegian and Barents Sea

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These seas experience many different weather phenomena due to their proximity to the Arctic, Atlantic Ocean, and European landmass with up to six different airmasses colliding in this region.

Due to the highly developed nature of NW Europe, the North Sea especially has a high number of offshore activities occurring from oil and gas exploration and extraction, shipping, dredging and renewable energy developments as well as salvage operations to name a few.

The UK & Netherlands as well as other European countries surrounding the North and Norwegian Seas are currently experiencing a strong ramp-up of offshore wind energy construction activities in the North Sea with 'greener' energy alternatives required to meet the Paris Climate Agreement. Next to wind energy the North Sea hosts several important (economic) activities, including oil and gas production, fisheries, sand and shell extraction, shipping, areas for military use, nature reserves, and recreational activities. The area thus has an important economic and environmental function for Northwest Europe.

Accurate and precise weather forecasts are a necessity in most offshore operations to reduce costs, mitigate or avoid delays and improve safety during the planning before, during and sometimes after projects. When operational limits are marginal accurate forecasts are essential and are often required by insurers. Short to medium term forecasts (5-7 days) help with day to day running making sure operational limits and the safety of personnel/equipment are within bounds. Our Further Outlook and Forecast Discussion Document forecasts (15 days) give project managers, stakeholders and decision makers a better idea of upcoming weather events and help them mitigate delays and better plan operations on longer time frames.

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Advection Fog

Meteorologically fog is defined and officially observed when humidity is high (e.g.>80-90%) and visibility is below 1000m with fog differing from cloud only due to its base being at the surface.

Advection fog is the most common over these seas and forms when relatively warmer, moist air moves over colder waters.

The cooling effect from the water allows the vapour in the air to condense near the surface forming low cloud and fog. Now the cooled air at the surface is denser and less buoyant a stable temperature inversion is created in the airmass. The depth of the fog layer and inversion depends on the moisture content of the air, temperature differential between the air and water, wind speeds that inhibit or promote turbulence and mixing as well as the amount of solar radiation. Events can last for prolonged periods if conditions are favourable.

The Key Impact on Offshore Operations

Polar lows are intense and rapid, accompanied by high wind speeds, large wave growth, and large snowfalls. There are uncertainties in polar low forecasts, and marine offshore activities should not take place along the possible tracks of such events - even if the waves would be less than the extreme waves for the area. The MetOcean conditions in polar lows suggest that a vessel at sea may experience severe sea spray icing, which can lead to issues with vessel stability.

Polar Lows

A polar low is typically defined as a short-lived, mesoscale depression forming over maritime areas northwards of the main polar front.

They usually occur during wintertime when a cold airmass is advected over warmer waters and are enhanced by positive vorticity advection usually westward of a previously occluded low. The large transfer of latent heat from the relatively warmer water into the cold air produces instability in the airmass with the rising, moist air creating heavy sleet, snow and/or hail showers and, in their mature phase, forming characteristic spiral cloud bands.

Strong surface winds associated with these lows are usually enhanced by downdrafts from the convective showers and can easily reach Bf 10.

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Icing

This can occur throughout the atmosphere and, although can look very pretty, can have disastrous consequences to both marine and aviation.

Generally icing occurs when super cooled water droplets (rain/wet snow – predominately found at temperatures between 0°C to -20°C) freeze on contact with a surface in temperatures usually below 0°C.

For marine activities sea spray as well as super cooled rain/wet snow can also be the cause and occur mostly in Arctic waters and the Barents/Norwegian Sea but in rare instances in the North Sea as well.

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For vessels and rigs as well as aircraft and helicopters icing can add huge additional weight to their structures which can sometimes lead to the loss of structural integrity and, in extreme cases failures, capsizes and complete collapses. In aviation it can also cause disruption to airflow over the aerofoil surfaces causing additional drag and loss of lift which can be disastrous during flight. Icing on wind turbine blades also reduces the amount of power produced so it's important to be able to foresee, prepare and possibly mitigate such events with accurate forecasts.