

Ice behavior in northern regions, availability and need for metocean data

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Ice and metocean data is needed for logistical support like marine operations, aviation, oil spill response, as well as for the design of offshore structures, vessels and pipelines. The presentation gives a high level overview on where ice and metocean data is needed by the oil and gas industry.

Operational support can cover a wide variety of operations such as seismic data acquisition, drilling, geotechnical surveys and all kind of marine logistics. When the amount of operations is significant, it is commonly seen that an operational ice and weather forecasting center is established where ice charters and weather forecasters work together to provide all the required ice and metocean data products. The role of ice charters becomes important when sea ice or icebergs are present in the operational area. The main source of data for production of ice maps is satellite imagery but all kind of other data sources like observations from vessels and offshore structure, marine and coastal radar systems and weather stations provide useful data also. The weather forecasters can help the ice charters to provide an ice forecast. A long experience exists for provision of a weather forecast. However, the ice products that are useful to support a certain operation are still in development. Hence, a close cooperation and interaction between ice charters, weather forecasters and the people in charge of operations (drilling, seismic, etc.) is highly recommended.

Ice and metocean data is also needed for the design of structures and pipelines. Typical Arctic metocean parameters are marine and atmospheric icing, visibility and cloud height, air temperatures, the presence of polar lows, waves in ice, frozen soils, etc.. Detailed specification of these data at the start of the design phase of a project is required. Obviously, data on sea ice and/or icebergs is essential depending on the exact location of your site. In the early phase of a project, some general statistics on ice season duration, ice thickness, and ice types are usually sufficient. In concept selection and early design, more and more ice data needs to be provided as input into e.g. ice loading calculations on structures. A wide variety of data sources and data collections campaigns is often required, which is costly and can also take many years. Specification of global and local ice loads requires data on the ice environment but also detailed information about the structure itself. Floating structures may often not be fully designed for ice loads and therefore, an ice management system with the objective to reduce ice loads to an acceptable level, needs to be established. In addition to loading onto a structure, icebergs and sea ice can also generate gouges and pits on the seabed. They form a potential hazard for pipelines and, as a consequence, pipelines need to be buried at a certain depth below the seabed. Ice engineers and pipeline engineers have to work together to determine the optimal pipeline burial depth from both a safety and cost perspective.