Insight: A Metocean and Ice Climatology Database for Offshore Newfoundland and Labrador

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In 2015, the Oil and Gas Corporation of Newfoundland and Labrador, in collaboration with C-CORE, undertook the first iteration of a metocean and ice climatology study and database for the offshore Newfoundland and Labrador region. Data were initially summarized for 391 study area subsections or “grid cells.” The study was updated in 2017 and 2021–2022 and expanded to 575 grid cells. This paper summarizes the key results from the most recent 2021–2022 study. The main aim of the study is to provide the most comprehensive, up-to-date, and accurate database regarding the meteorological, oceanographic, and ice conditions in the study area.

INTRODUCTION

Since 2011, the Oil and Gas Corporation of Newfoundland and Labrador (Oilco, formerly Nalcor Energy Oil and Gas) along with partners Petroleum Geo-Services (PGS) and TGS Geophysical have embarked on a multiyear regional two-dimensional (2D) seismic program offshore Newfoundland and Labrador (NL). More than 180,000 line kilometers of 2D broadband seismic have been acquired by 2022 as well as nine three-dimensional (3D) surveys covering over 60,000 square kilometers of frontier basins. The seismic data collected have led to some major scientific advancements of the regional geography, such as the newly defined Chidley, Holton, Henley, and Hawke sedimentary basins off the Labrador coast (Carter et al., 2013), and a Lower Tertiary play trend (Wright et al., 2016), which was imaged on the 2015 multi-client 3D seismic survey.

The NL offshore now has 20 defined sedimentary basins ranging from the Paleozoic to Cenozoic ages, all of which are potential candidates for oil and gas exploration (Fig. 1). As part of Oilco’s exploration strategy, an ice and metocean study was considered a critical piece of information in an area of frontier exploration. Oilco issued the Metocean Climate Study Reports (and associated Nalcor Exploration Strategy System (NESS) database and Geographic Information System (GIS)) for Phase 1 in May 2015 (C-CORE, 2015; King et al., 2015), Phase 2 in September 2017 (C-CORE, 2017), and Phase 3 in April 2022 (C-CORE, 2022). Phase 1 covered the area from 45.5° N to 63° N latitude, and from 42° W to 65° W longitude, with a total of 391 “grid cells” (of 0.5° Latitude × 1° Longitude each). Phases 2 and 3 extend further south, covering the area from 39.5° N to 63° N and from 42° W to 65° W, covering the entire Grand Banks and the Southern Shore and the West Coast of Newfoundland/Gulf of St. Lawrence east of Anticosti Island. Phases 2 and 3 encompass 575 grid cells (Fig. 2), an area of more than 2.3 × 10⁶ km² offshore NL.

The objectives of all three phases of this study were to:

• Characterize regional ice and metocean conditions (winds, waves, currents, visibility, vessel icing, pack ice, icebergs and ice islands, and sea surface and air temperature) in the specified area of interest; and
• Compare these conditions to those in other analogous internationally explored regions (e.g., East and West Greenland, the North Sea, Rockall Basin, Barents Sea, Canadian Beaufort Sea, Chukchi Sea, Kara Sea, Caspian Sea, Sakhalin Island, Grand Banks, and Orphan Basin).

The study area may be divided into four main regions:

1. The Labrador Sea, which can be divided into three distinctive areas (Phase 1):
   • The Labrador Continental Shelf (Hopedale and Saglek Basins);
   • The Labrador Shelf Slope (Chidley and Hawke Basins); and
   • Deep-water offshore (Chidley and Holton Basins).
2. The Newfoundland offshore eastern areas (Phase 1):
   • Newfoundland Shelf and Slope (includes St. Anthony and Orphan Basins);
   • The North-East Grand Banks of Newfoundland (includes Jeanne d’Arc Basin);
   • Flemish Pass (includes Flemish Pass Basin); and
   • Flemish Cap.
3. South-East and West Grand Banks (includes sedimentary basins of Whale, Horseshoe, Carson, Bonnition, Salar, Fogo East and Fogo West (Norris, 2016), South Whale, and Laurentian Basins); and,