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DriX

DRIX LINE KEEPING CAPABILITIES

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This document deals with DRIX line keeping capabilities. Its behaviour was assessed in different weather and current conditions.

Document history

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One of DRIX assets is its great line keeping capabilities. DRIX has already been tested on different projects and in different sea states & current conditions, in order to assess those capabilities. In the tests below, DRIX's off track to its mainline in different conditions was recorded :

- Optimal conditions: almost no current / clear weather.
- "Complex" weather conditions: 15 knots of wind / sea state 3.
- "Complex" hydrodynamic conditions: about 2 knots of side current (North of Raz de Sein, France).

1. OPTIMAL CONDITIONS

1.1. SURVEY AREA AND CONDITIONS

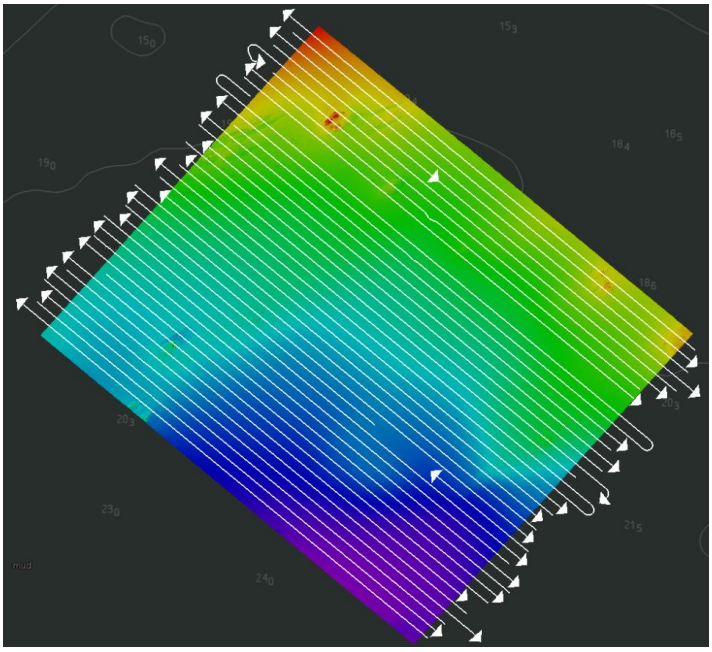

Figure 1 : line keeping map in normal conditions

An example of lines used for a bathymetric survey is given below. The weather conditions during the survey were optimal with almost no wind, a sea state of 1 to 2, and very little current.

1.2. LINE KEEPING RESULT IN OPTIMAL CONDITIONS

The two figures below show DRIX heading variations during each of the above surveyed lines and compared to the theoretical line bearing (black line). Figure 2 shows the lines going to the South East (12 lines). Figure 3 shows the lines going to the North West (12 lines). Each line has a different colour.

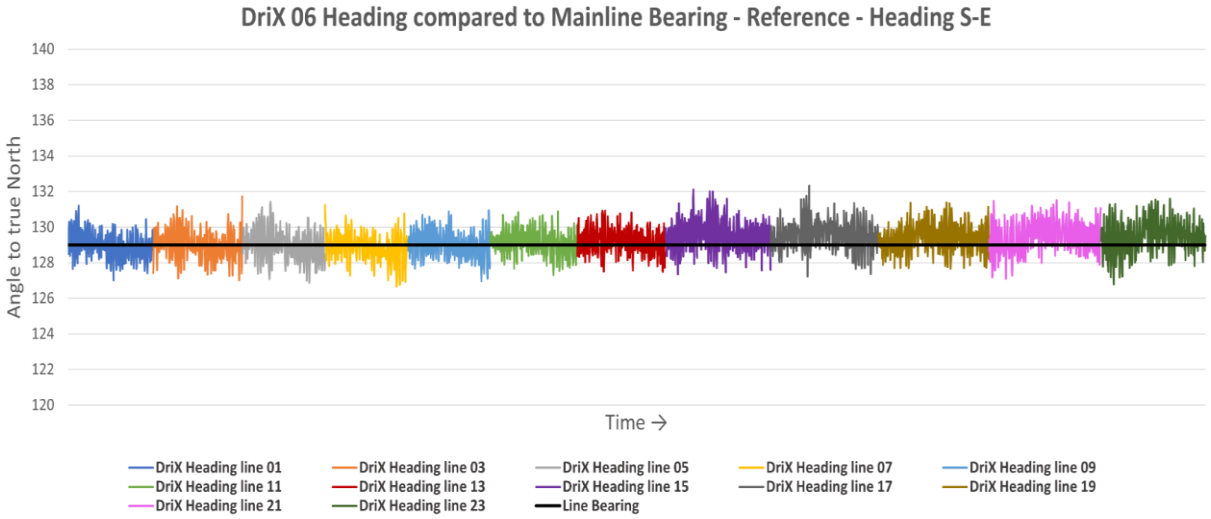

Figure 2 : DRIX heading compared to mainline Bearing (S-E)

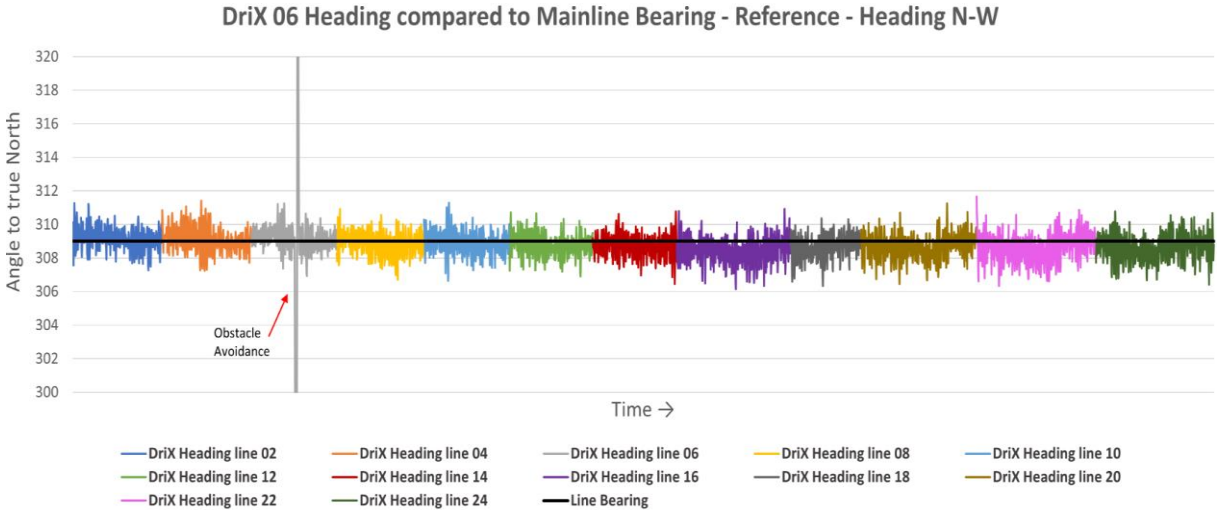

Figure 3 : DRIX heading compared to Mainline Bearing (N-W)

The two figures below show DRIX off-track in metres to its line for each of the 24 lines. The figure 4 shows DRIX off-track for the 12 lines going to the SE. Figure 5 shows DRIX off-track for the 12 lines surveyed to the NW.

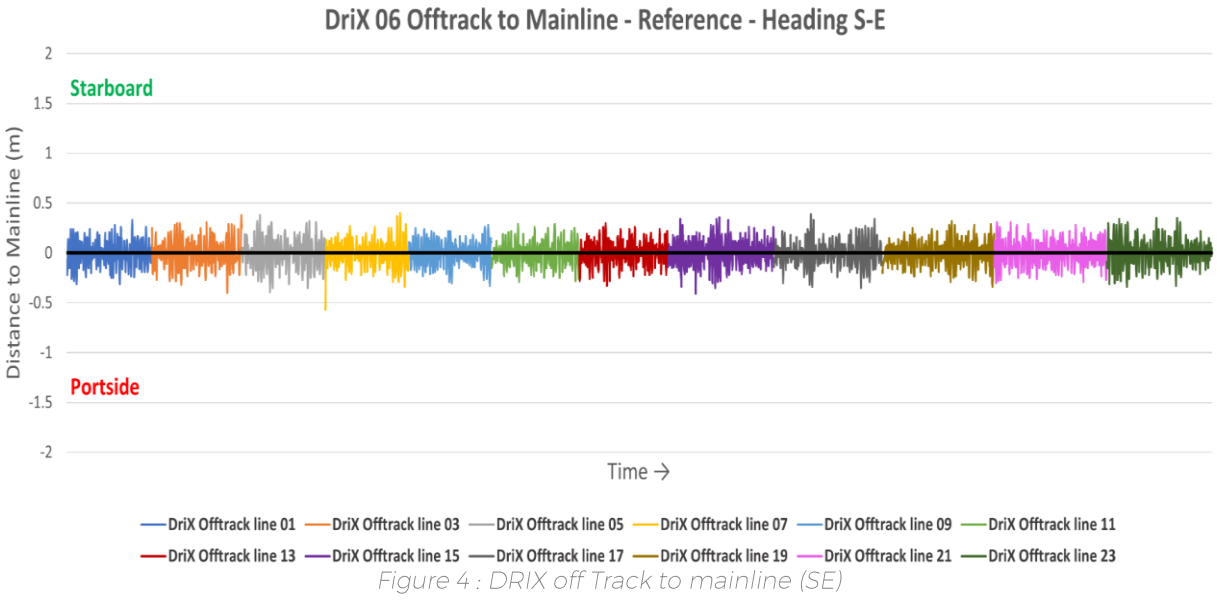

Figure 4 : DRIX off Track to mainline (SE)

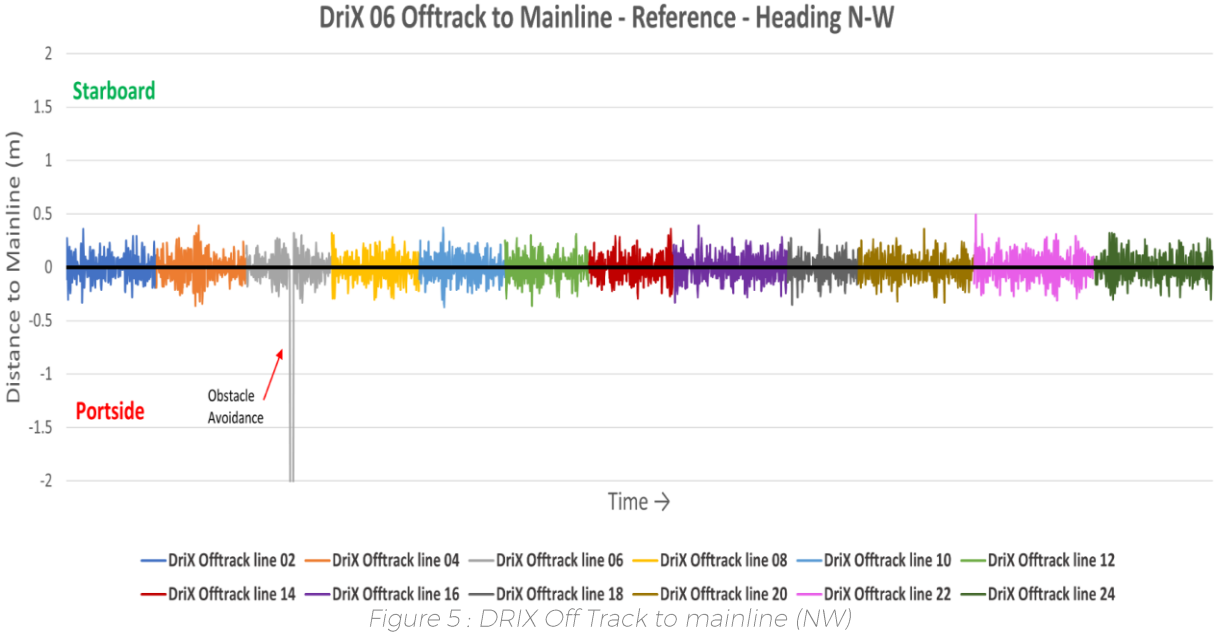

Figure 5 : DRIX Off Track to mainline (NW)

Results show that in optimal weather and current conditions DRIX is able to maintain an insignificant off-track (on the example above the mean off-track value is 15cm). DRIX stays on its line with minimal heading adjustments.

2. SEA STATE & WIND

2.1. SURVEY AREA

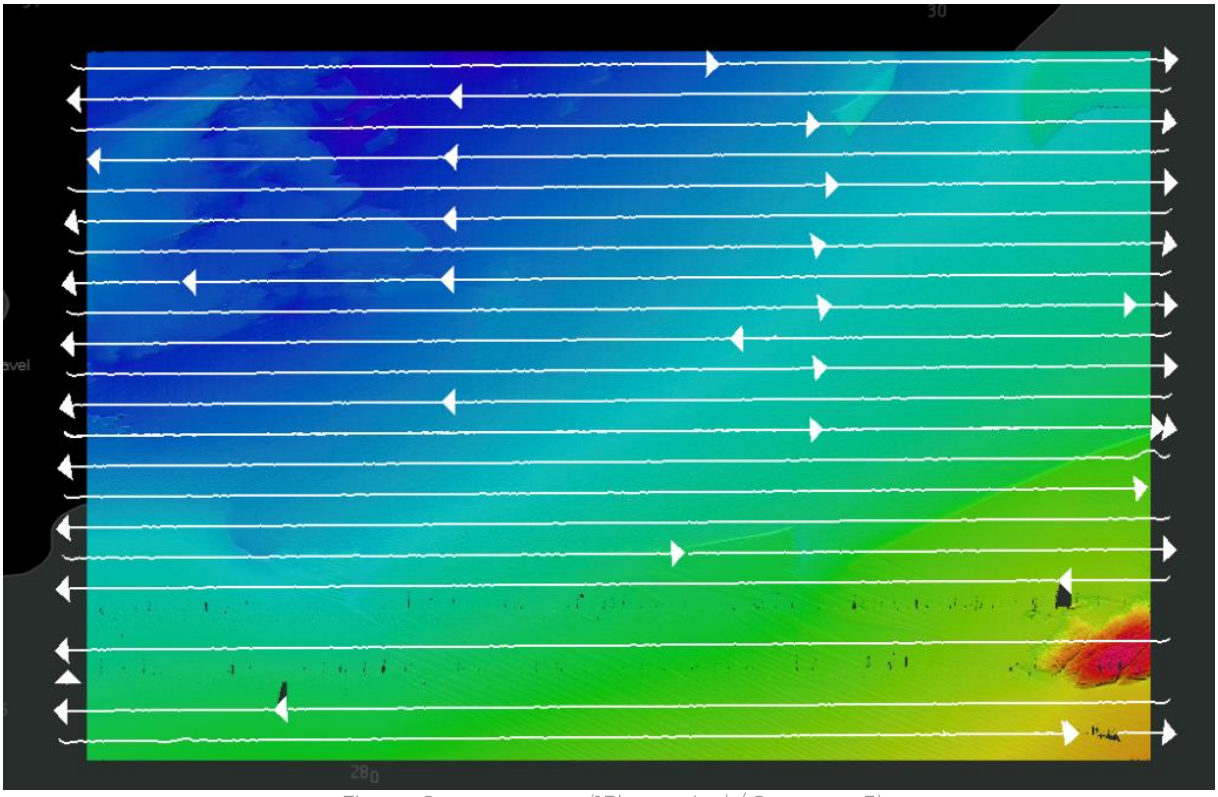

Figure 6 : survey area (15knts wind / Sea state 3)

In conditions with approximately 15 knots of wind (gust of 20 knots) and sea state 3, a DRIX was deployed to perform a bathymetric survey.

2.2. LINE KEEPING RESULT IN SS3

Both figures below show DRIX heading variations along its line, compared to the theoretical line bearing (black line) for 6 lines. Figure 6 shows DRIX heading related to mainline with wind on port side. Figure 7 shows DRIX heading related to mainline with wind on starboard side.

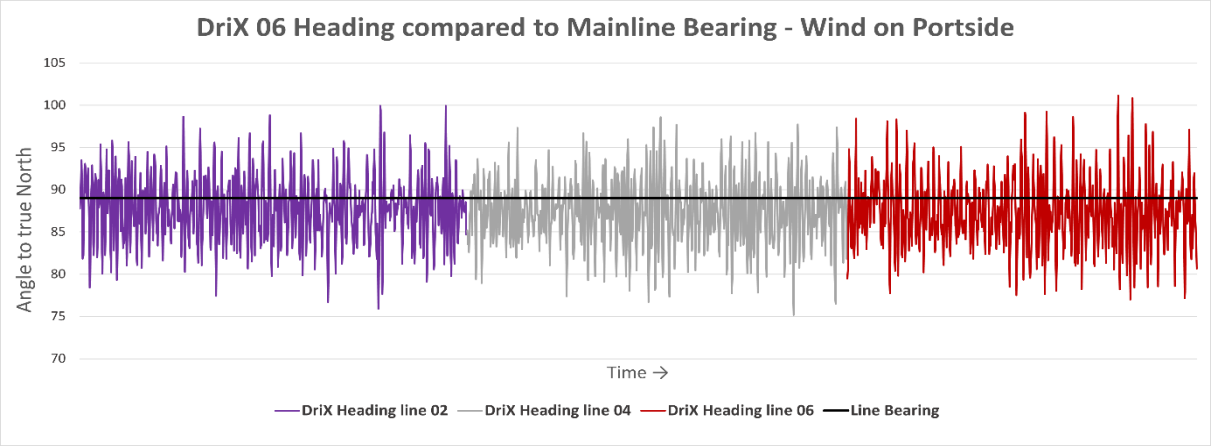

Figure 7 : DRIX heading to mainline (portside wind)

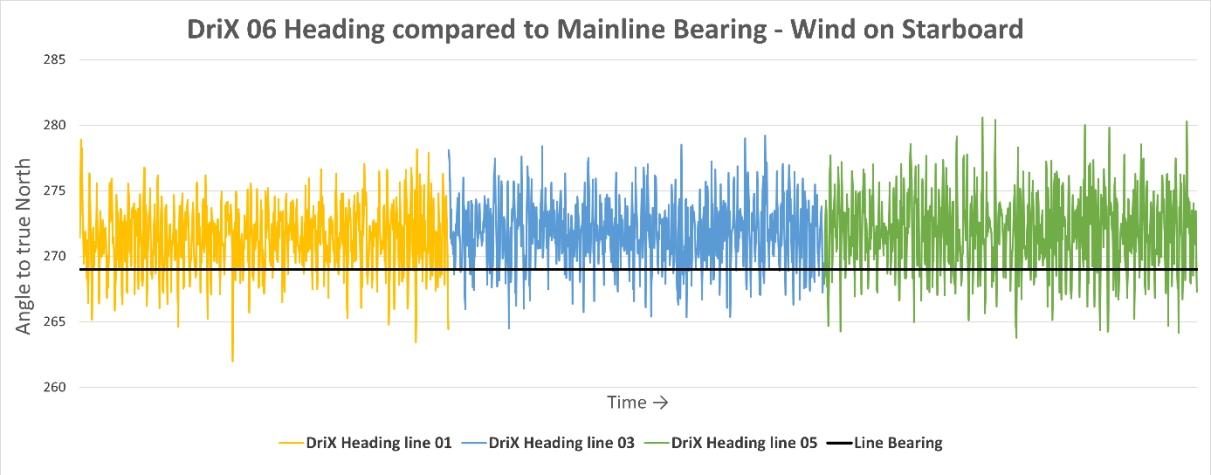

Figure 8 : DRIX heading to mainline (wind on starboard side)

Both figures below show DRIX off-track in metres to its line for each of the lines. The figure 8 shows DRIX off-track for the lines with wind on Portside. The figure 9 shows DRIX off-track for the lines surveyed with wind on starboard side.

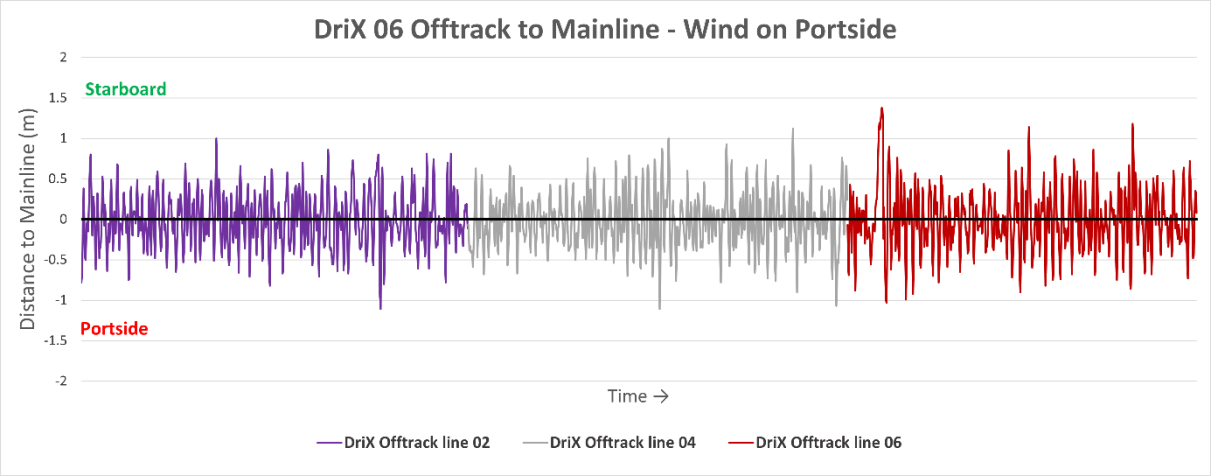

Figure 9 : DRIX off Track to mainline (Wind on port side)

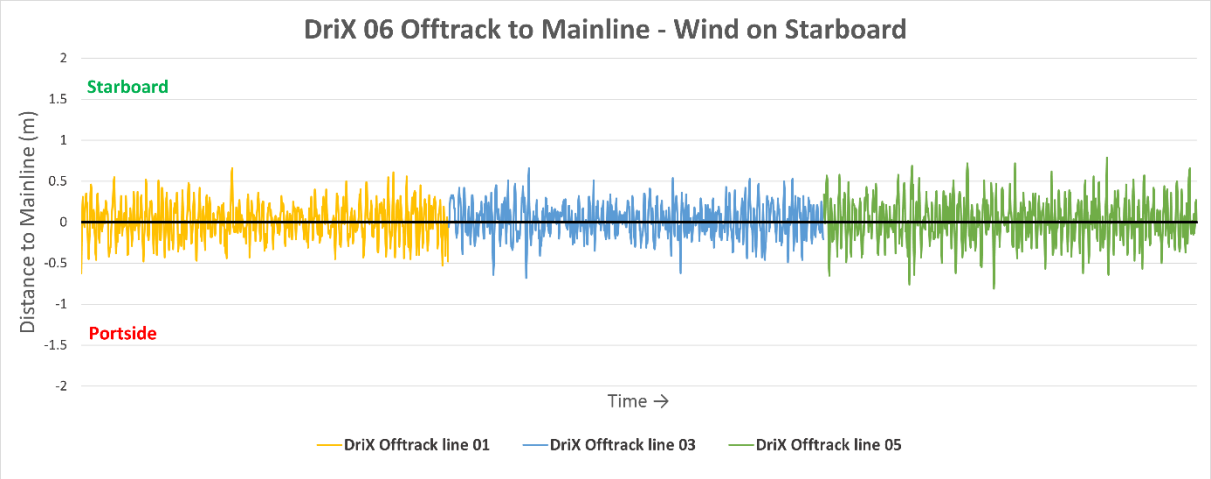

Figure 10 : DRIX off Track to mainline (Wind on starboard side)

Results show that even in more complex weather conditions DRIX is capable of maintaining a small off track, with a mainly a distance to line being under 50 cm. Heading adjustment is slightly more important than in optimal conditions.

The off-track results are relatively similar to the results obtained under optimal conditions, which confirms DRIX ability to perform very well at line keeping despite the wind or the sea state.

3. TIDE CURRENT

3.1. SURVEY AREA

DRIX has already performed bathymetric surveys in difficult hydrodynamic conditions when working in the English Channel. Lines were oriented in the current direction. Current speed could reach up to 2 to 3 knots. In this scenario, DRIX is simply adjusting its engine Rate Per Minute in order to maintain an identical survey speed in both directions.

An off-track test was performed in side-current conditions in the north of Raz de Sein, in Britany (France), a place known for its strong tidal currents. When running the bathymetric survey 3 hours after high tide, during spring tides. The tidal current is heading towards the south.

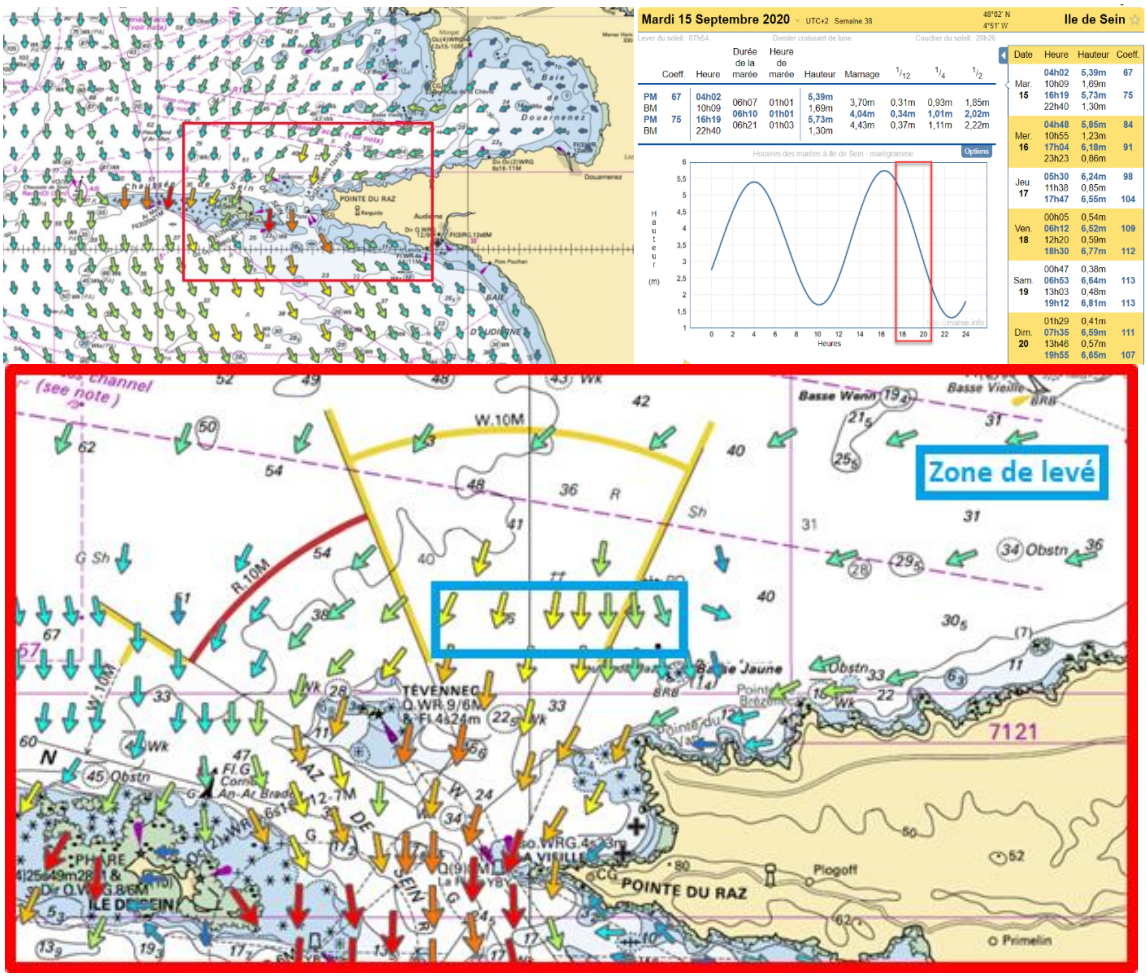

Figure 11 : Tidal current on survey area

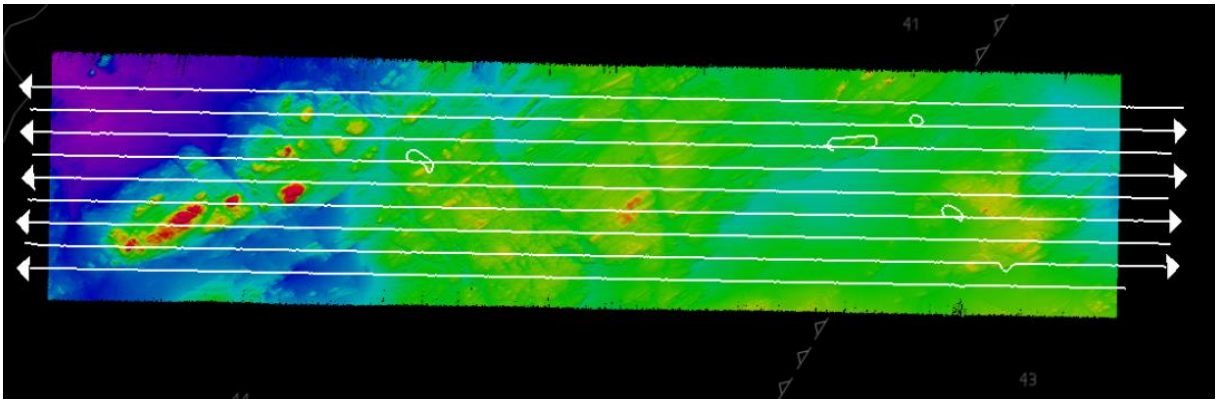

Figure 12 : Bathymetric data and navigation line

The current crosses the survey area with different speeds increasing from the East to the West of the area.

3.2. LINE KEEPING RESULT IN STRONG CURRENT

The figure below shows lines surveyed in this area with an East to West direction, meaning starting in a low current environment and ending in a stronger current environment. As the current increases when going West, DRIX adjusts its heading to counter the current with a compensation of up to 12°.

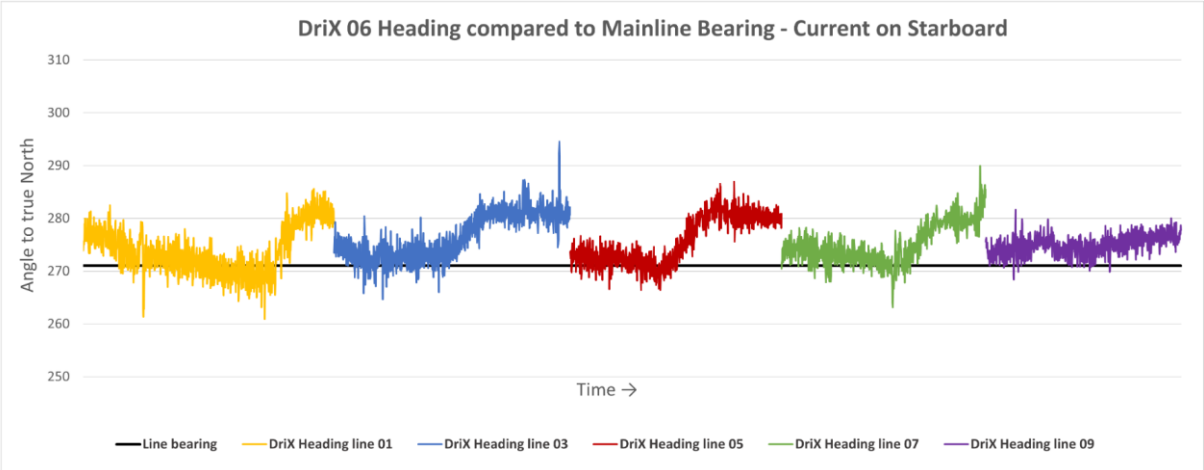

Figure 13 : DRIX heading to mainline (Current on starboard side)

The figure below shows all lines surveyed with a West to East direction, on which DRIX starts with a strong heading compensation of up to 12°. As the current slows down to the East, DRIX decreases its heading compensation.

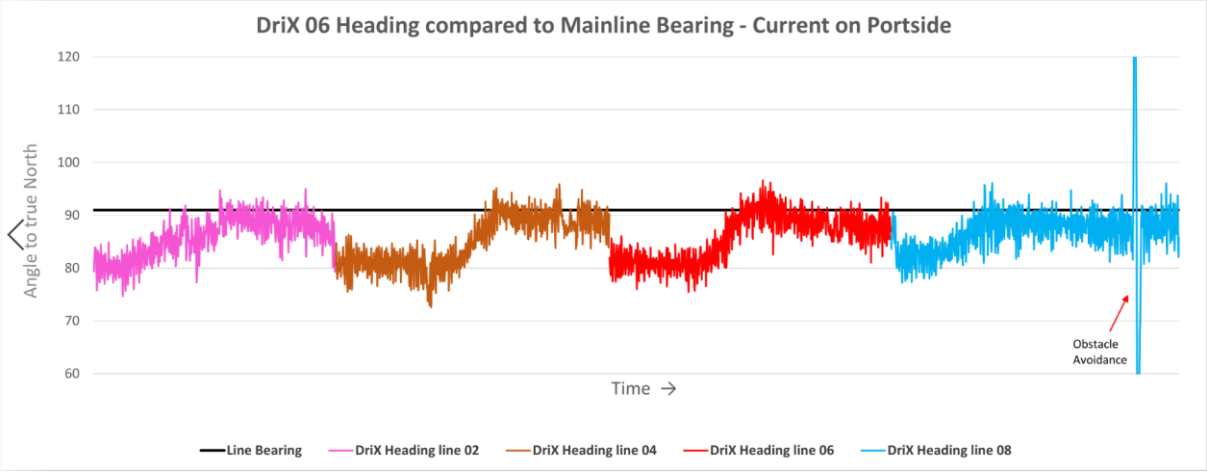

Figure 14 : DRIX heading compared to mainline (current on port side)

Both figures below show the off-track in metres, in both directions. Most of DRIX deviations from the line is not exceeding 25 to 30 cm, whatever the direction of the lines. The results are similar to those obtained under optimal conditions, which demonstrates DRIX line keeping capabilities in strong side currents.

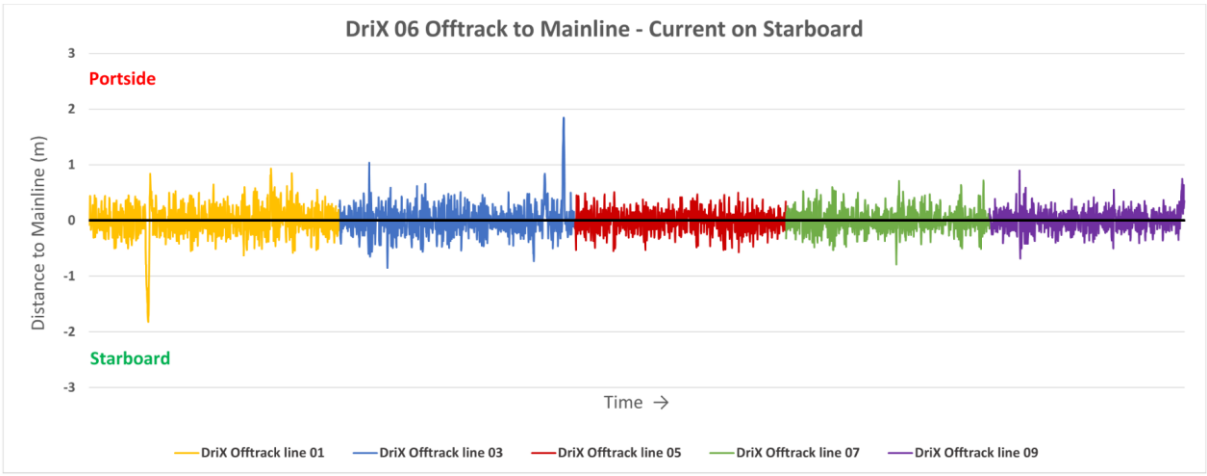

Figure 15 : DRIX off track to mainline (current on starboard)

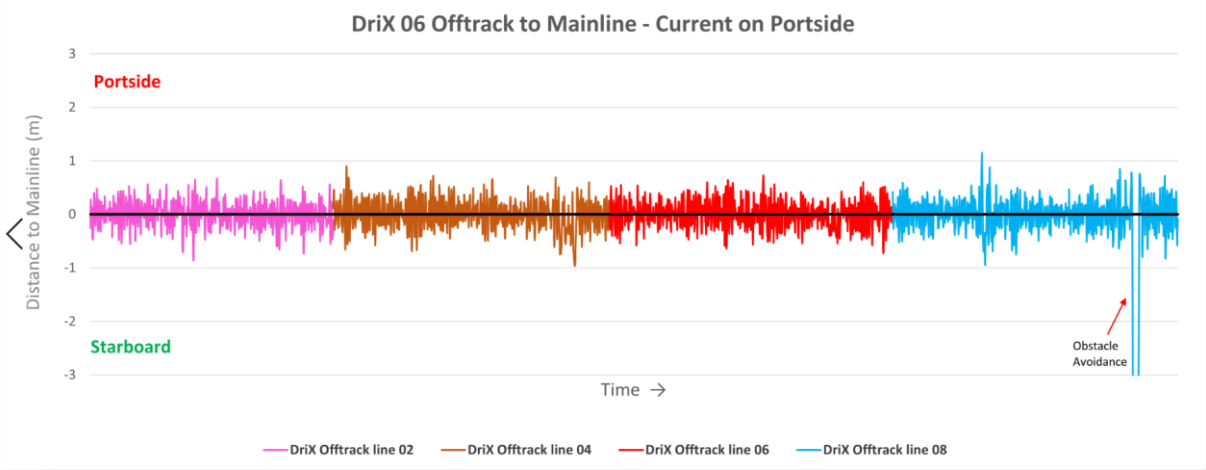

Figure 16 : DRIX off track to mainline (current on Portside)