



Technical Report

The tidal current around the point Glyvursnes, Faroe Islands

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point Glyvursnes, Faroe Islands**

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1 Introduction

The municipality of Torshavn has plans to place a dump in a disused quarry in the headland of Glyvursnes. One of the tasks is to estimate the initial dilution of run-off material from the dump into the ocean close to planned dump.

In this connection the consultant company have required estimates for the tidal currents in the vicinity of the point Glyvursnes and a description of the tidal currents in the area.

This report includes plots which are representative for the peak current speeds in the area at mean and spring tide, and twelve tidal current maps representing the currents in a tidal cycle at mean tide.

2 Material

The plots in the present report are generated from the results of simulations of the tides with a numerical model solving the barotropic non-linear equations of motion and the equation of continuity [Simonsen and Gislason, 2002].

The numerical resolution of the model was 100 m, and the model was forced by the constituents M_2 , S_2 , O_1 , and K_1 . The model result was analysed for the forcing constituents, and additional 14 higher harmonics originating from the forcing constituents.

The model is validated towards a fairly large number of measurements, and is found to give a fairly representative description of the tidal currents in the coastal regions of the Faroes [Simonsen and Gislason, 2002].

The area of the fish farming site at Gulin just of Torshavn (Red polygon on the plots) is drawn according to the license details for the actual site, which are available from the harbour authorities (www.landsverk.fo).

3 Average and maximum currents speeds

The tidal currents in the area are in general dominated by the semi-diurnal constituents M_2 and S_2 , where the contribution from the M_2 -constituents in general is about 2-3 stronger than the contribution from S_2 . The contribution from the diurnal constituents is in general weaker than from these two semi-diurnal constituents.

Close to headlands and abrupt features in the bathymetry, the higher harmonics do provide a significant contribution to the total tidal current strength. In particular the contribution from the M_4 -constituent exceeds the S_2 contribution in some locations in the considered area.

Plots of the tidal ellipse semi-major axis lengths for M_2 -constituent is shown in Figure 1, and the sum of the semi-major axis lengths from the two semi-diurnal constituents is shown in Figure 2. Figure 2 is to a very large degree representative for the peak current at mean tide.

In Figure 3 the sum semi-major Length from 8 of the major constituents (M_2 , S_2 , O_1 , K_1 , M_4 , M_6 , M_8 , and MS_4) in the area presented, which to a very large extent represents the expected peak current speed at mean spring tide.

4 Description of the tidal currents

The tidal currents in the area are shown by 12 tidal current maps in Figures 4-6, which shows the situation for approximately every hour through the main tidal cycle (12.4206 hours) based on the M_2 , S_2 , and M_4 constituents derived from numerical simulations.

The semi-diurnal constituents are generally dominating the tidal currents in the area, but the M_4 constituent is also included since this constituent have a significant contribution at several locations in this area.

The time is given by a timebar on the plots, which indicate the waterlevel variation at Trongisvagi, which traditionally is used as reference tidal station. High water at Trongisvagi almost coincide with slack water after westgoing tide ("vest-falskyrrindir") in Suðuroyarfirði, which is used as reference by local sailors.

5 Concluding remarks

- Plots representative for the peak current speed at mean and mean spring tide are provided.

In general the currents most be considered to be relatively strong, although there are areas along the coast with calm waters. The peak currents just of the point Glyvursnes are about 0.5 m s^{-1} (Figure 2) at mean tide and exceeds 1.5 m s^{-1} at spring tide (Figure 3), while the areas close to the coast just south of Glyvursnes and north of Glyvursnes just of the harbour of Torshavn are characterized by relatively calm water.

In the area south of Kirkjubønes, the peak currents are generally exceeding 2 m s^{-1} except for some areas close to the coast.

- Tidal current maps for the area around Glyvursnes with approximately one hour interval is provided (Figures 4-6).

6 Plots

- see the following pages.

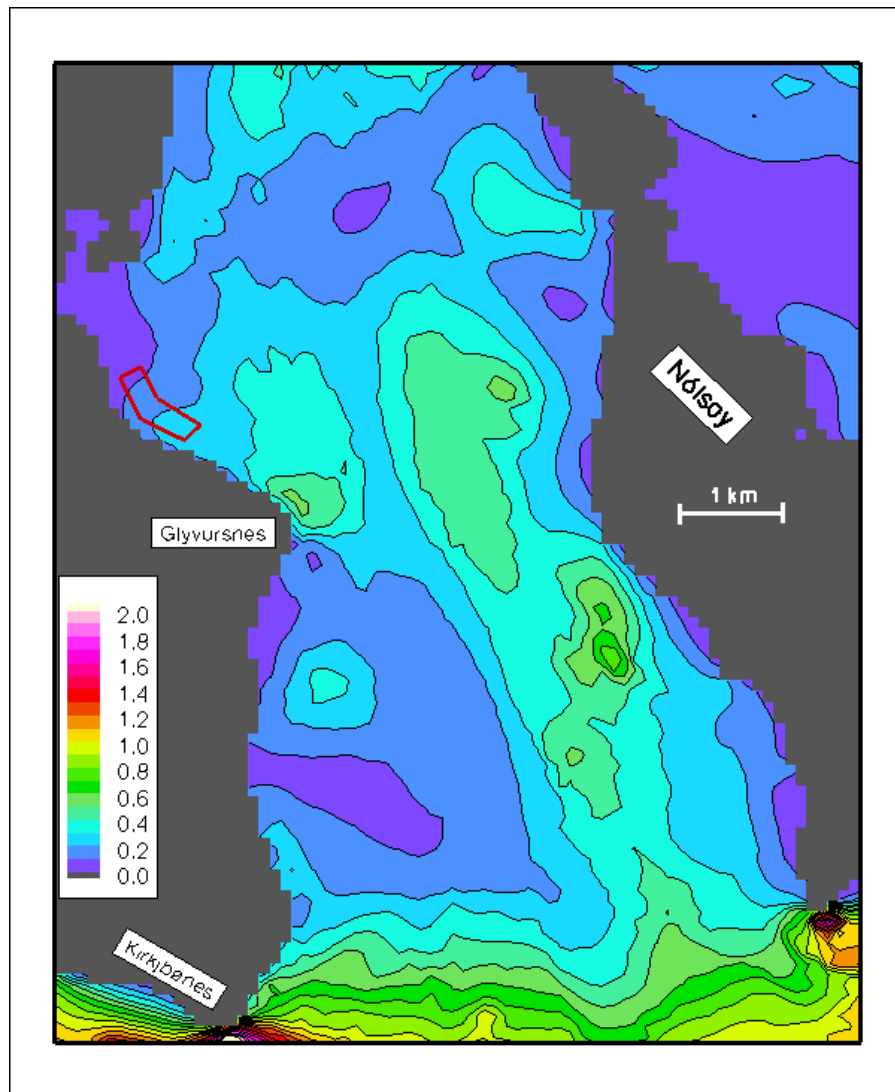


Figure 1: Contour plot of the semi-major axis length in the tidal current ellipse of the M_2 -constituent.

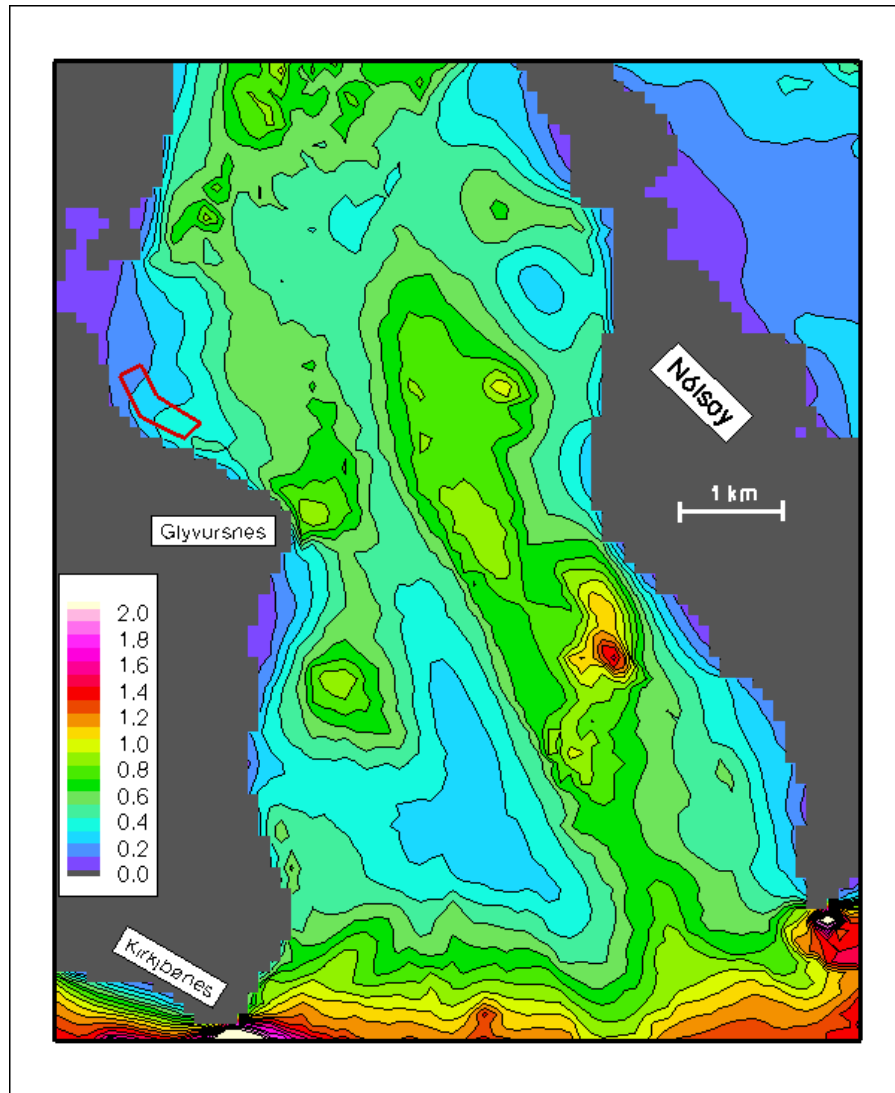


Figure 2: Contour plot of the sum of the tidal ellipse semi-major axis lengths of the M_2 - and S_2 -constituents.

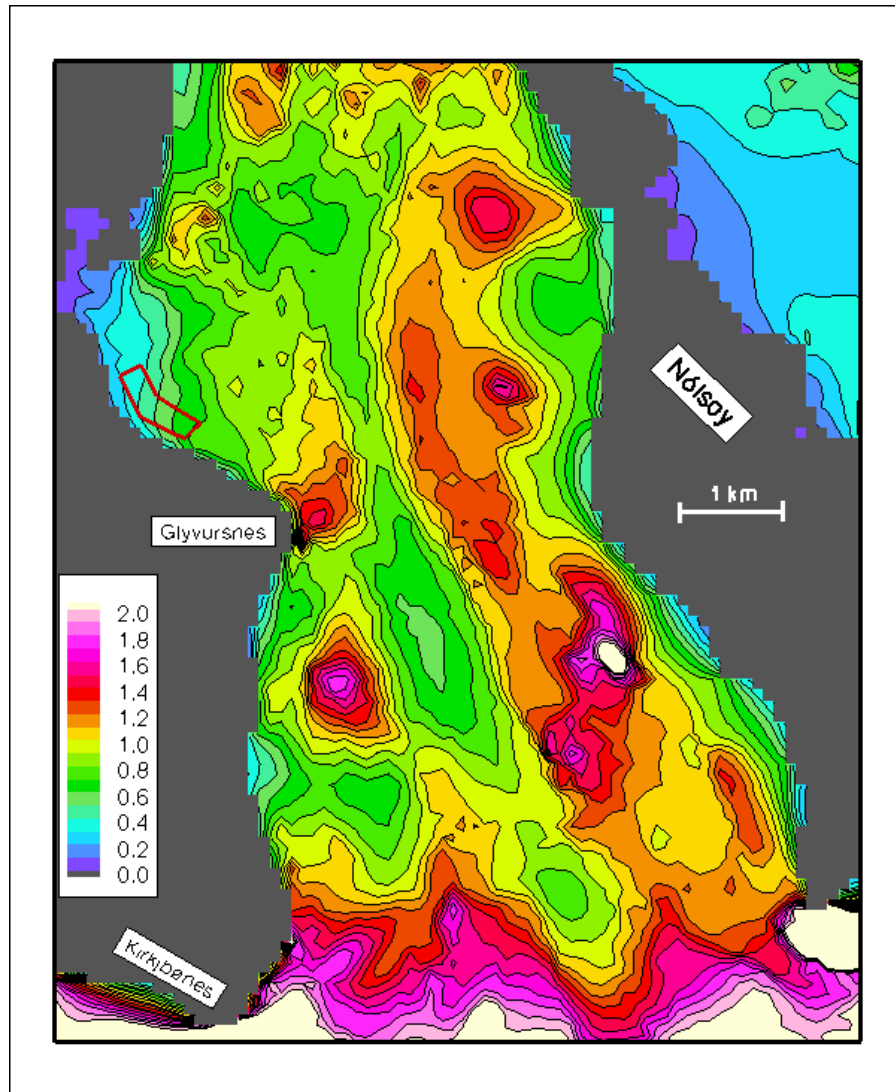


Figure 3: Contour plot of the sum of the semi-major axis lengths for 8 of the major constituents (M₂, S₂, O₁, K₁, M₄, M₆, M₈, and MS₄) in the area.

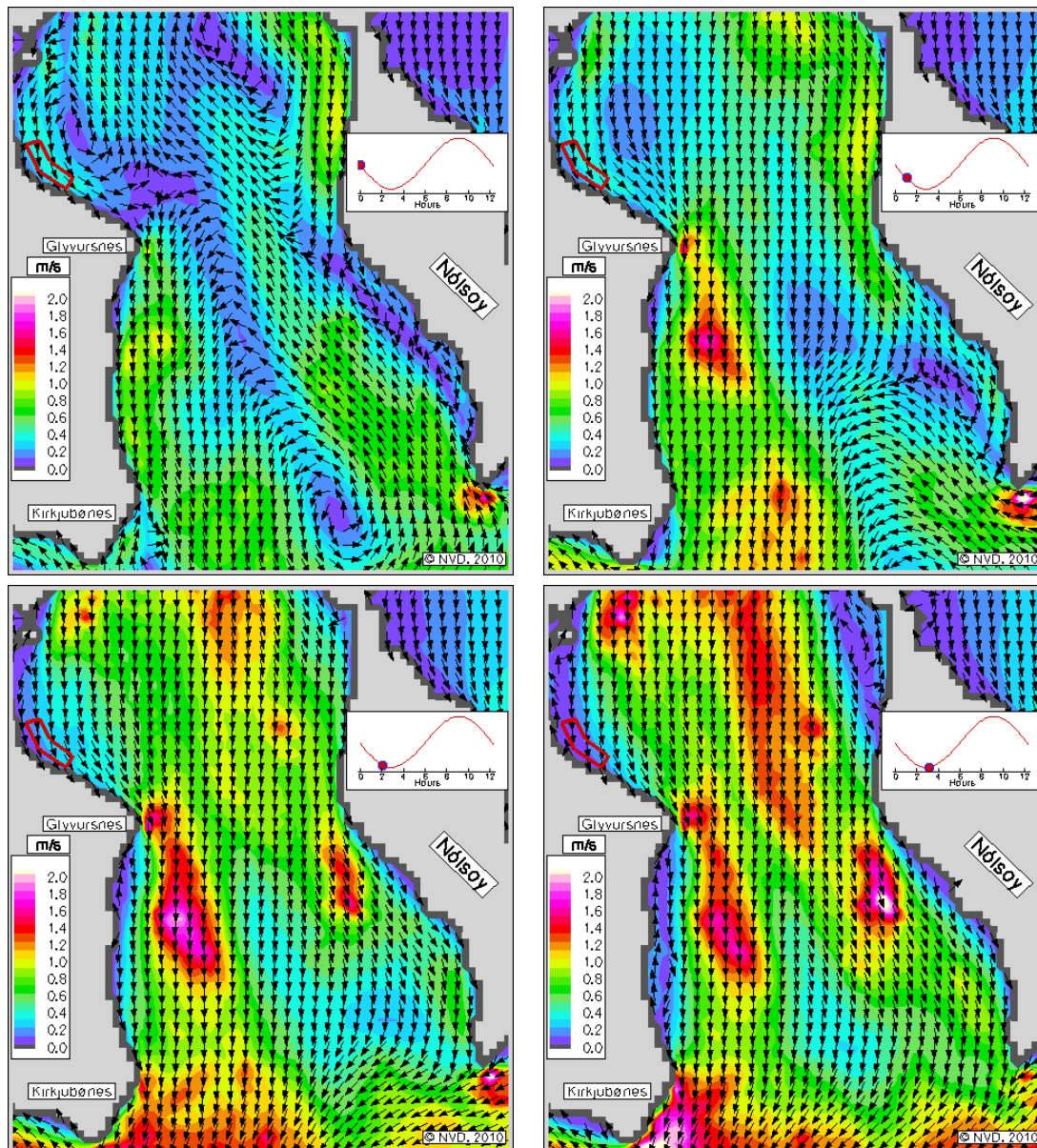


Figure 4: Tidal current maps for the area in the vicinity of the point Glyvursnes based on the M_2 , S_2 , and M_4 constituents. The elapsed time is indicated by the timebar showing the waterlevel at the reference station Trongisvagar. The color contours indicate the speed and the direction is given by the arrows. The red polygon shows the fish farming site at Gulin.

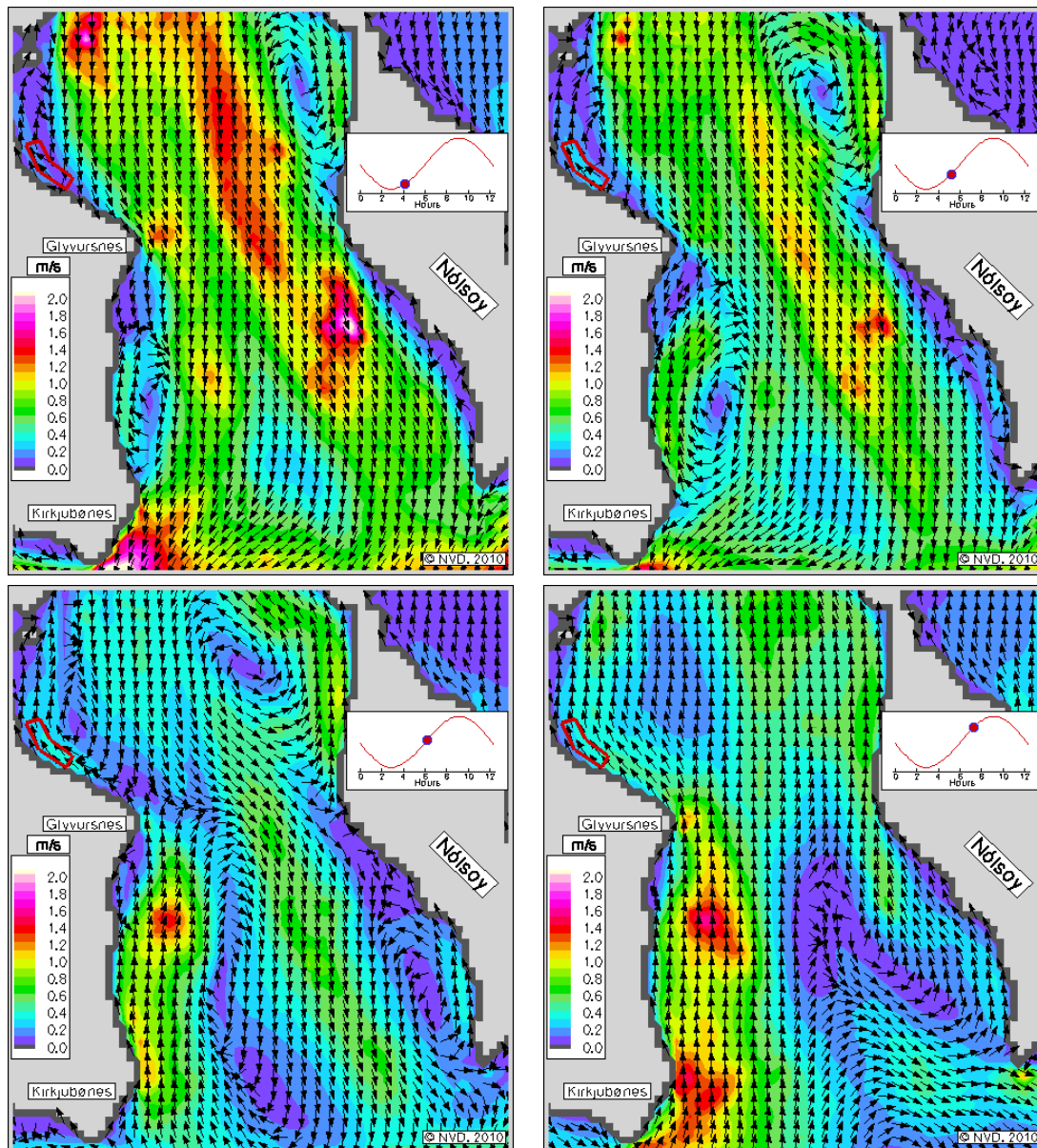


Figure 5: Tidal current maps for the area in the vicinity of the point Glyvursnes based on the M_2 , S_2 , and M_4 constituents. The elapsed time is indicated by the timebar showing the waterlevel at the reference station Trongisvagar. The color contours indicate the speed and the direction is given by the arrows. The red polygram shows the fish farming site at Gulin.

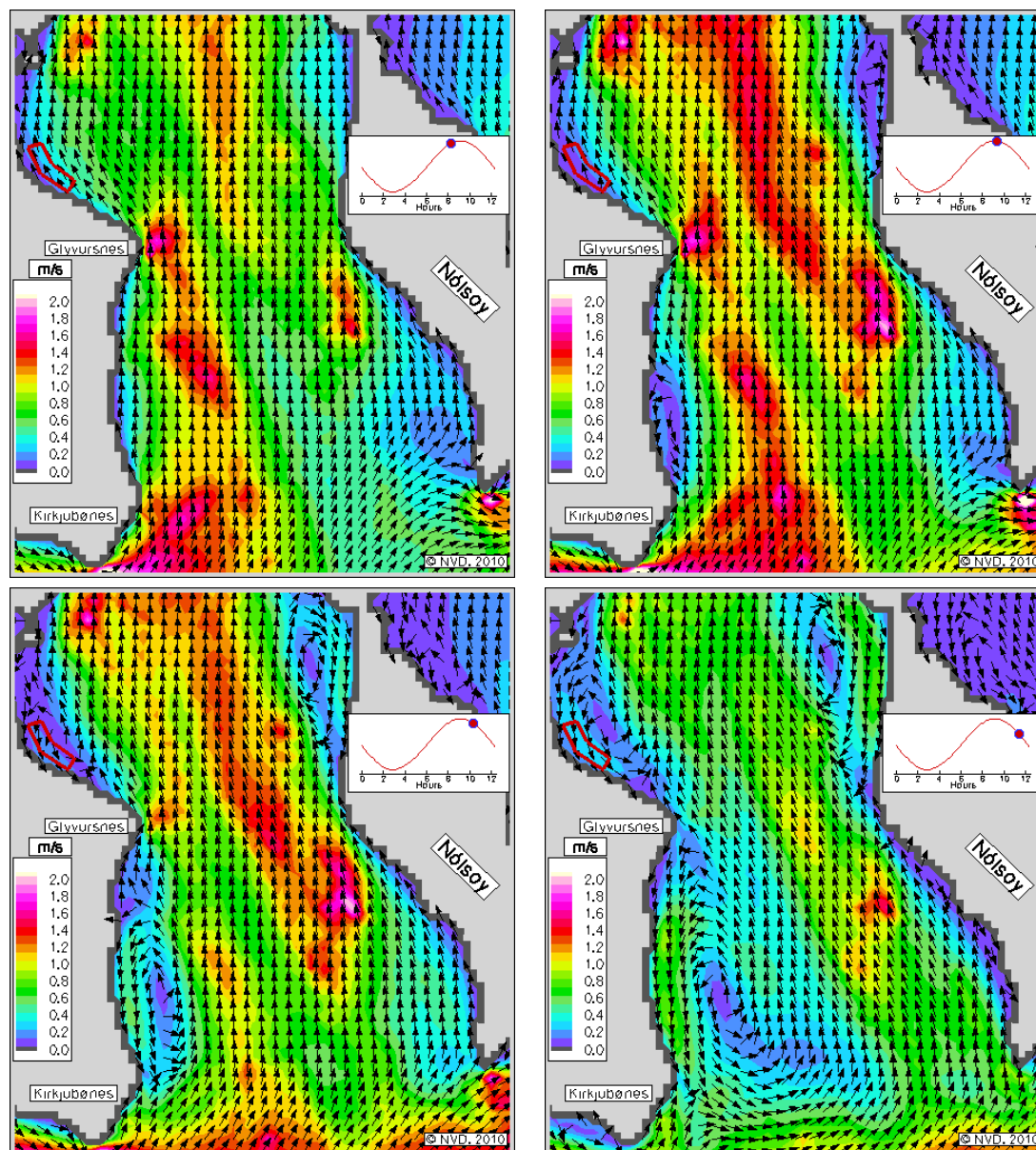


Figure 6: Tidal current maps for the area in the vicinity of the point Glyvursnes based on the M_2 , S_2 , and M_4 constituents. The elapsed time is indicated by the timebar showing the waterlevel at the reference station Trongisvagar. The color contours indicate the speed and the direction is given by the arrows. The red polygram shows the fish farming site at Gulin.

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- K. Simonsen and E. Gislason. STREYMALD - ein teldutøk streym, aldu og dýpdar-kunningarskipan fyri Føroyar. Technical Report 2002-05, The University of the Faroe Islands, Torshavn, Faroe Islands, 2002. (www.streymkort.fo).