Samanburður á mælingum á sjávarborði og líkanreikningum með Delft3D-FM og greining áhrifaþátta strandflóða

Veðurstofa Íslands

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Introduction: Coastal floods cause damage and disruption to the activities in harbours and coastal communities. Iceland has undergone about 84 floods in the second half of the XX Century (G. E. Jóhanssdóttir, 2017), with a recurrency of about 6 significant floods every decade (P. Imsland and Þ.Einarsson, 1991). Thus, both monitoring and forecasting these events is relevant to the coastal communities. The aim of this project is to improve knowledge of coastal floods. We set up 1 domain for Iceland shown in Figure 1.

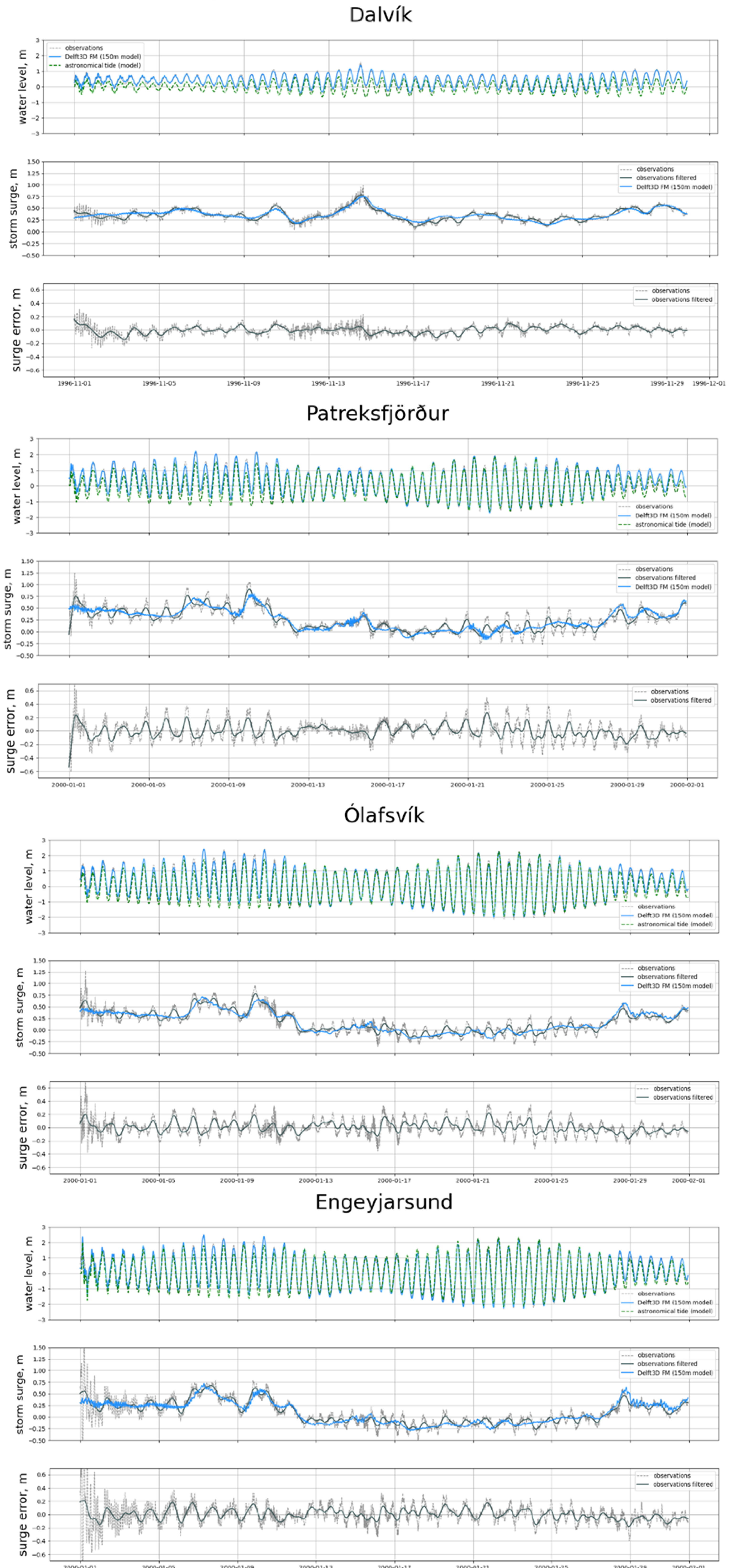


Figure 2-7. Storm surge observations and numerical model estimates for November 1996 (figures 1 and 5) and January 2000. For each figure, the upper panel shows the water level from observations (gray), the tidal model (dashed green) and the Delft3D FM solution (blue). The middle panel shows the storm surge from the observations (dashed gray), the observation surge after having applied a low-butter filter (thick gray) and the model full forced with surface winds and pressure. The lower panel shows the residual between the observations and the model. The last figure shows the surge (panel 1), the meteorological conditions at the station (atm. Pressure-> panel 2, wind-> panel 3 and wind magnitude->panel 4).

Method: We selected seven historical storms from November 1996 to February 2016, recorded at tide gauges in multiple stations around Iceland as Patreksfjörður, Olafsvík, Dalvik, Engeyjarsund, Þorlákshöfn and Báskasker (Vestmannaeyjar). We used the coastal model Delft3D-FM to simulate the flooding events. The numerical model is forced with hourly surface wind and pressure (IRCA reanalysis) throughout the domain and tidal constituents (FES2017) at the boundaries. The results are compared with the measurements from Vegagerðin's database. Two sets of simulations were carried out to separate the contribution of each component: tide-only (dashed green) and tide, atmospheric pressure and wind (light blue). Following out last year pilot project we carried out on South-West Iceland where we also studied the contribution of wind only and pressure only.

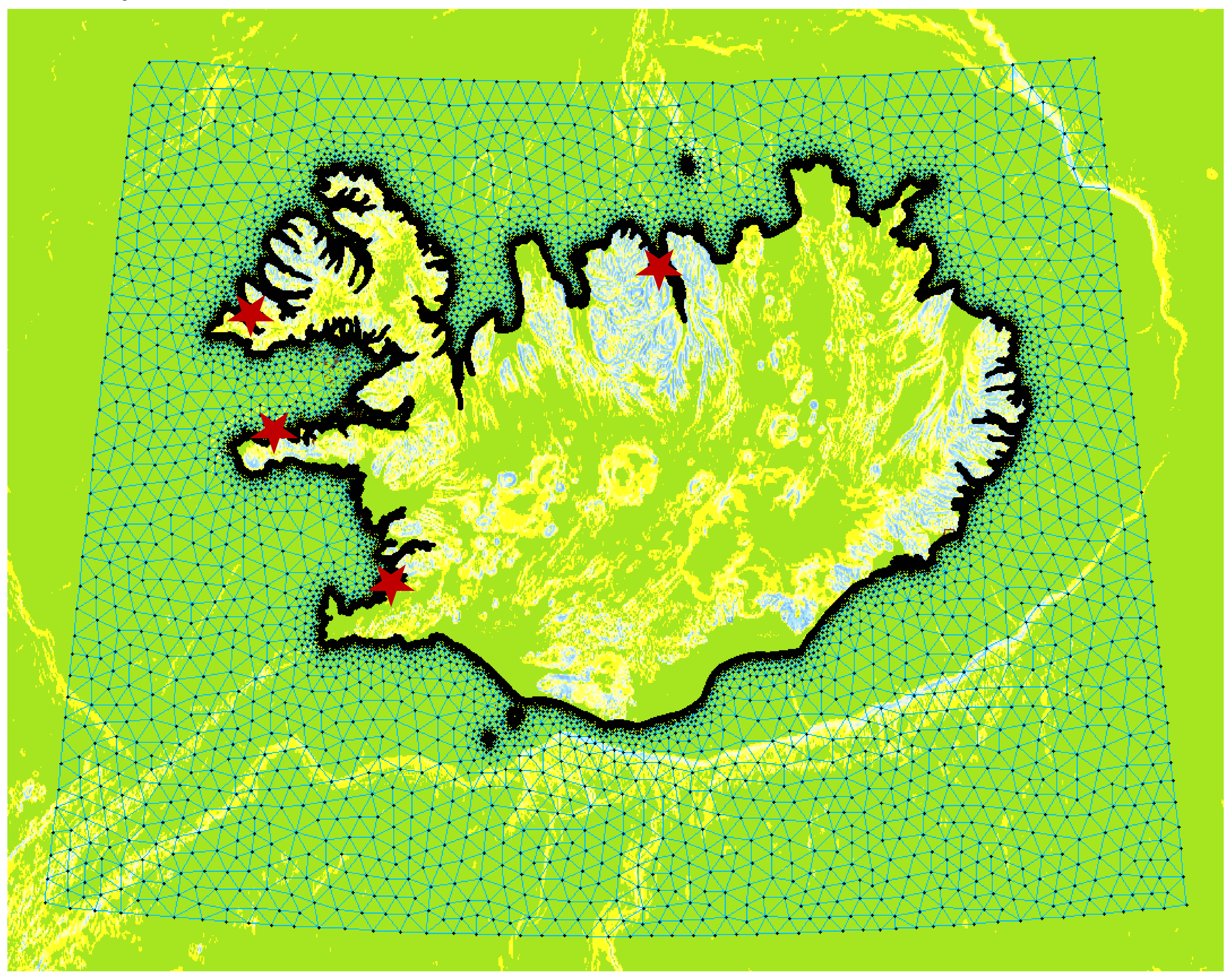
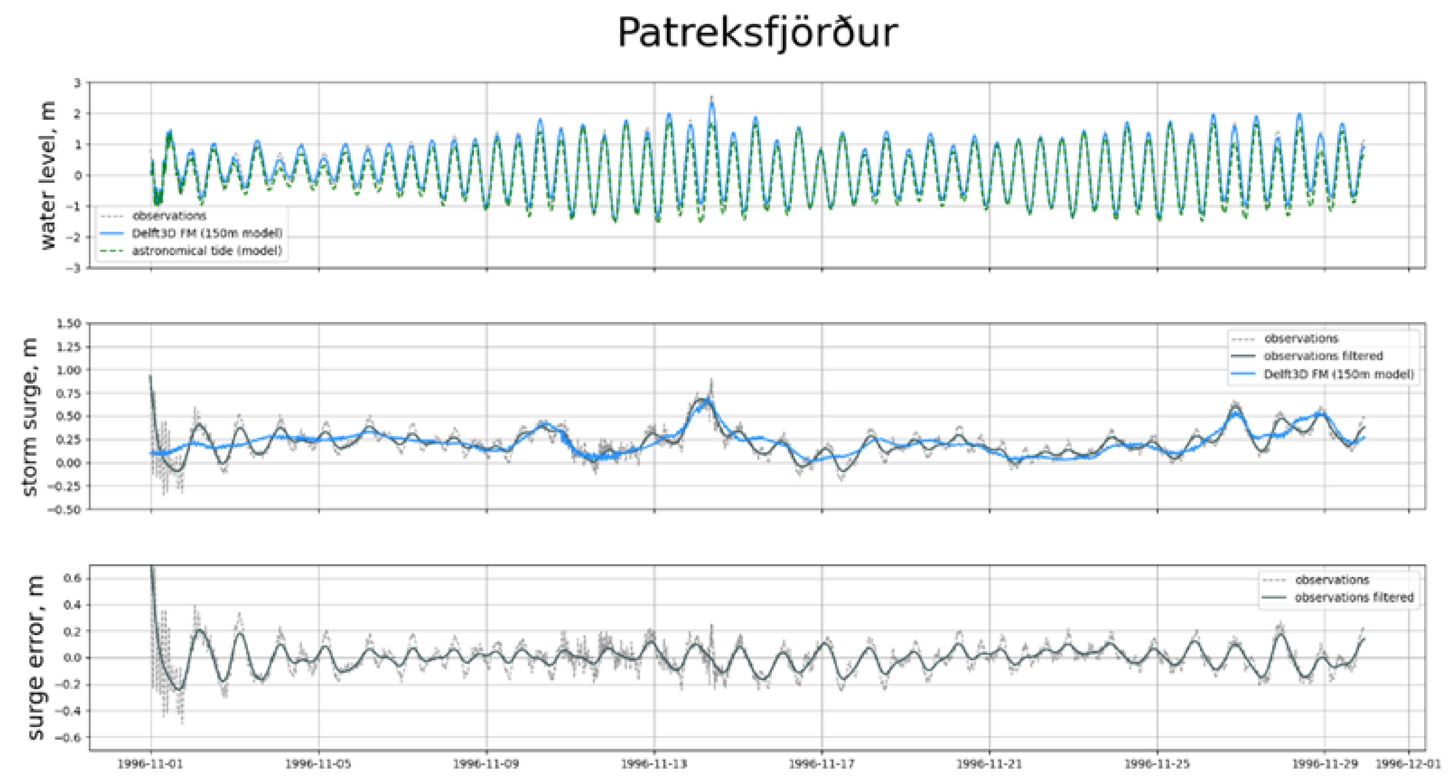
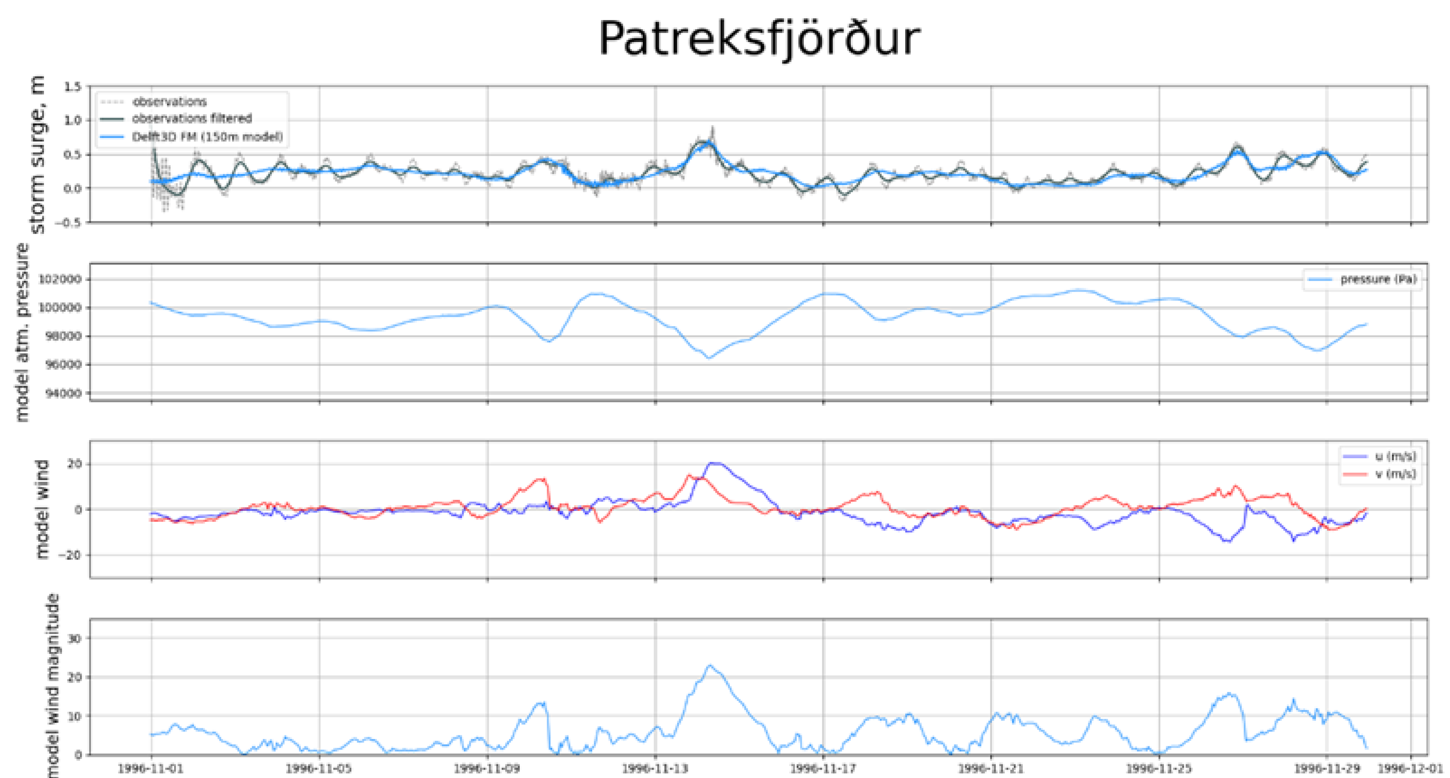


Figure 1. Map of Iceland including the unstructured mesh showing higher resolution at the coast. The stars represent the stations where the comparison for the storms were performed.





Preliminary results: we have successfully performed storm surge simulations for Iceland. The results are compared with the observations at 15 stations showing a relatively good agreement. The numerical model cannot reproduce the high frequency variability observed in the measurements since the input files are hourly and it automatically filters out the high frequencies. From this analysis we conclude that is pressure the main forcing driving the surge, similar to inverse barometer. The spin up time response is very similar for all stations and it is about 4 days. The overall storm surge estimates are satisfactory.

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G. E. Jóhanssdóttir (2017). Methods for Coastal Flooding Risk Assessments: An Application in Iceland; P. Imsland and Þ.Einarsson (1991). Sjavarflоð a Eyrarbakka og Stokkseyri