Introduction to oceanography

Sheet 1

Ole Pinner

October 23, 2018

1 Topography of Warnow River

1.1 Plot the topography of the Warnow river

Figure 1 shows the topology of the warnow river mouth. The depth of the water is clearly to be seen. Data points on the land are displayed in white.

1.2 What is the maximum and mean depth of the river?

To just focus on the Warnow and not on the baltic sea, we only used the data points southern of $54.177°$. If we average now, we get a mean depth of $-6.32\,\mathrm{m}$ with a maximum depth of $-15.24\,\mathrm{m}$.

1.3 Calculate the mean horizontal resolution of the data set!

To simplify this task, we assume that the the difference in latitude has only a negligible effect of the conversion from distance in degrees to meters, equivalent to assuming the region as flat. Now we can use a mean latitude to calculate the horizontal resolution. Averaging now the degree differences of the longitude positions, we get a mean horizontal resolution of $0.000\,33°$ or $21.62\,\mathrm{m}$.

1.4 Plot the water depth against distance along a zonal section of latitude $54°\ 7'$ N!

Now we concentrate only on the topology on the latitude $54°\ 7'\,\mathrm{N}$. The stream bed is displayed in figure 2. The x-axis is set to start at the west shore.

1.5 Calculate the width of the River and its cross section at that latitude!

If we find the first and last non NaN data point from the zonal cut at $54°\ 7'$N, we can calculate the river width to $713.91\,\mathrm{m}$. Integrating the depth profile from problem 1.4 from shore to shore with the Simpson's rule, we receive a cross section of $4699.68\,\mathrm{m}^2$.

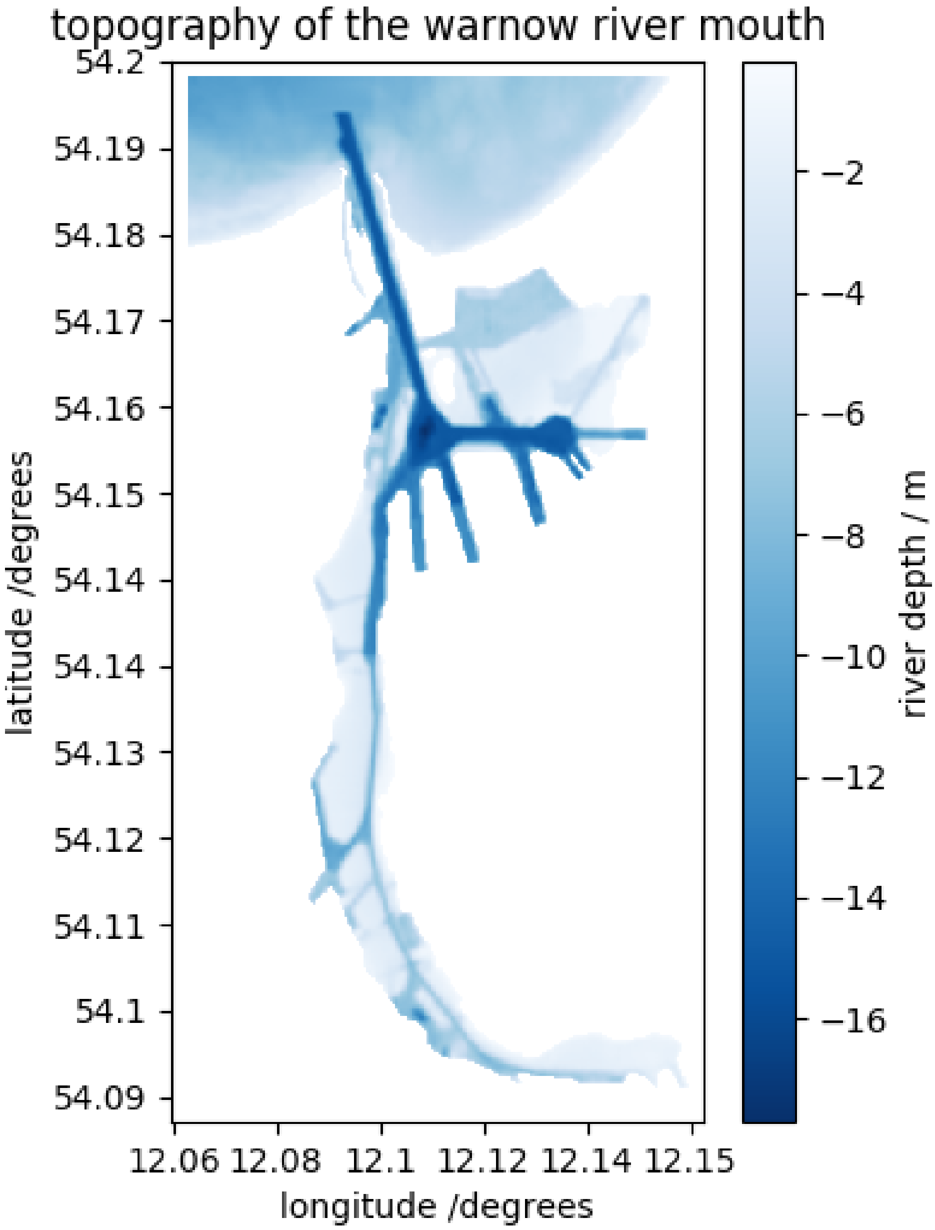
topography of the warnow river mouth
54.2
54.19
54.18
54.17
54.16
54.15
54.14
54.14
54.13
54.12
54.11
54.1
54.09
latitude /degrees
12.06
12.08
12.1
12.12
12.14
12.15
longitude /degrees
−2
−4
−6
−8
−10
−12
−14
−16
river depth / m

Figure 1

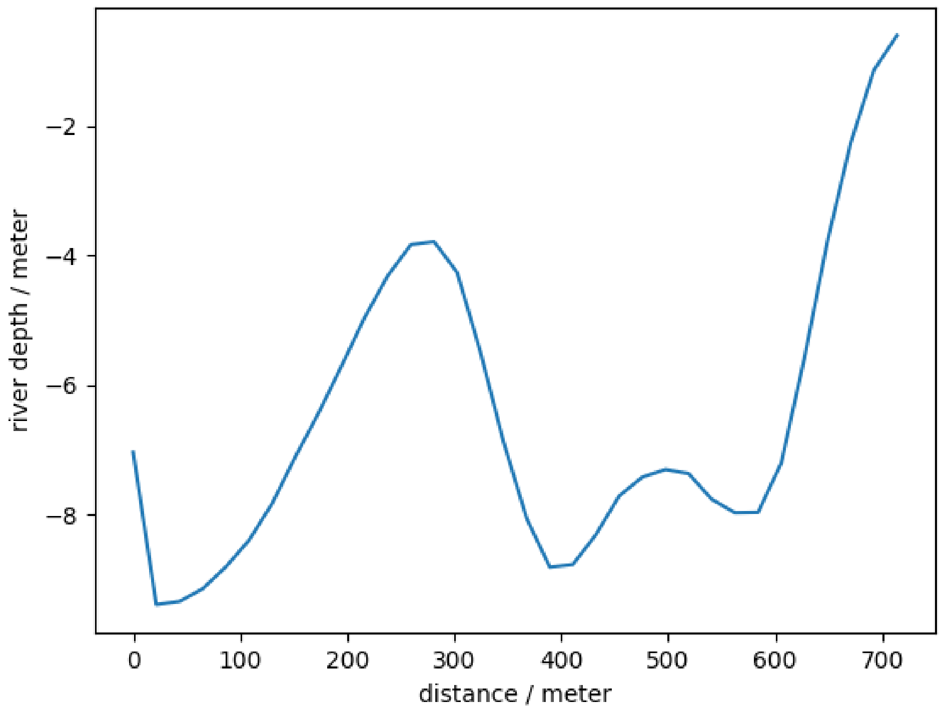

Figure 2

1.6 Estimate the transport through this cross section!

With a given mean velocity of 0.013 m/s, we get by multiplying with the cross section a transport of 61.10 m^3/s. Extrapolating thso to a year, leads to a transport of 1.93 km^3/a. This almost exactly the given annual transport at the Mühlendamm with 2 km^3/a. Our calculated answer is therefore in the right order of magnitude.