Sediment transport along the Vistula Spit (the Baltic Sea)

Boris Chubarenko, Aleksander Babakov

Laboratory for Coastal System Study, Atlantic Branch of P.P. Shirshov Institute of Oceanology Russian Academy of Sciences

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Study area

Vistula Lagoon and Vistula Spit belong to the sediment-system of the Gulf of Gdansk

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Study area

Historical changes in hydrographic scheme of the Vistula Lagoon

New outlet of the Vistula River was artificially constructed between 1889 and 1895 and officially opened on 31 March 1895.

Nogat River took up to 85% from the Vistula River discharge. Sluice ‘Biala Gora Lock’ was constructed at the Visla-Nogat divergence point in 1915. It finally separated the Vistula Lagoon from the Vistula River.

(Presentation of P. Margonsku, MIR, ARTWEI Project)
Motivation

Unidirectional flux to south [Zenkovich, 1958]

Convergence of fluxes at the central part of the Vistula Spit [Babakov, 2003]

Convergence of fluxes at the Yantarny-Baltiysk concave [Beloshapkov, Beloshapkova, Brasavs, 1984]

Convergence of fluxes at the southern part of the Vistula Spit

Convergence of fluxes at the Vistula Lagoon inlet [Boldyrev, Zenkovich, 1982]

[Ostrowski, Pruszak, Skaja, Szmytkiewicz, 2010]

[Leontjev, 2012]
Motivation

Strong arguments, but no exact answer till now

Convergence of fluxes at the Vistula Lagoon inlet [Boldyrev, Zenkovich, 1982]

Unidirectional flux to south [Boldyrev, 2001]

Wave modelling: convergence of fluxes at the southern part of the Vistula Spit

[Kaczmarek et al, 2008]

[Ostrowski, Pruszk, Skaja, Szmytkiewicz, 2010]

[Leontjev, 2012]
Motivation

Alongshore drift

Accretion criteria – the argument in favor to southward drift
Method


Bottom tripods with self-recording current meter (1 m above the bottom) and sediment traps

1 – self-contained current meter
2 – suspension storage

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Results

Roses for coastal currents for the period 12.09.2015-18.11.2005 combined for the typical wind directions: (a) N, (b) NW, (c) W, (d) SW, (e) S, (f) SE.
Results

Baltiysk, 1949-1988

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Discussion

1625 Bathymetry the Vistula Lagoon inlet [Zharomskys, 2008].

1768-1780 - construction of the southern jetty
1818-1840 - construction of the northern jetty
Discussion

The scour holes are a typical morphometric manifestation of the excited longshore currents by an obstacle at the shore.

Finalizing of the construction of the existing jetties - 1878

Scour hole at the seaward end of the jetties of the Vistula Lagoon inlet on the map of 1903 (a) and in 2005 (b).

The accretion to north and the erosion to south are clear visible (b).
Conclusions