River-bed morphology changes during winter season in the regulated channel of the Wilga River, Poland

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The motivations

- only several works address the sediment transport under ice cover and at low water temperature being around freezing point (Sayre and Song 1979; Hong et al. 1984; Lau and Krishnappan 1985; Tsai and Ettema 1994; Ettema et al. 2000; Knack and Shen 2015)

- sediment transport and channel morphodynamics in vegetated rivers

- continuation of the previous investigation carried out in the same part of the channel (Bialik et al. 2014)

Main goals

To present changes in river-bed morphology during winter season (October 2014 – March 2015).

To investigate the influence of the loss of vegetation on the sediment transport in the form of the river-bed forms.

↓

Low water temperature
(5 °C - 0°C - 10 °C)

↓

ice on shores, frazil ice, loss of vegetation at the bottom of the trough and its shores

Fig. 1. *Ice on shores.*

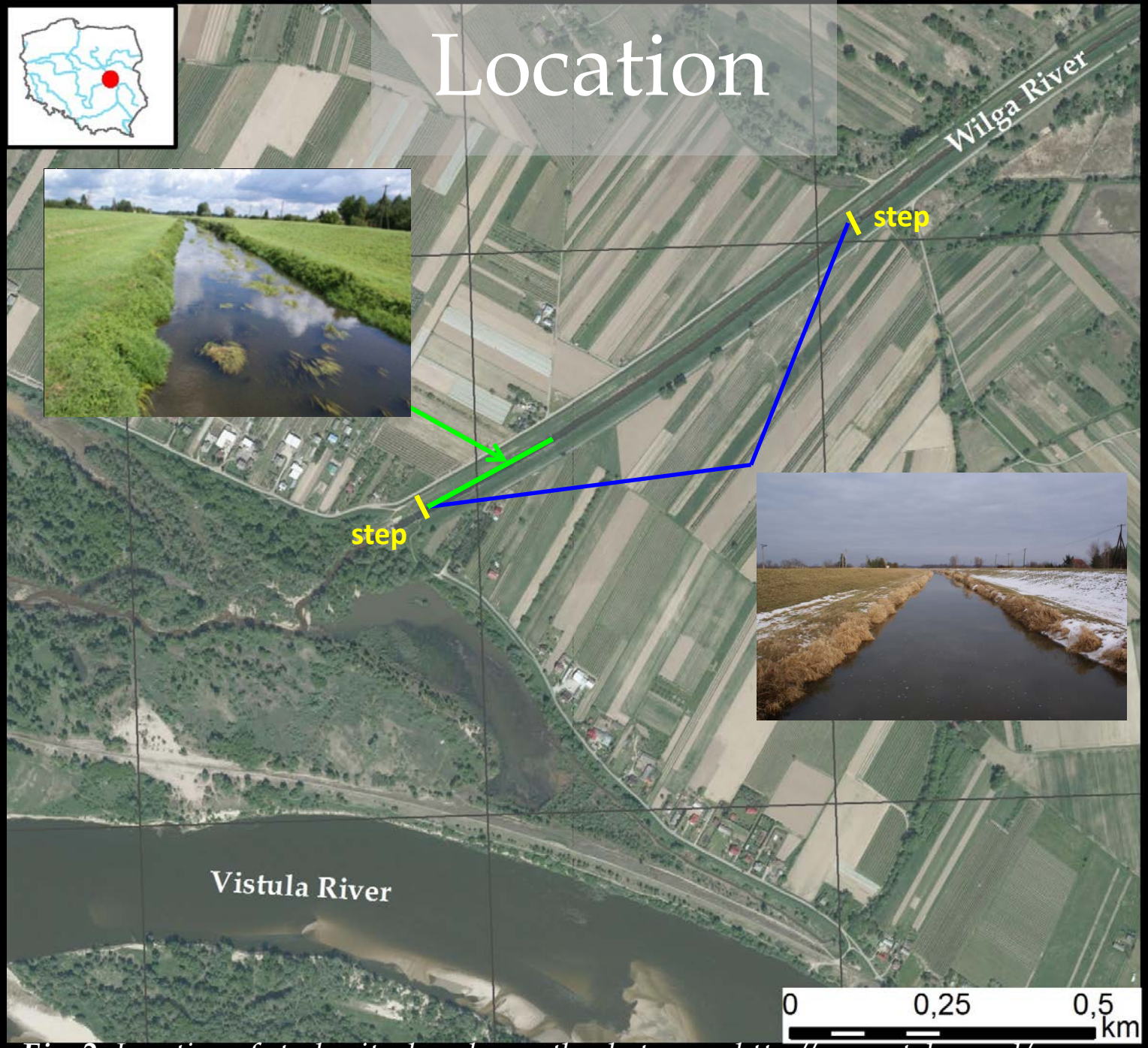

Fig. 2. *Location of study site, besed on orthophotomap, http://geoportal.gov.pl/*

Methods

acoustic Doppler current profiler **(aDcp):**
- vertical single-beam echo sounder;
- four beams for velocity measurement;
- DGPS.

Fig. 3. *aDcp measurement.*

<u>Software for post-processing:</u>

•MATLAB (river depth, discharge);

•Arc GIS (2D maps of river-bed morphology changes, main morphodynamic processes).

Results

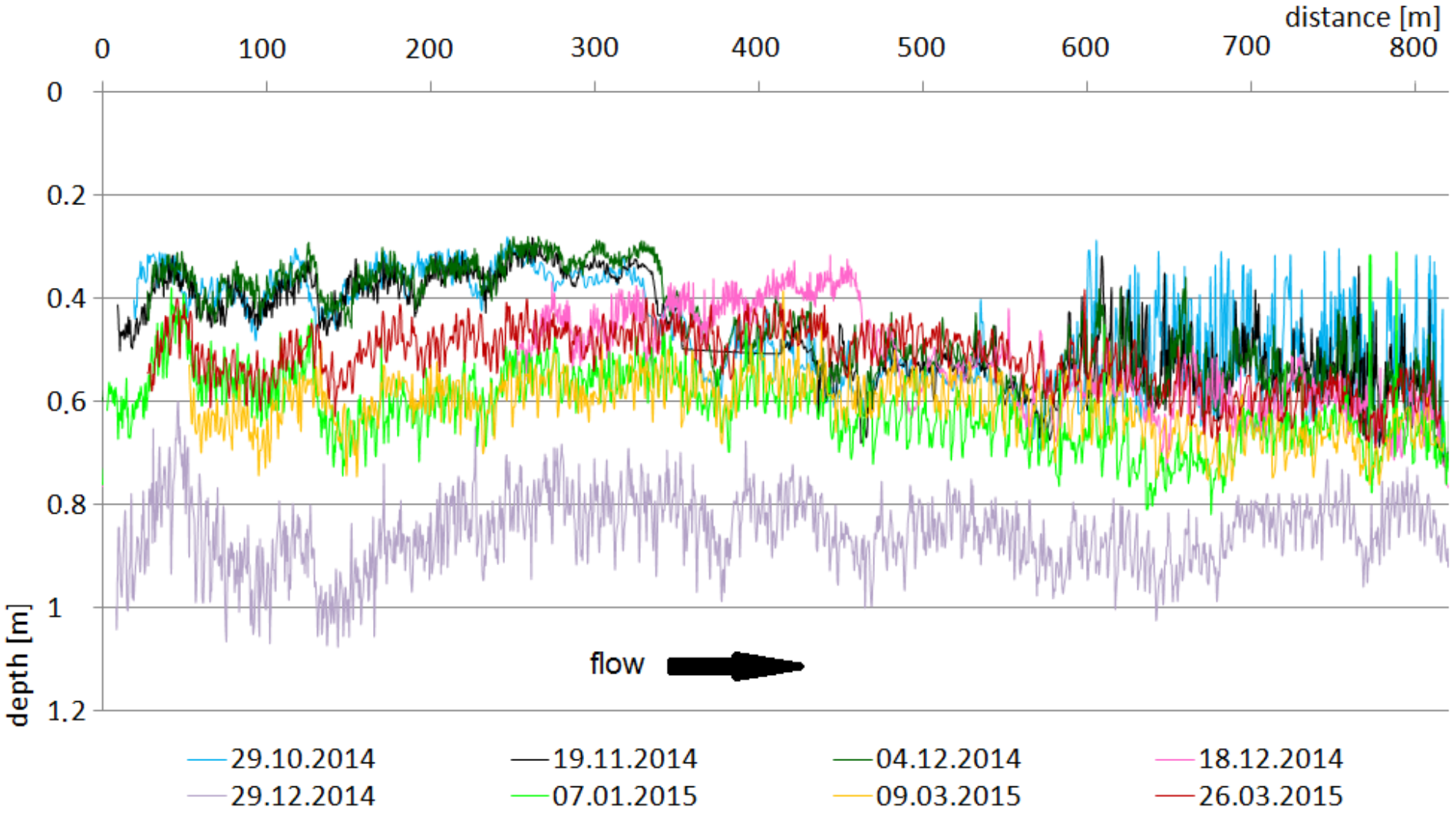

Fig. 4. *Longitudinal profiles measured in the main channel of bed elevations for each day.*

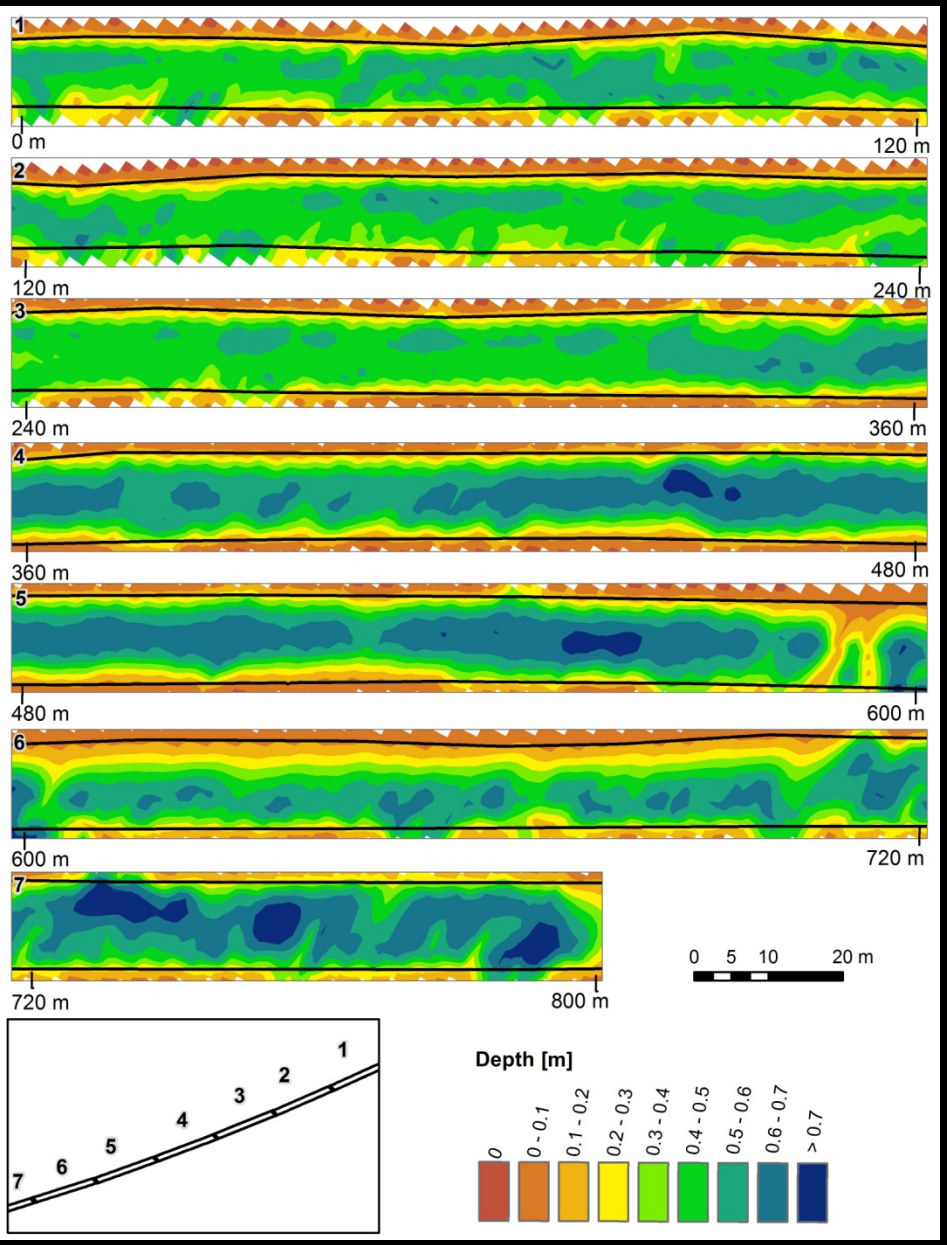

Fig. 5. River bathymetry on 29.10.2014.

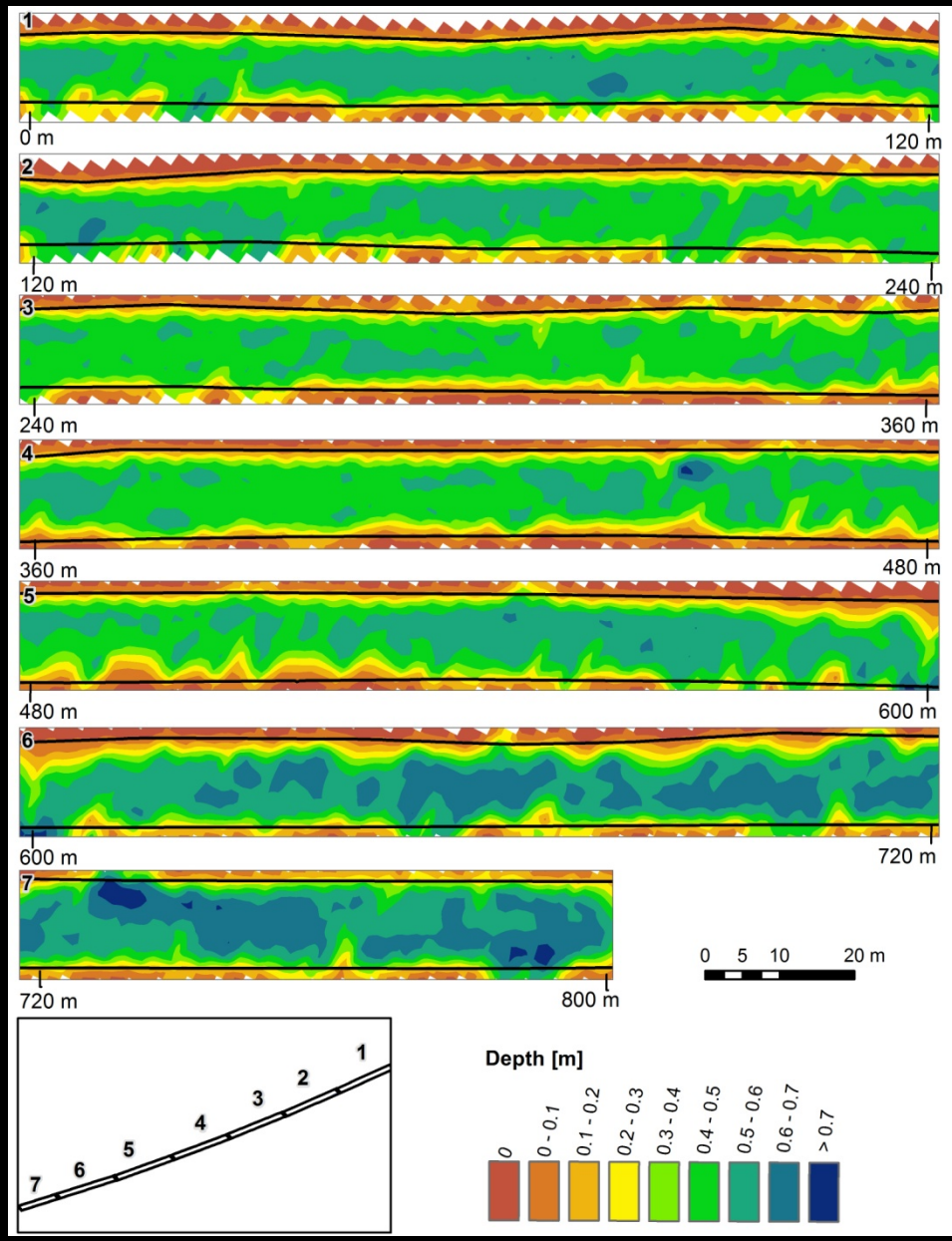

Fig. 6. River bathymetry on 26.03.2015.

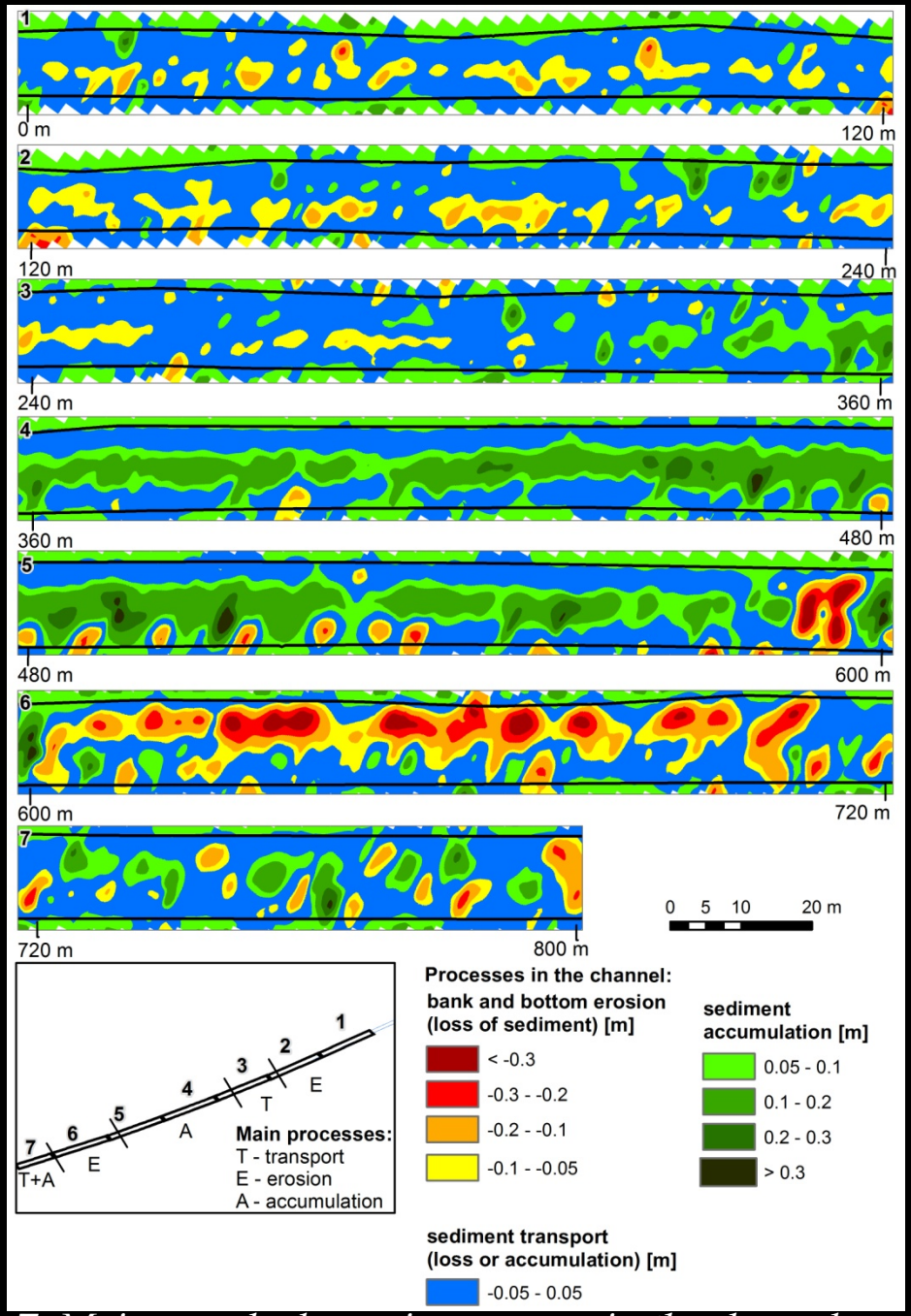

Fig. 7. Main morphodynamic processes in the channel.

Spectral analysis

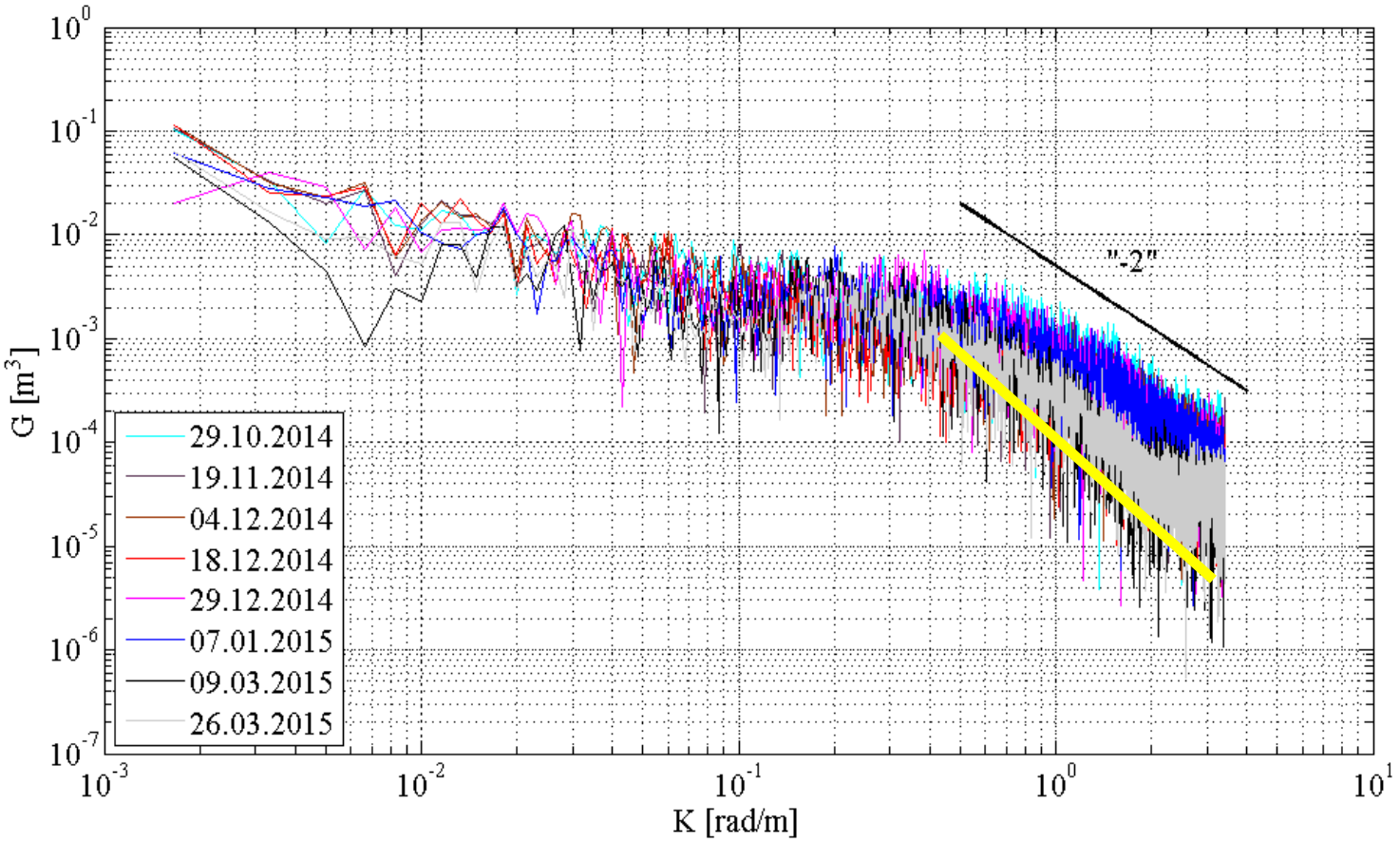

Fig. 8. *Single-sided spectra of bed elevation for all measurements.*

Conclusions

- dependence between bathymetry and vegetation patch on the river bed is confirmed;
- direct effect of the temperature on the bedform shape has not been observed;
- regulated rivers are seeking to form meanders;
- sequences of the main processes (erosion, transport, deposition) are the same as in the non-regulated channels;
- ArcGIS software is apropriate for spatial analysis of the river bathymerty and main river processes;
- single-sided spectra of bed elevation suggest that in the case of existing vegetation in the channel it is characterized by the scaling region with the exponent “-2”, which tends to be “-3” with the disappearance of the plants.

Referencess

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Thank You