

# Element geochemistry as a tool for determining the suspended particulate matter (SPM) pollution sources in the Sava River headwaters



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Study area and sampling



Fig.1. a) Sampling sites along the Sava River; b) Time-integrated mass flux sampler (TIMS) – located in the Ljubljanica River; c) Zbilje lake – sampling location

### Geochemical nature of elements in river sediments

-0.4

-0.2

0.0

Comp.1

0.2

0.4

-0.4

-0.3

-0.2

0.1

0.0

Comp.1

0.1

0.2

0.3

#### S14 **—**S23 -S11 S20 S5 100 10 Al Ca Fe K Mg Mn Na Si S Ti As Ba Be Bi Cd Co Cr Cs Cu Ga Ge Li Mo Nb Ni Ph Rh Sb Sc Sn Sr TL Th U V Zn W 0 Bo1 KB Indest 3 and Kr6 Bo3 D1 stionst Steel factory Acron 3 **\$**5 23 T10 883814 \$3 551915<sub>812</sub> 5 Bo2 Å٩ Apricultural activities Comp.2 0.0 p.3 0.0 T2 Kk 823<sup>S1</sup> o Mo T22 Kr4 S16 ø T19 83 0.2 T18 0.2 T16 T185a7 822 -0.3 2 Wastewater effluents-ZapreSil T12

## Sources of suspended particulate matter



## **CONCLUSION**

The highest EF values (between 3 and 22) were obtained for potentially toxic elements: As, Bi, Cd, Cr, Cu, Ni, Mo, Pb, Sb, Sn, Zn and P.

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7

- 74

- Spatial distribution of anthropogenic elements in soils and sediments pointed out three main areas under the anthropogenic pressure;
- a) first area includes the Moste dam and Acroni Jesenice steel factory, which is characterized by element association of **Cr-Cu-Ni**,
- b) second area is related to the zinc production in Celje and the element association of Cd-Mo-Zn
- c) third area is related to agricultural activities and sewage discharges in the surrounding of Zaprešić area which is characterized by **Pb-Sn-Zn** element association.
- Ce, Nb, Ti and Th were established as the most conservative of the immobile elements, and the best indicators of the SPM sources
- Fluvisol was revealed as the most probable source of the SPM of the Sava River upper catchment