

Discharge-related variation of the chemical composition of suspended sediment of the River Rhine in the Netherlands



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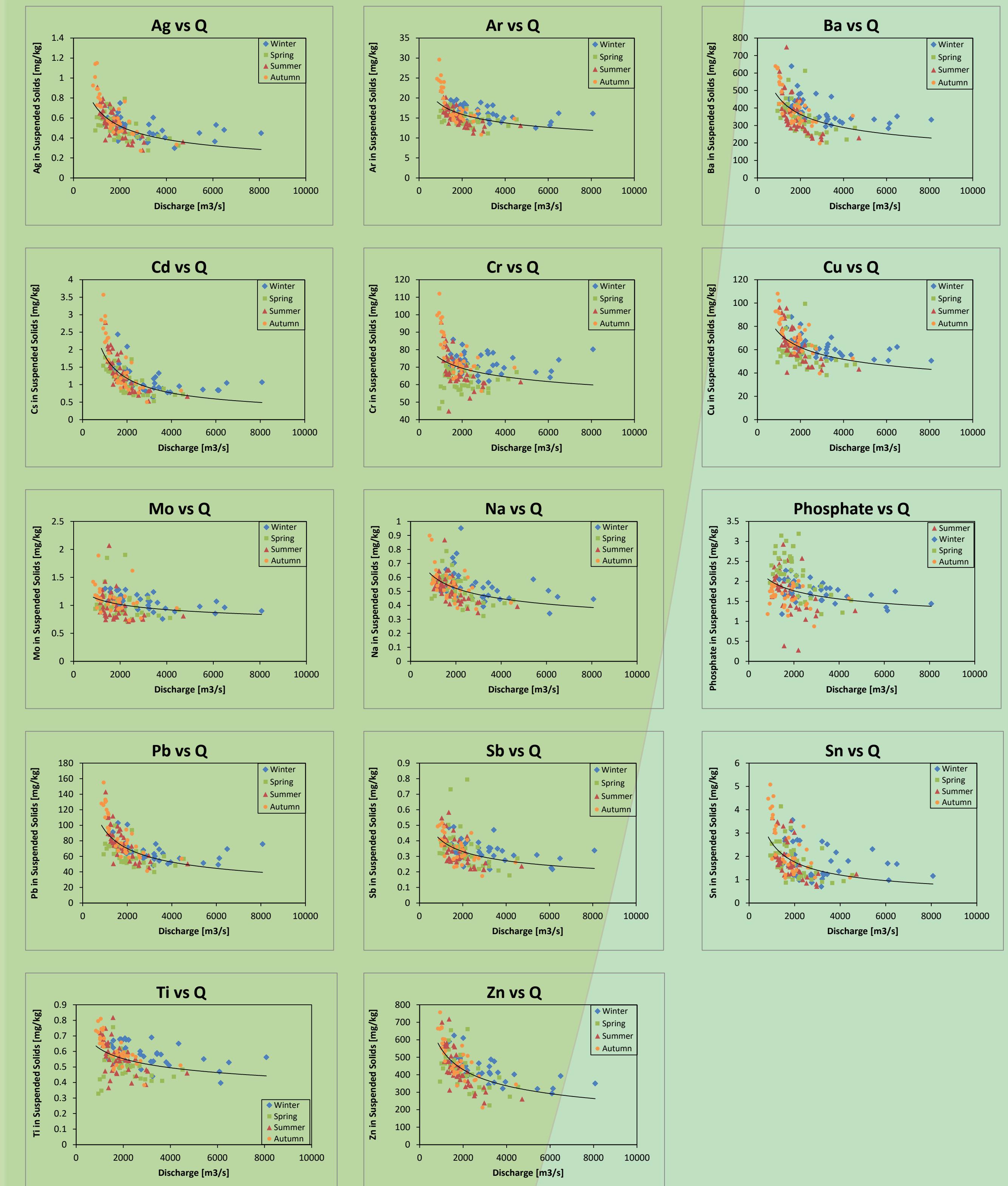
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1. Background and aim

The response of the chemical composition of suspended sediment to variations in river discharge may reveal the sources of sediment and associated contaminants.

In this study, we used the Waterbase database of Rijkswaterstaat (Dutch Ministry of Infrastructure and Water Management) to examine the relation between the concentration of 53 elements in suspended sediment and discharge of the River Rhine at the Lobith monitoring station near to the German-Dutch border.

2. Elements showing a negative relation with discharge



Elements originating primarily from anthropogenic point source discharges

Dilution during periods of high discharge

(Shift of source area to regions with relatively low concentrations of these elements during high flows)

Seasonality with positive residuals during autumn and winter and negative residuals during spring and summer

Elements mainly associated with inorganic sediment particles; dilution by primary production of organic particulate matter during summer

There are also elements that show a negative relation with discharge, but without seasonality

3. Elements showing a positive relation with discharge

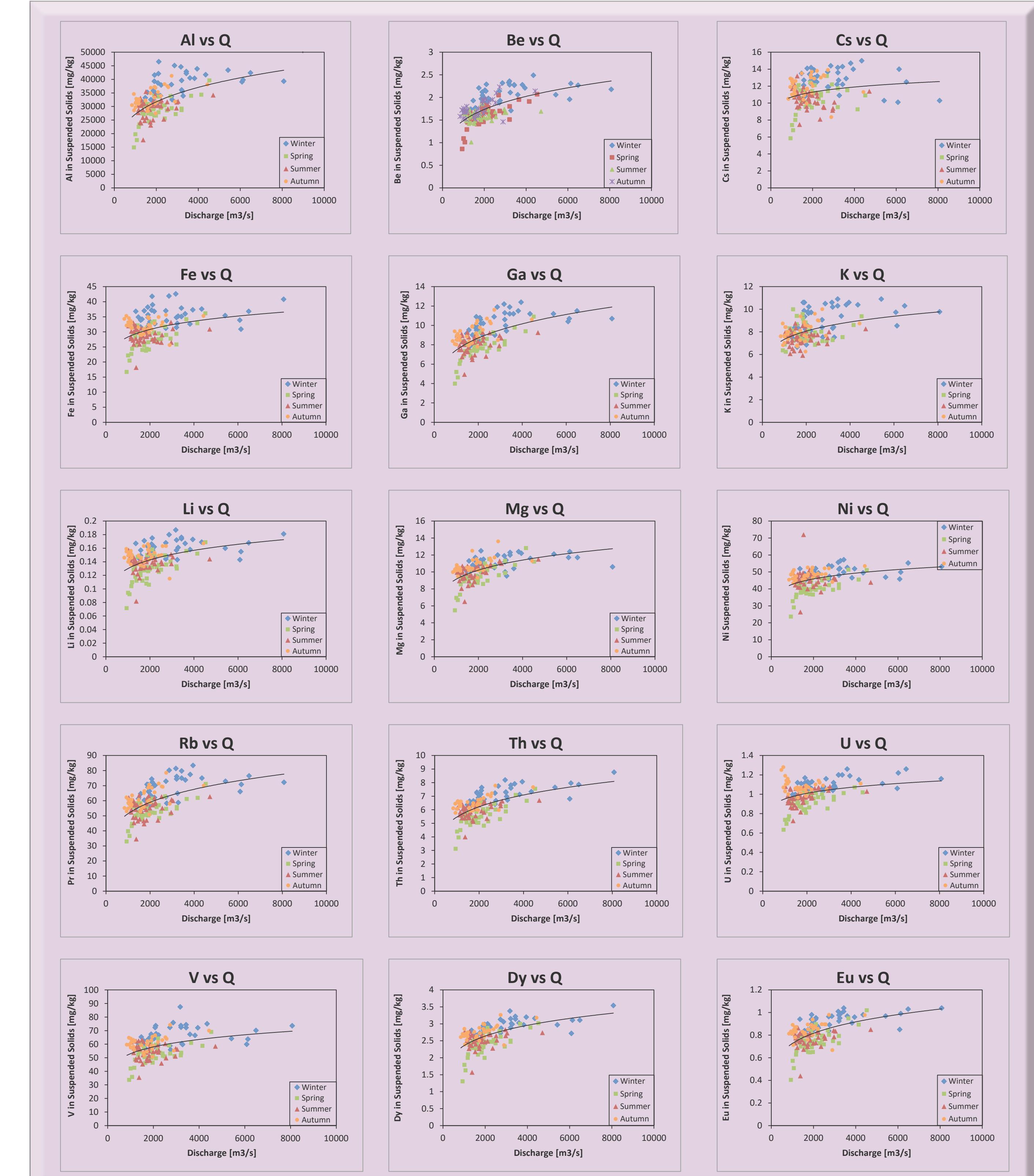
Elements of geogenic origin

Sediment source area shifts to regions with relatively high concentrations of these elements during high flows

Negative correlation with organic C, indicating association with clay minerals

Residuals of the relations show the same seasonality as or elements that are negatively related to discharge

There are also elements that do not show any relation with discharge, but show a similar seasonal variation



4. Conclusions

- The direction of the relationship between the element concentration in suspended sediment and discharge indicates whether the elements originate primarily from anthropogenic or geogenic sources.
- Primary production of organic carbon affects the element concentration in suspended sediment.
- Future study will examine to what extent the chemical composition of suspended sediment in the River Rhine allows the demarcation of the geographic source area of the sediment.