中国地质调查局
CHINA GEOLOGICAL SURVEY

NH_4^+ occurrence in subsurface aquifer: to assess the association of NH_4-N with OMs in aquifers of Jianhan Plain, China

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Introduction

Nitrogen contamination of water bodies is commonly attributed to anthropogenic sources.

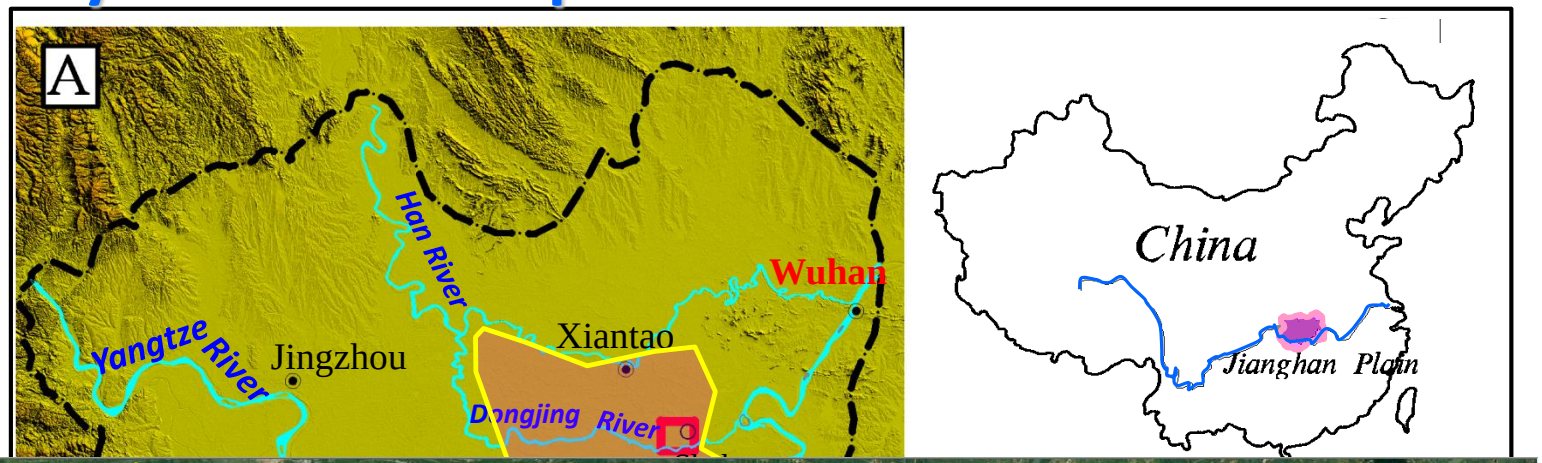
The natural occurrence of NH_4^+-N in aquifers is receiving increasing attention. Most of the observations are from coastal aquifers (Manning and Hutcheon 2004).

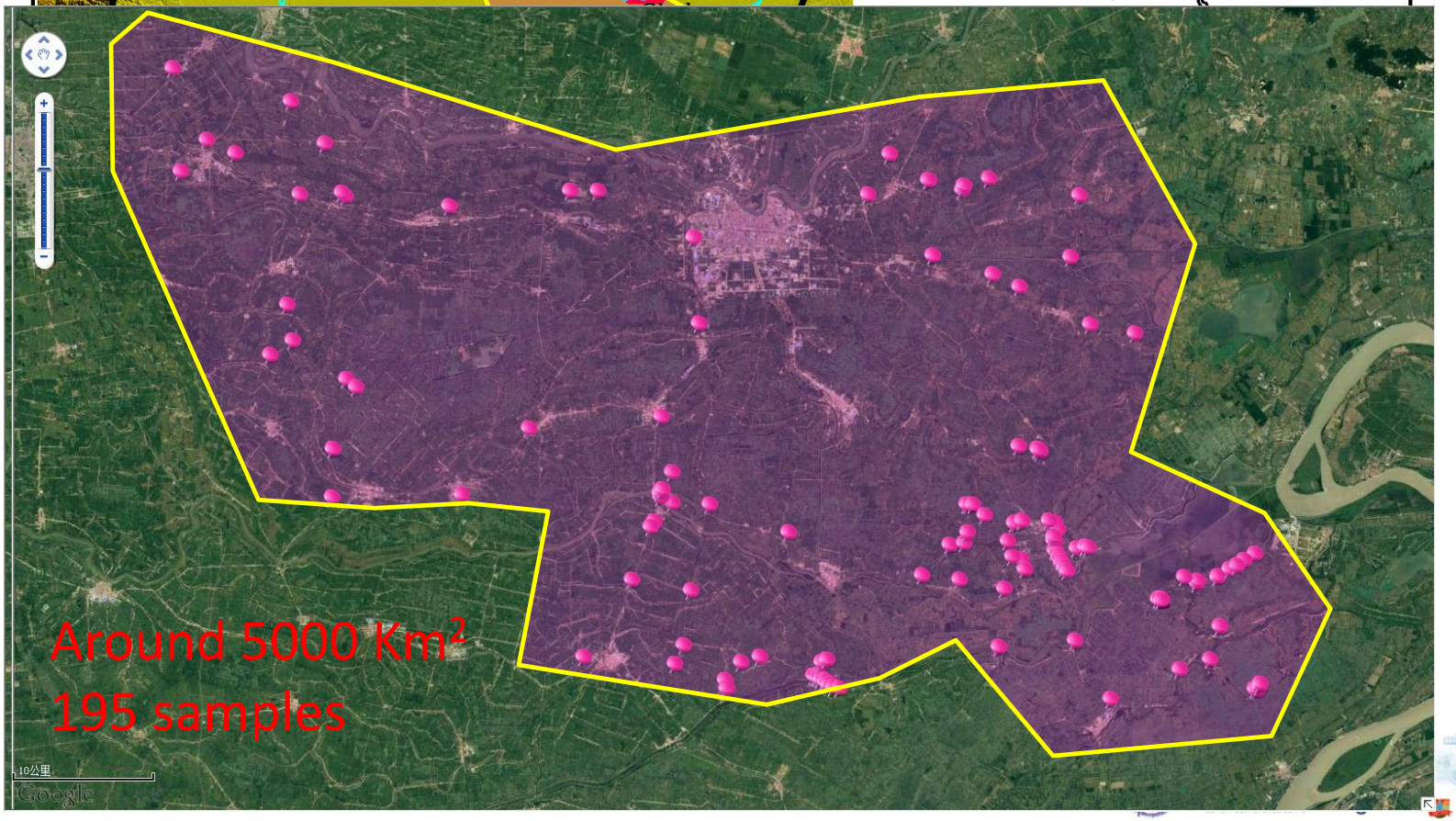
Few studies have examined the natural occurrence of NH_4^+-N in fresh groundwater, no specific study found, to the best knowledge of ours, on OM-associated source information between sediments and groundwater.

Introduction

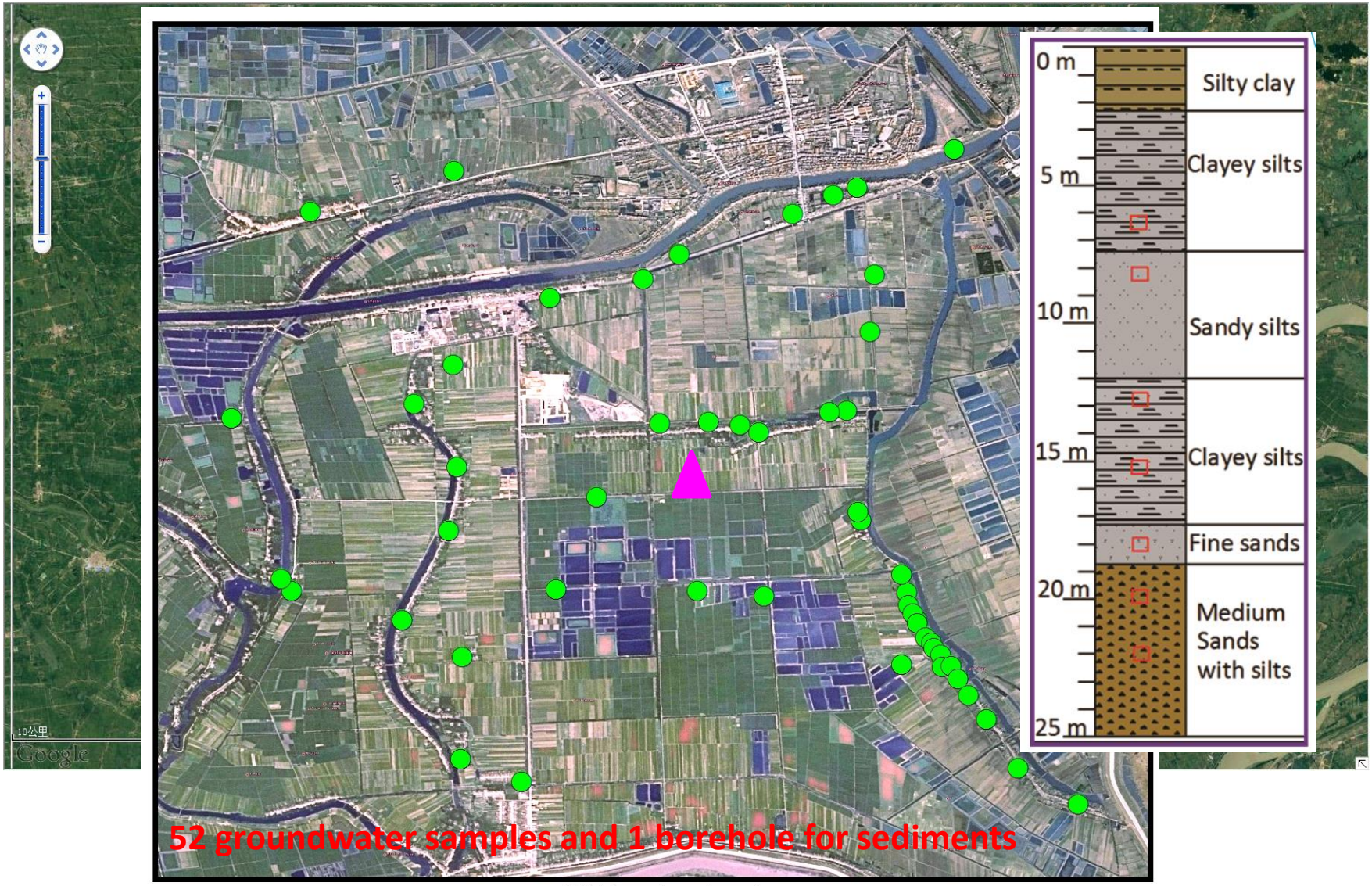
By employing fluorescent and geochemical methods, we displayed the concurrence of NH_4^+ and Fulvic acid-like OM in the groundwater of Central Jianhan Plain, China.
The study also presented some hints for assessing potential binding of NH_4^+ with OM in aquifers.

Study area and samples





Study area and samples



Measurements : groundwater samples

Hydrochemical analyses

ORP pH, DO, and EC

NH4-N (nessler ' s reagent colorimetry), DOC

Major cations and anions

DOM analysis

Fluorescence measurements

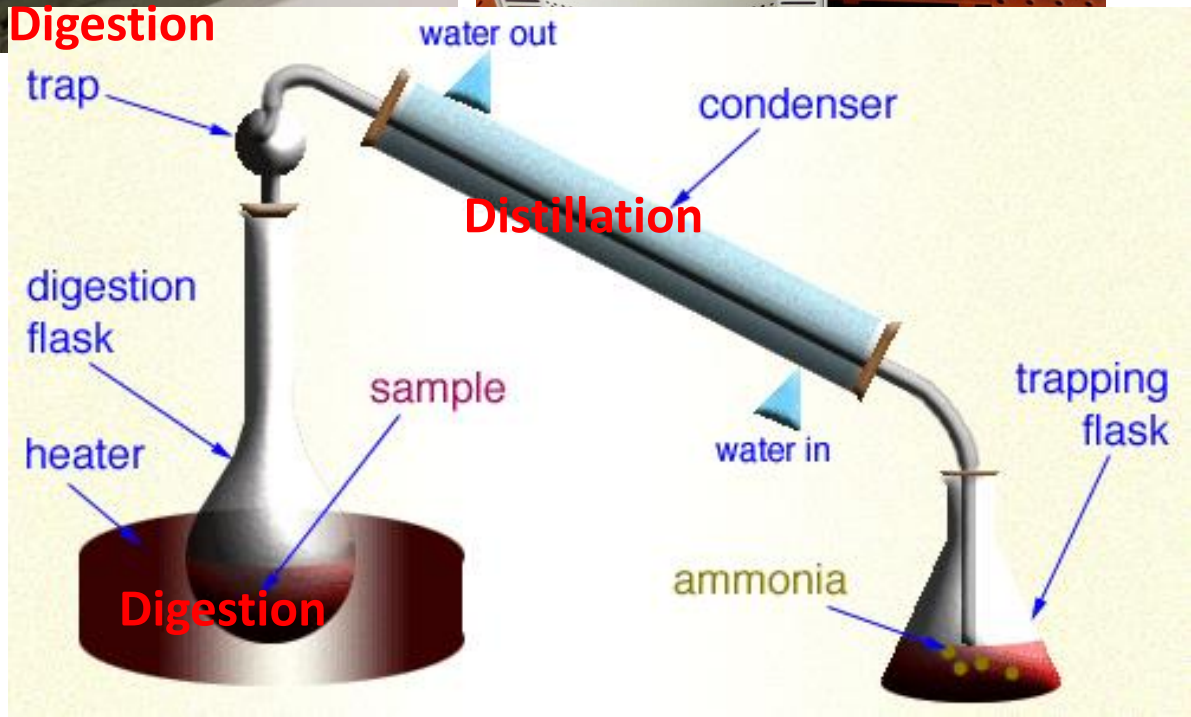
PARAFAC for spectroscopic data analysis

Experimental: sediment samples

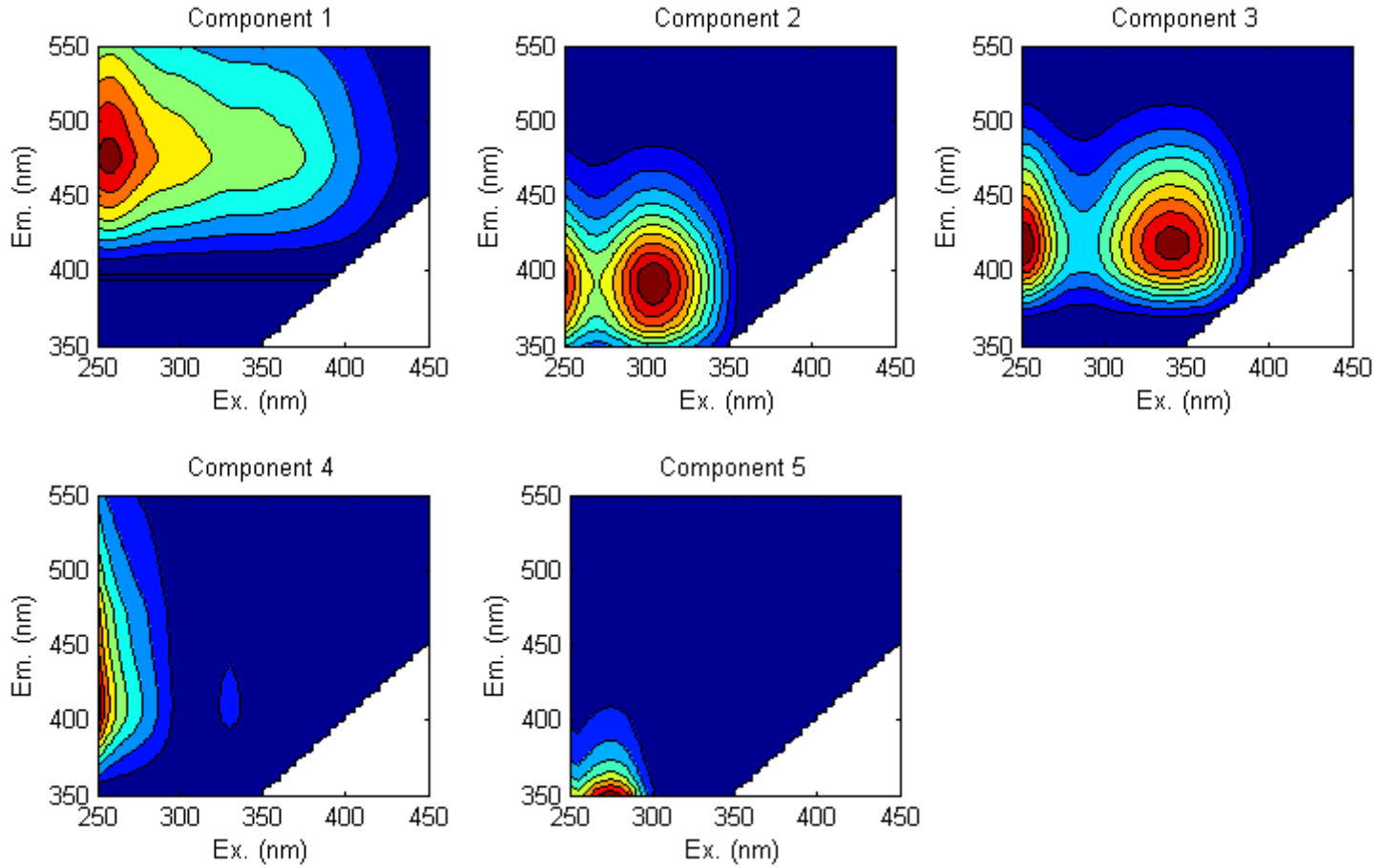
DOM extraction
from sediments
($CaCl_2$ as extractant)

Kjeldahl Nitrogen—to determine the amount of nitrogen in mixtures of substances containing ammonium salts or organic nitrogen compounds.

Classcial chemical method



Results and discussion



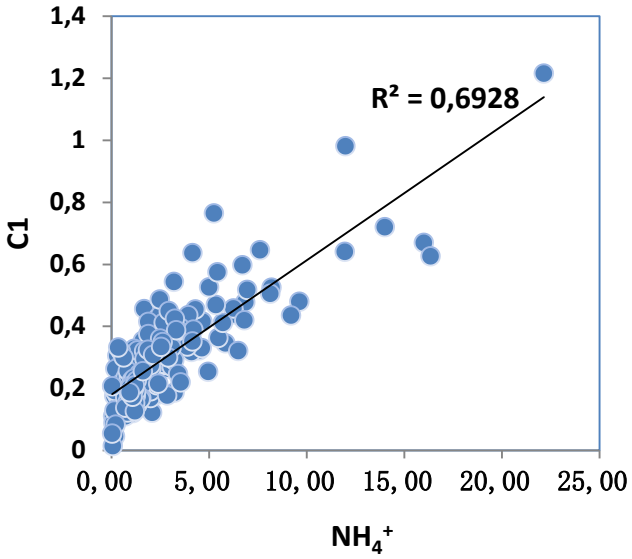
C1-C3, Humic-like substances: close to fulvic acid-like components

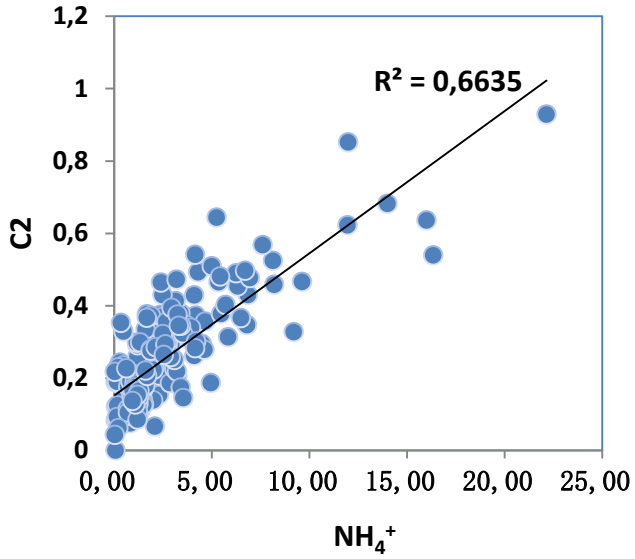
C5, Microbial source, amonia acid-like component, C4 is the transition species between humic-like and amino acid-like component ,

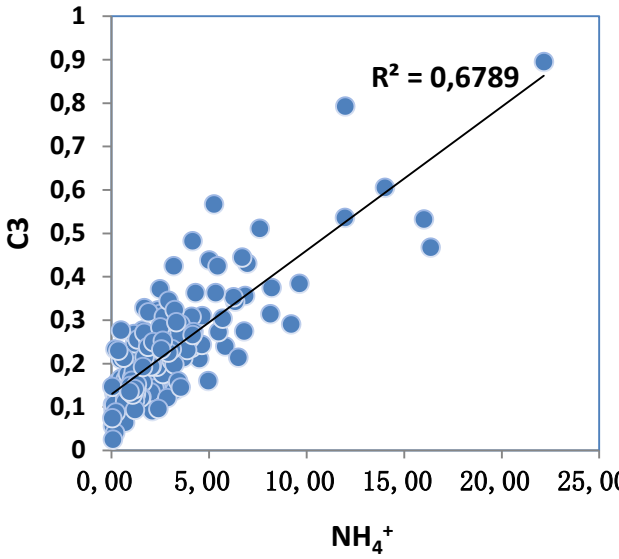
For short and convenience, we read all sth–like components only as FA and AA thereafter.

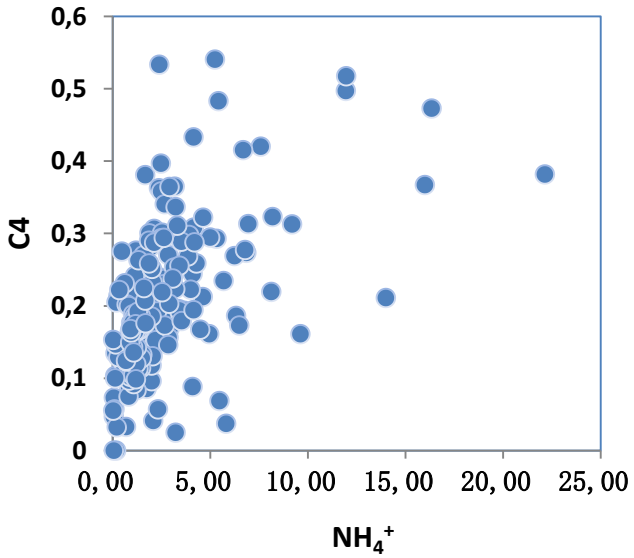
C1-C3 as humic-like, are refractory; C4 C5 are labile to biodegradation

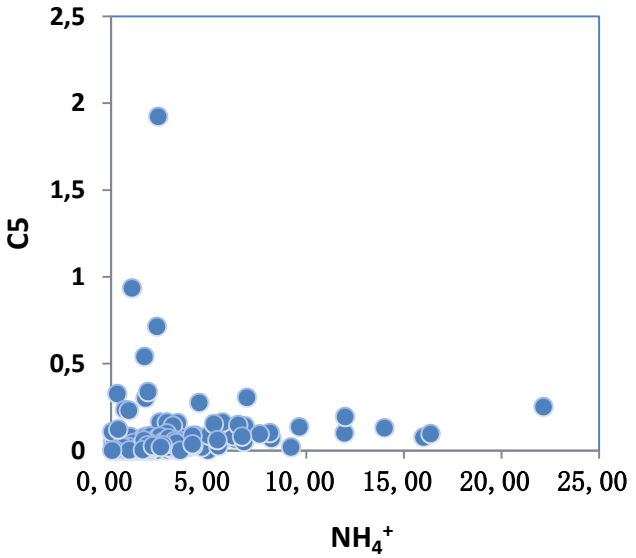
Big scale field







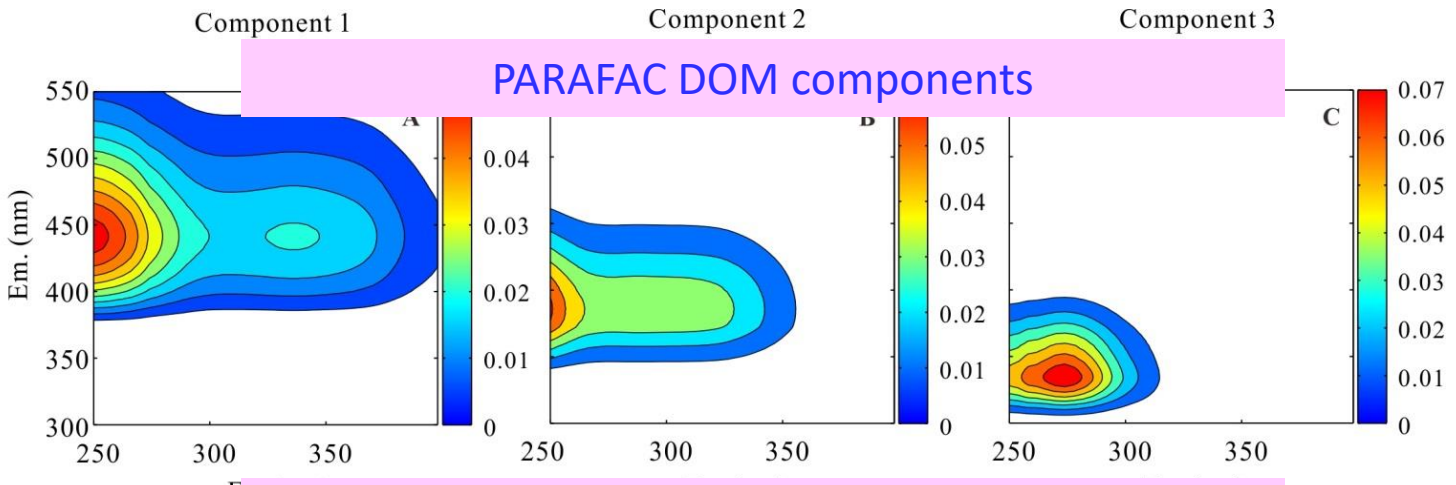




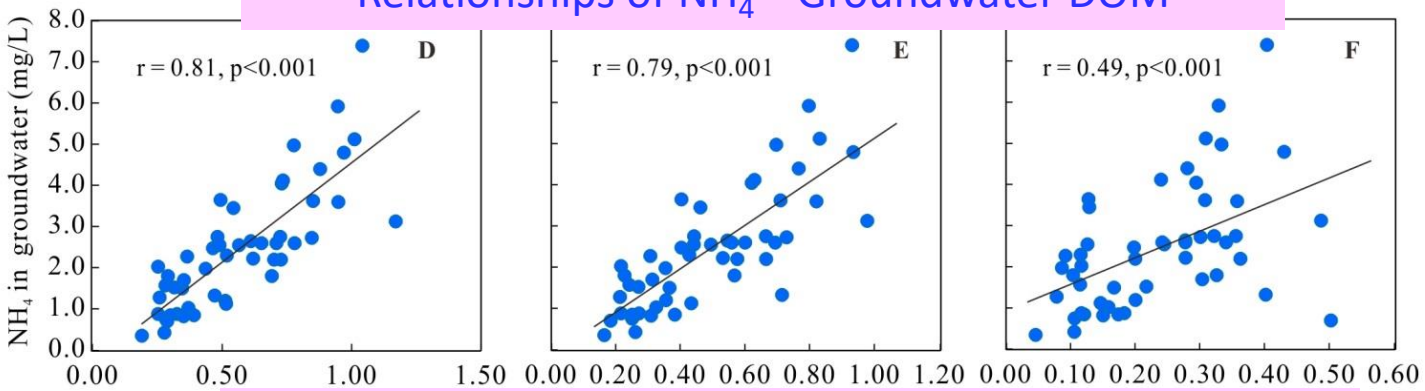
We found strong positive correlations between NH4 and Fulvic acid OMs and no obvious positive relationship or even negative relationship were observed between NH4 and amino acid OMs.

Small scale field

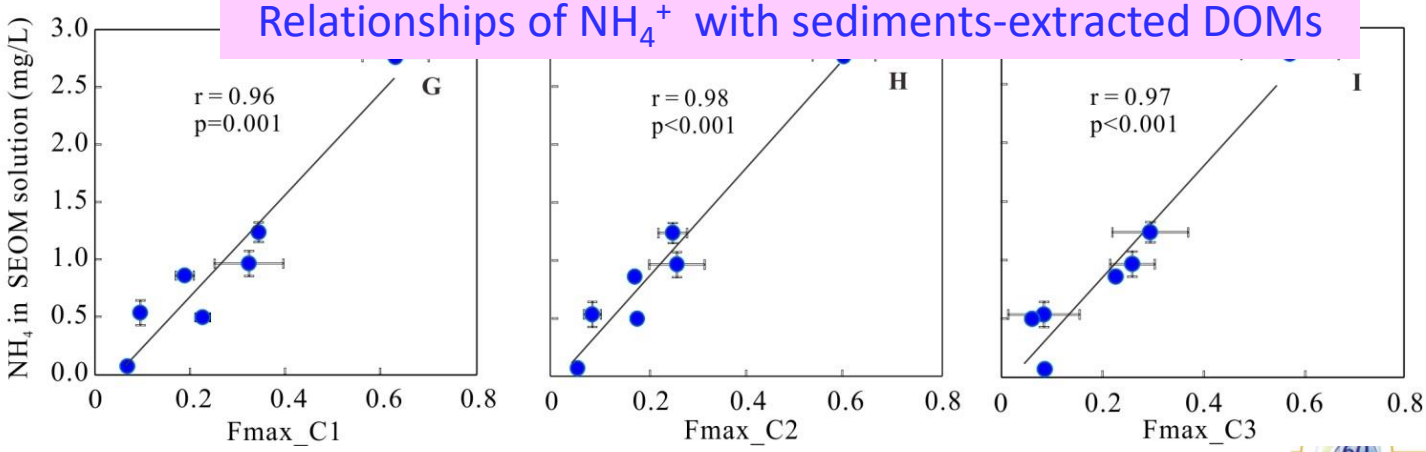
PARAFAC DOM components



Relationships of NH_4^+ -Groundwater DOM



Relationships of NH_4^+ with sediments-extracted DOMs



Significant correlations of NH_4^+ with fluorescent DOM components for sediments-extracted DOM and groundwater DOM

NH4-N accounts for 5.84-7.72%

Organic nitrogen accounts for 87-93.51%

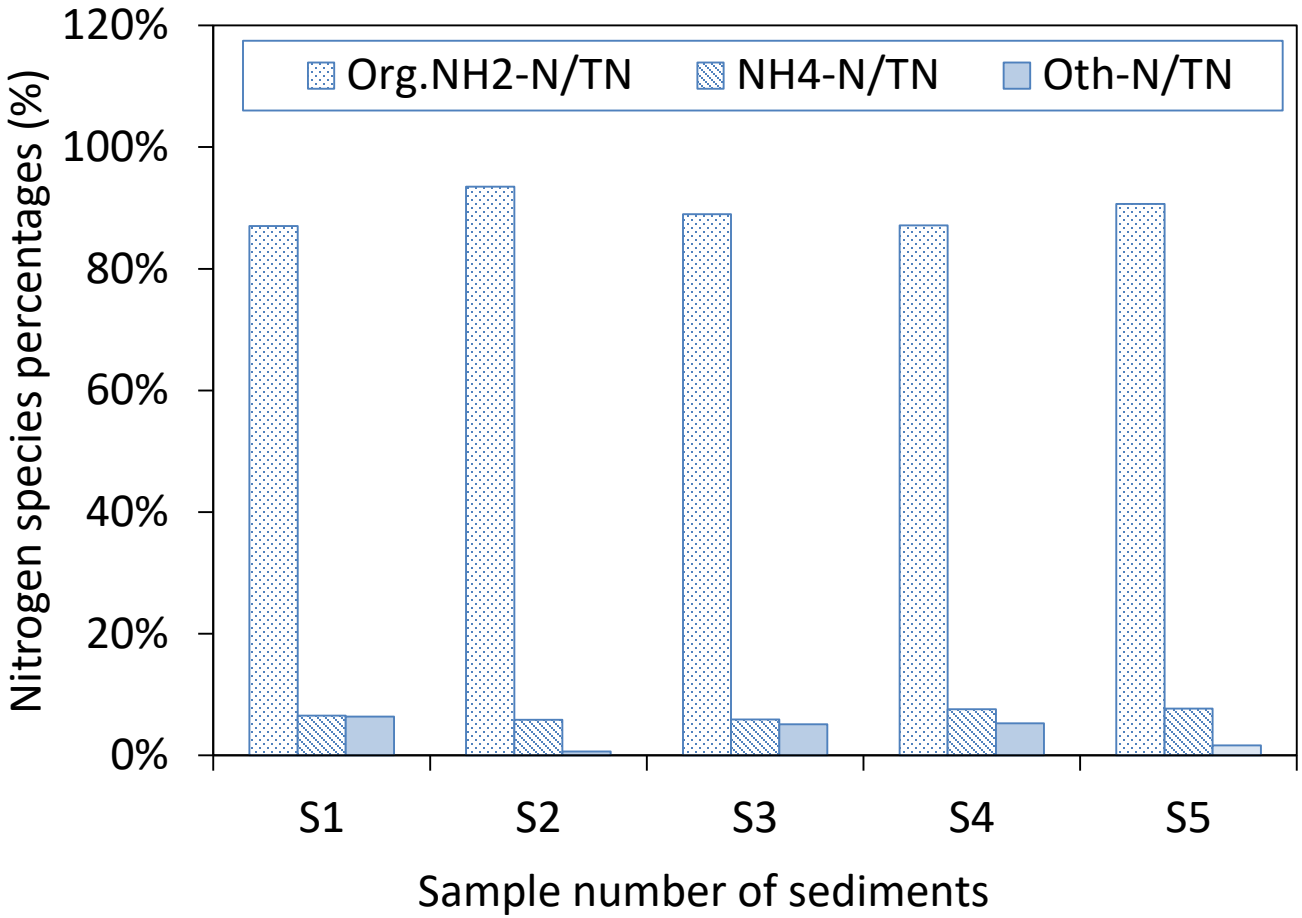
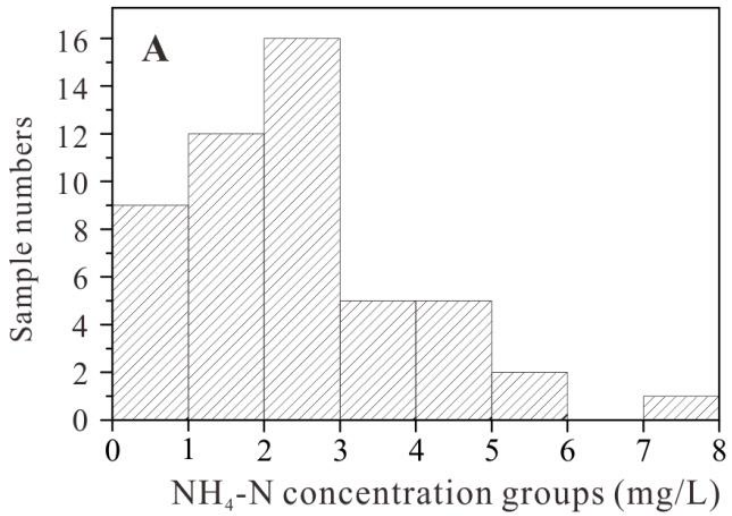
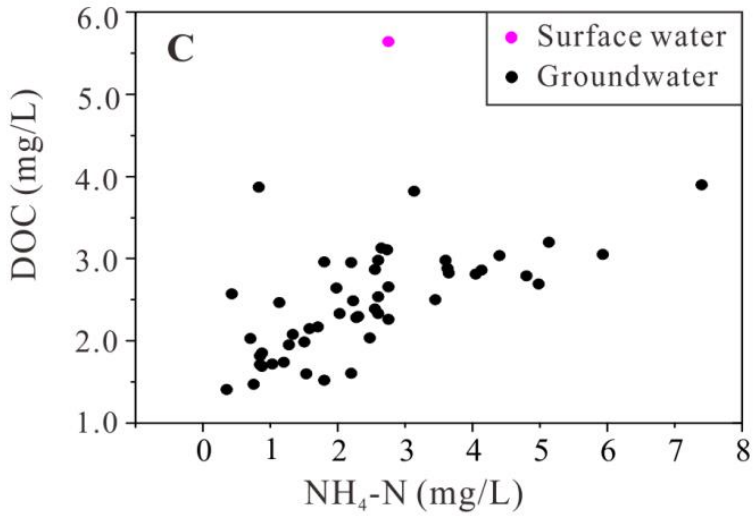
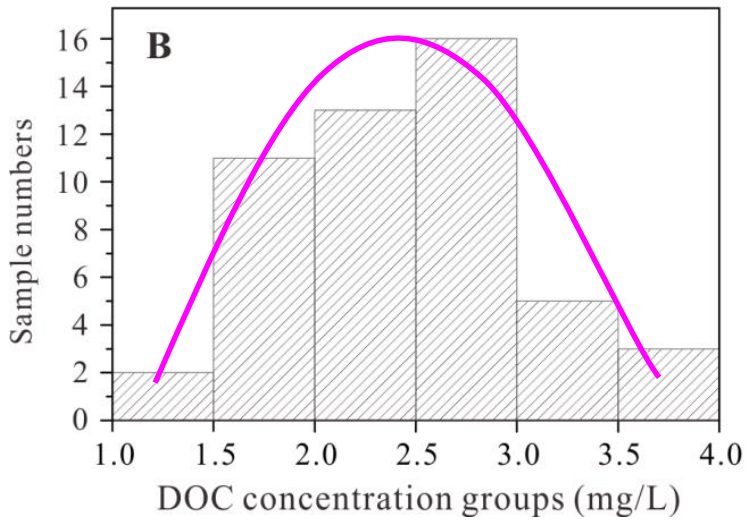


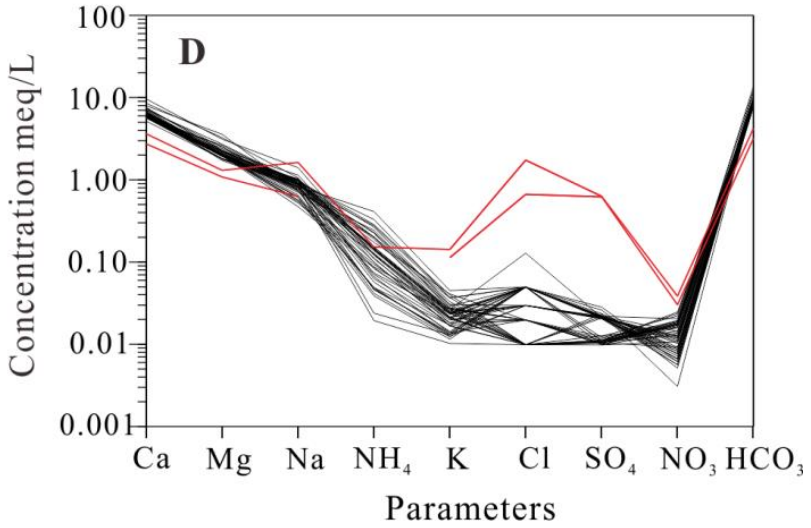
Table S2 Nitrogen species contents (mg/g) in sediments and the rates (%) of Org.NH_2-N, NH_4-N, Kj-N to TN

Sample ID	NH_4-N	Kj-N	TN	Org.NH_2-N	NOx-N *	Org.NH_2-N/TN *	NH4-N/TN	Kj-N/TN
S1	0.041	0.59	0.63	0.54	0.081	87.04%	6.56%	93.60%
S2	0.068	1.15	1.16	1.08	0.075	93.51%	5.84%	99.35%
S3	0.015	0.23	0.25	0.22	0.027	88.98%	5.92%	94.90%
S4	0.036	0.45	0.48	0.41	0.061	87.16%	7.58%	94.74%
S5	0.048	0.61	0.62	0.56	0.058	90.65%	7.72%	98.37%









Ammonium, DOC and major ions concentrations in groundwater of an aquifer at Jianhan Plain

Summary

1. For both regional and local aquifer GWs, strong positive relationships exist between NH_4 and refractory fulvic acid OMs while not significant between NH_4 and labile amino acid OMs.

2. Geochemical analysis suggested the OM-associated NH_4-N source for GW, and the present NH_4 could come from the organic species.

Summary

3. The concentration magnitudes and distribution characteristics of both DOC and NH_4 appear to suggest an accompanying release of the two from the aquifer sediments.

4. Refractory FA OMs is relatively stable so could remain in the groundwater and labile fractions (AA) are easily consumed by microbes and thus not significant relationship could be maintained between NH4 and AA OM. ----An assumption, to be evidenced further!

Thank you for your attention

Welcome to IHEG, CAGS

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