Workshop on Medical Geology

Metals, Health and the Environment

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ARSENIC OCCURRENCE IN BRAZIL AND HUMAN EXPOSURE

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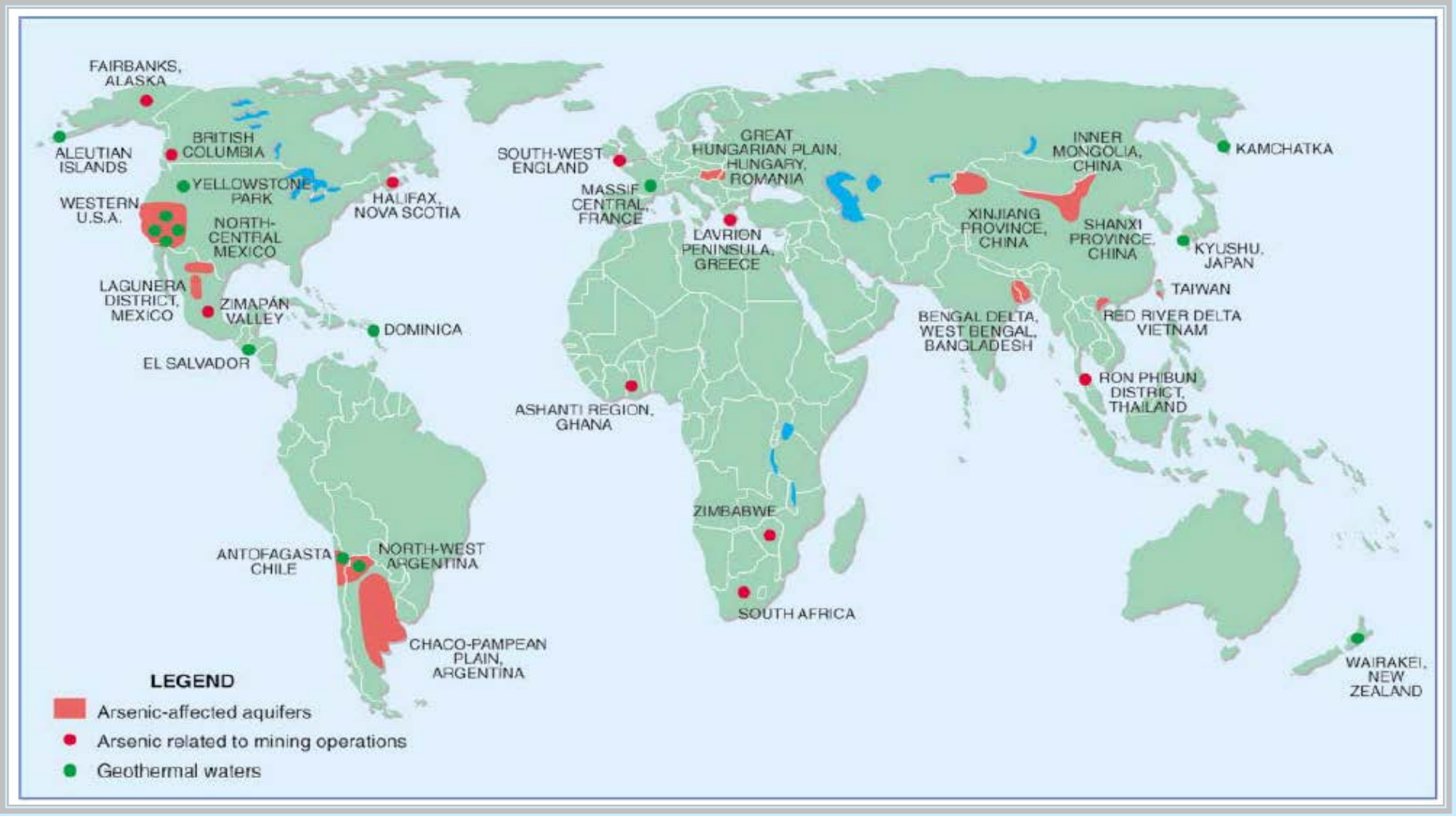
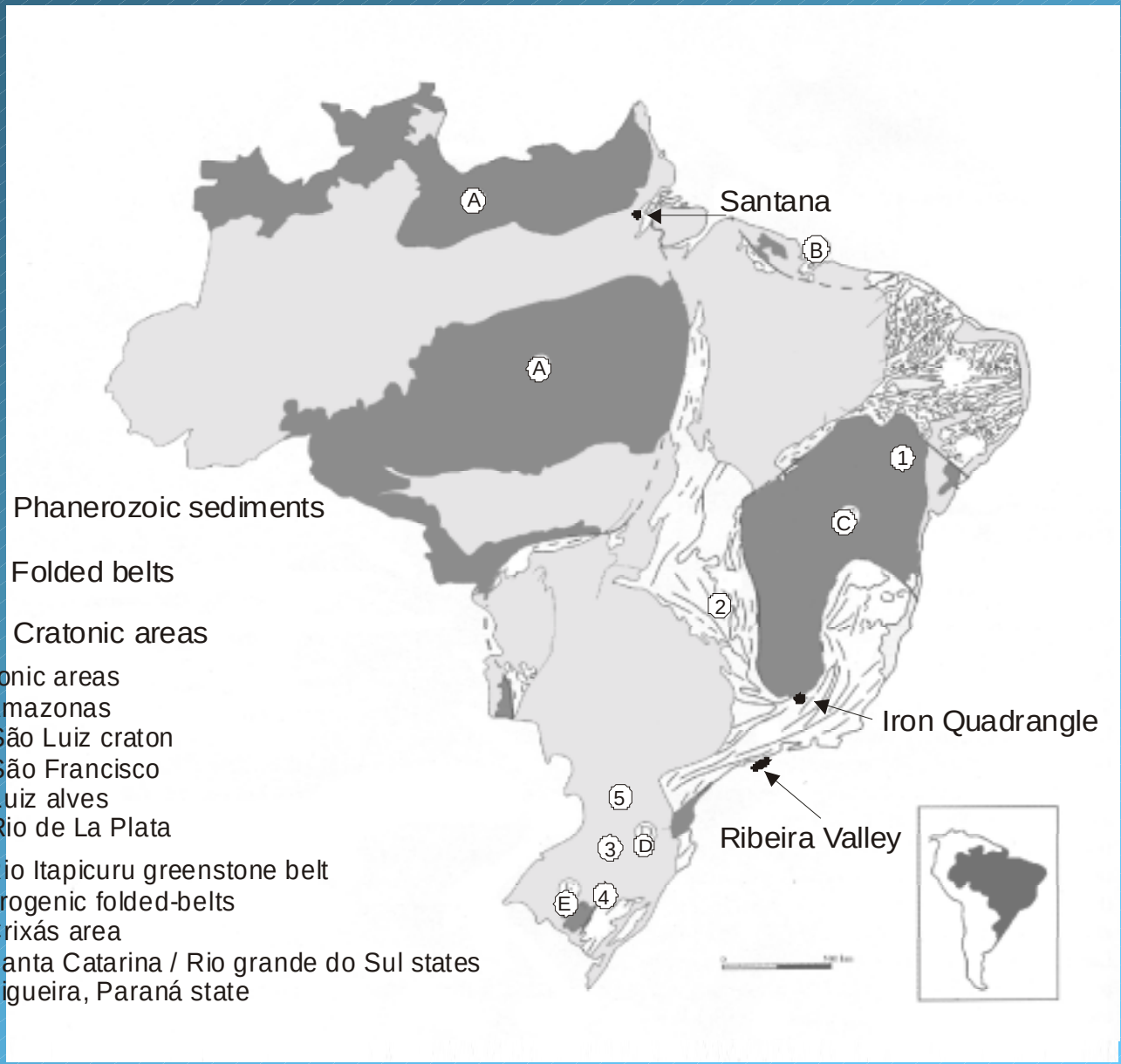
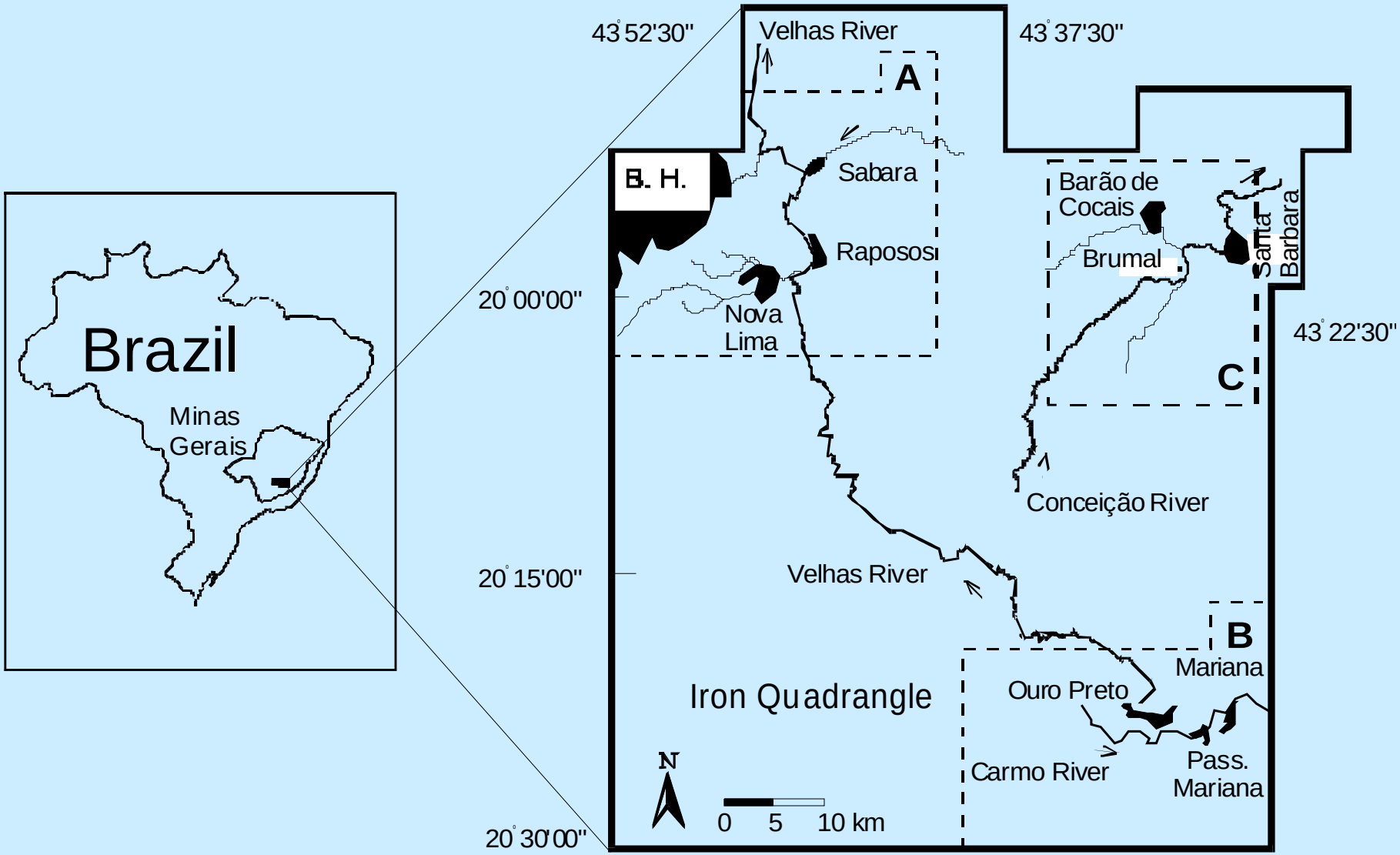


Distribution of documented world problems with As in groundwater in major aquifers as well as water and environmental problems related to mining and geothermal sources. Areas in blue are lakes

(Smedley & Kinniburgh,2002)



Location map and geologic-tectonic units in Brazil



The Iron Quadrangle, Minas Gerais State

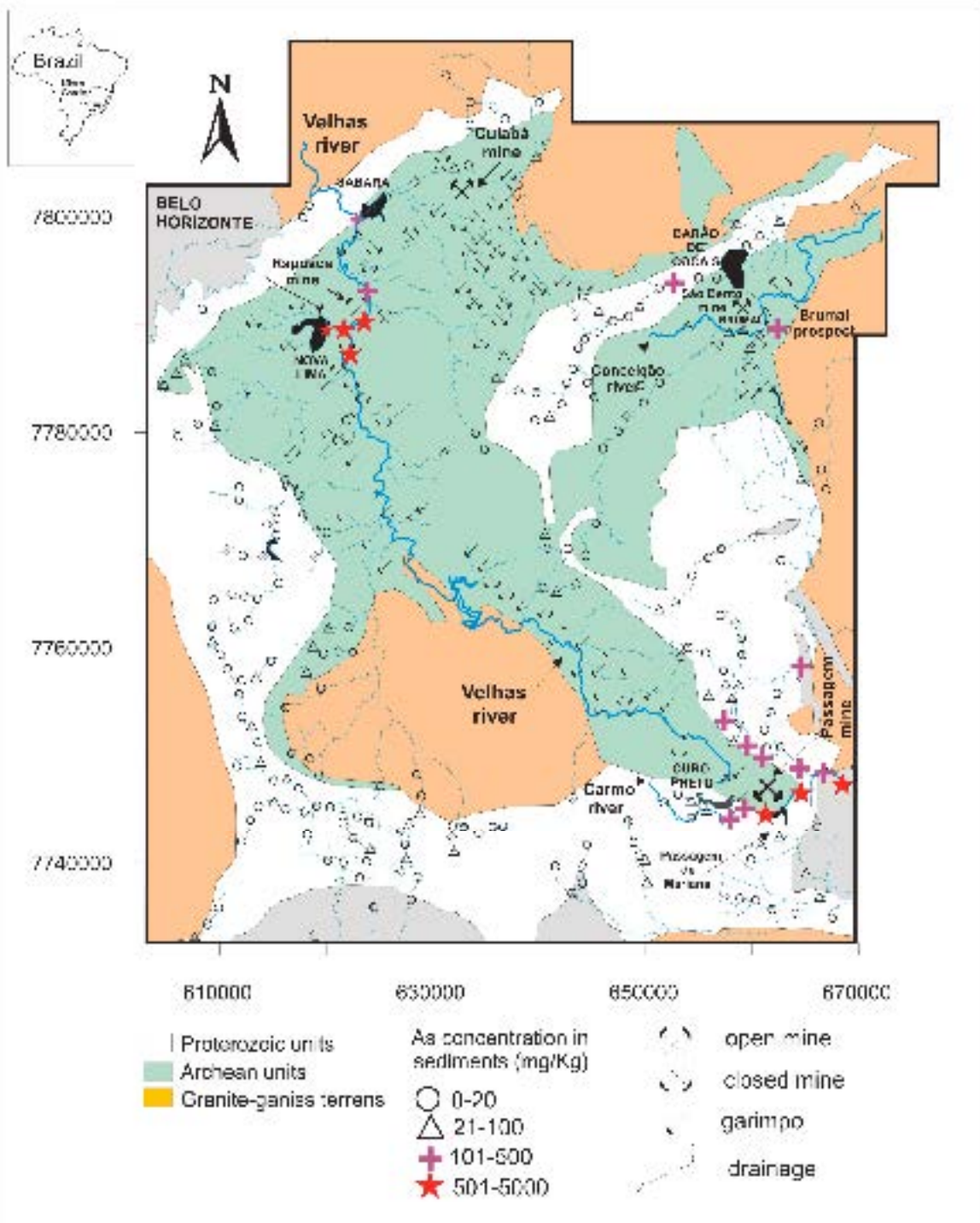
ARSENIC DISTRIBUTION IN THE IRON QUADRANGLE

Sediments
<4,000 mg/Kg As

Surface waters
<350 µg/L As

Groundwater
<10 µg/L As

Mine waters
<2980 µg/L As_{total}
<86 µg/L As^{3+}

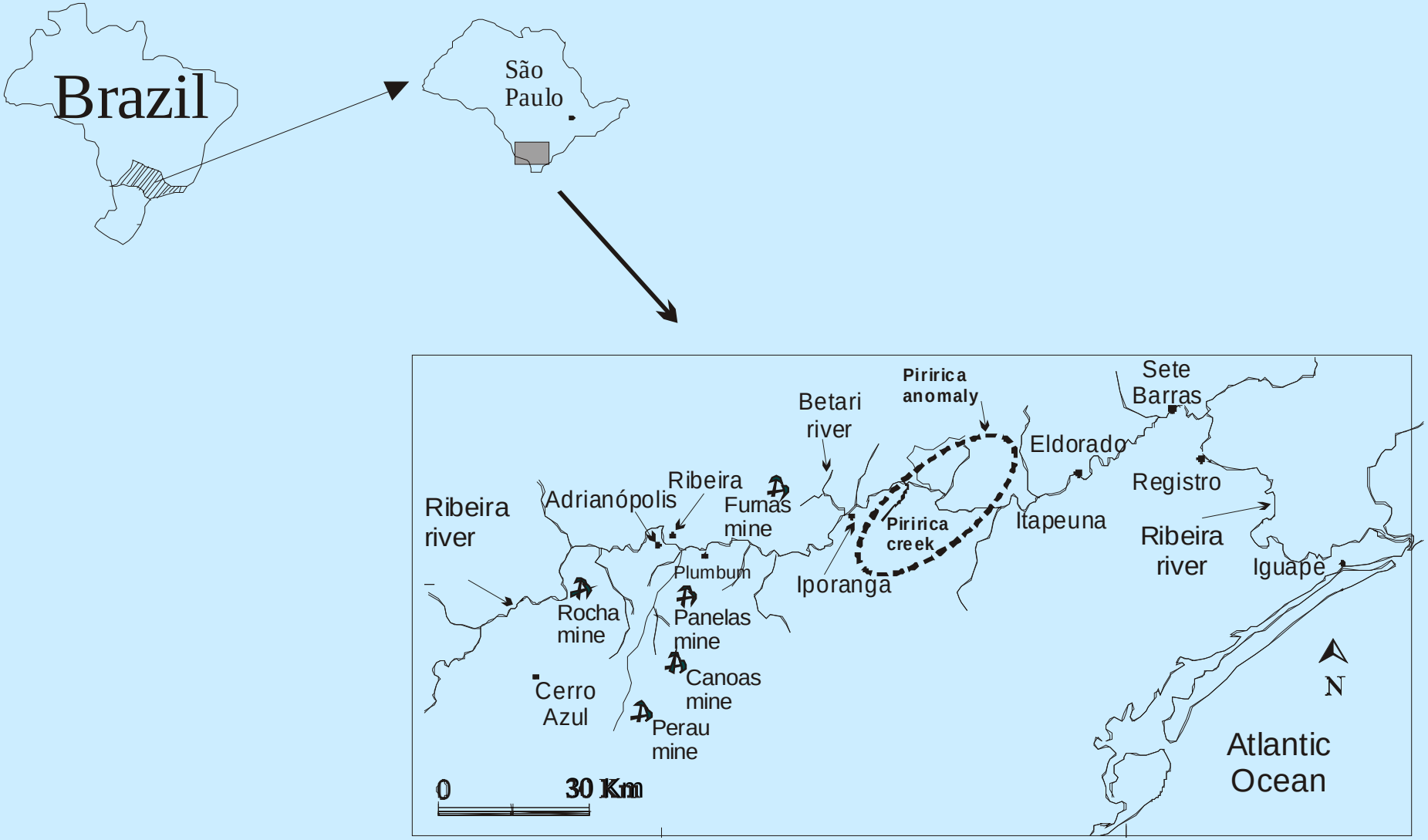


ARSENIC IN URINE – IRON QUADRANGLE 1998 (µg/L As)

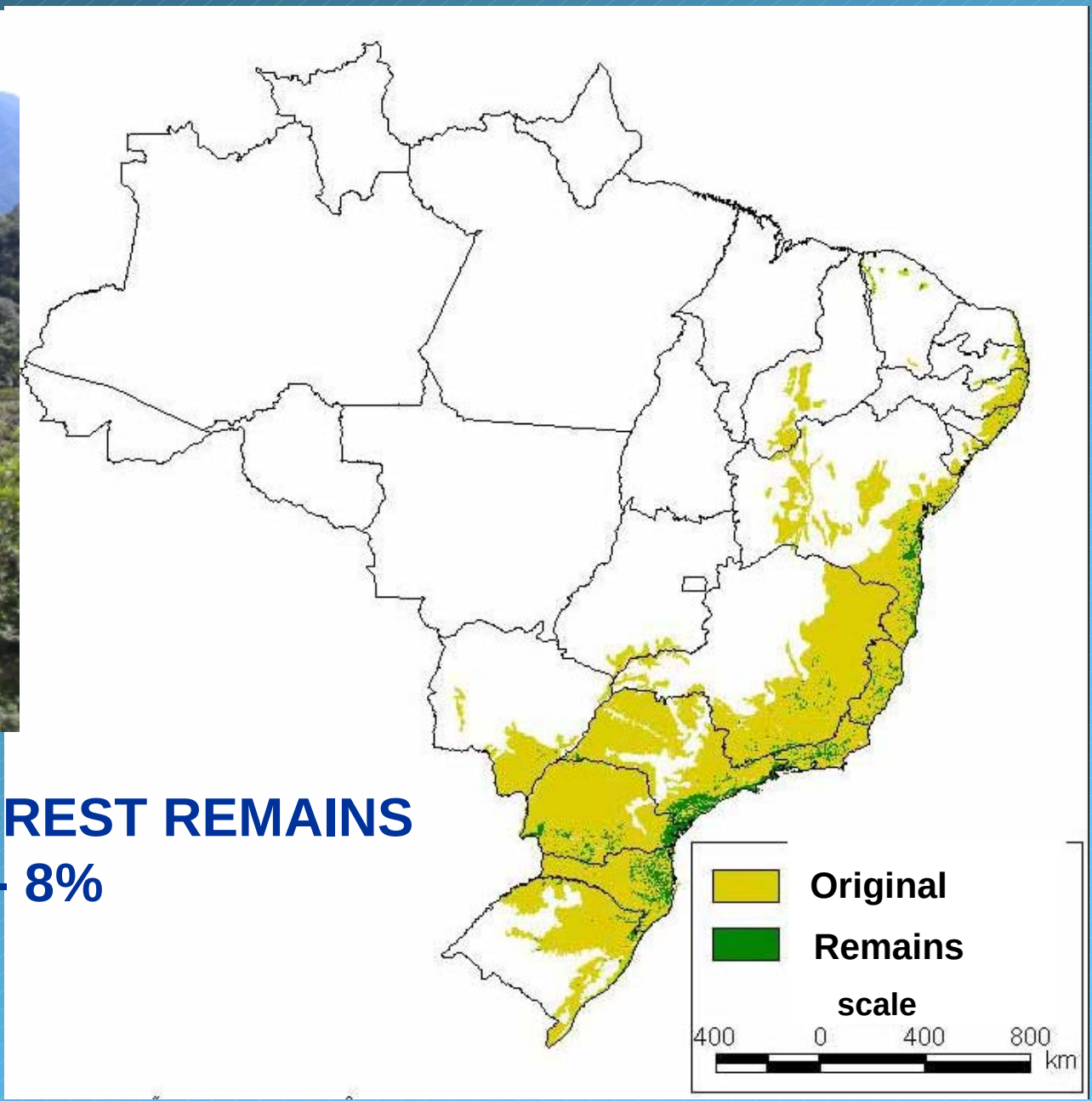
Locality	n	mean	boys	girls
Galo		30.2	31.3	29.3
Mingu		18.5	21.4	13.5
Brumal		25.3	27.0	23.8
TOTAL	126	25.7	27.1	24.3

19.2 % of children > 40 µg/L As

Source: Matschullat et al. (2000)



Ribeira Valley, Southeastern Brazil



ATLANTIC FOREST REMAINS
BRAZIL 1998 - 8%

Upper Ribeira Valley – Pb-Zn mining and refinery

As contents

Sediments
<355 mg/Kg

Surface water
<9 µg/L

Soils (0-30 cm)
<2,000 mg/Kg

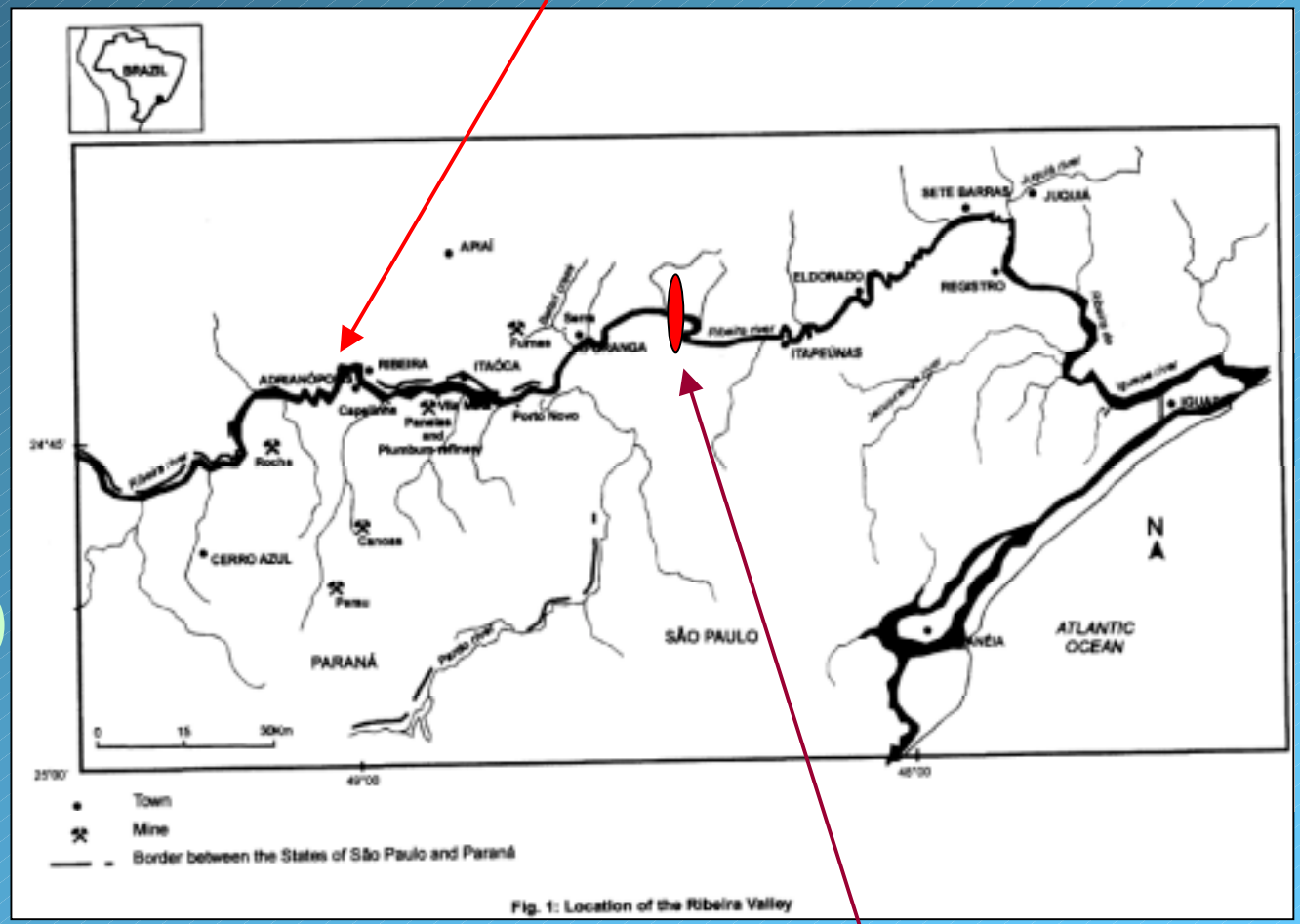


Fig. 1: Location of the Ribeira Valley

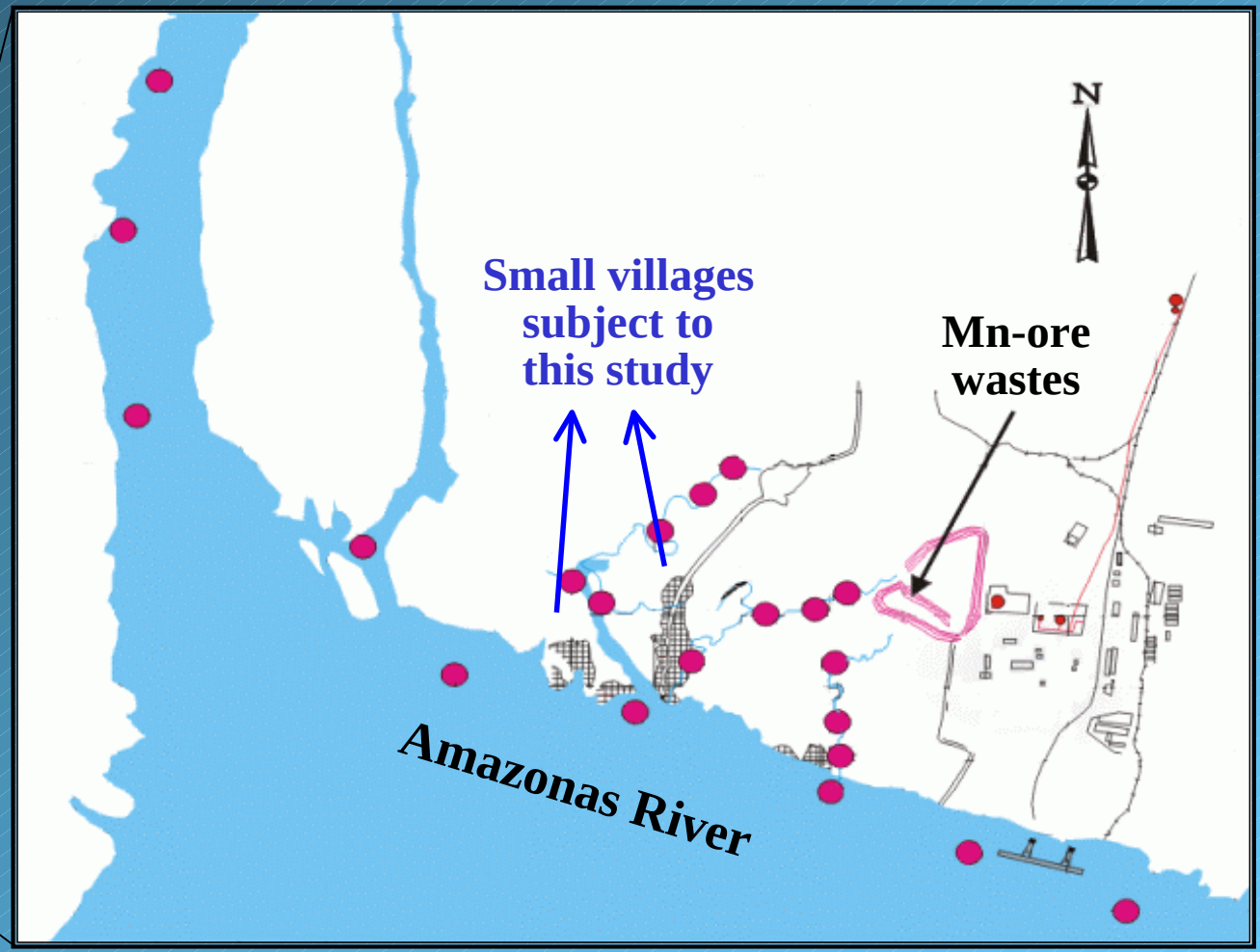
Middle Ribeira Valley – Natural arsenic anomaly

ARSENIC IN URINE – RIBEIRA VALLEY – 2002-2003 (µg/L As)

Locality	n	Mean	Min	Max
Cerro Azul	156	3.86	1	34.12
Serra	175	8.90	1	62.54
Iporanga	108	8.35	1	33.49
Pilões	49	4.63	1	68.92
Castelhanos	54	9.48	1	60.32
São Pedro	51	11.35	1	76.19
Maria Rosa	26	2.24	1	24.34
Nhungara	22	6.98	1	36.55
TOTAL	641			

Source: Sakuma et al. (2003)

SANTANA-AMAPÁ AREA



- River sediments - <1,600 mg/Kg As
- Surface water - <231 µg/L As
- Tap water - <0.5 µg/L As

ARSENIC IN HAIR – SANTANA 2001-2002 (µg/g)

Population	n	Mean	Min	Max
MEN	182	0.200	0.074	1.936
WOMEN	330	0.200	0.063	1.855
TOTAL	512	0.200	0.063	1.936

Source: Santos et al. (2003)

CONCLUDING REMARKS

Only point pollution sources known so far

- High As concentrations in river sediments and soils
- Deep chemical weathering favors As retention in soils and sediments
- Very low As concentrations in surface waters (dilution phenomena)
- Low levels of human exposure for As
- Population less dependend on groundwater supply (except in NE region)

FINAL REMARK

Non-point pollution sources still unknown

- On going studies on As-bearing geological formations and major aquifers in Brazil on areas where As-anomalies have been indicated

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Thanks,

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