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O CONHECIMENTO GEOCIENTÍFICO
COM EXCELÊNCIA



SERVIÇO GEOLÓGICO DO BRASIL – CPRM

AGE CONSTRAINTS AND ISOTOPE SIGNATURE OF THE
EDIACARAN PB-ZN AND CU-EPITHERMAL DEPOSITS, MINAS
DO CAMAQUÃ, BRAZIL

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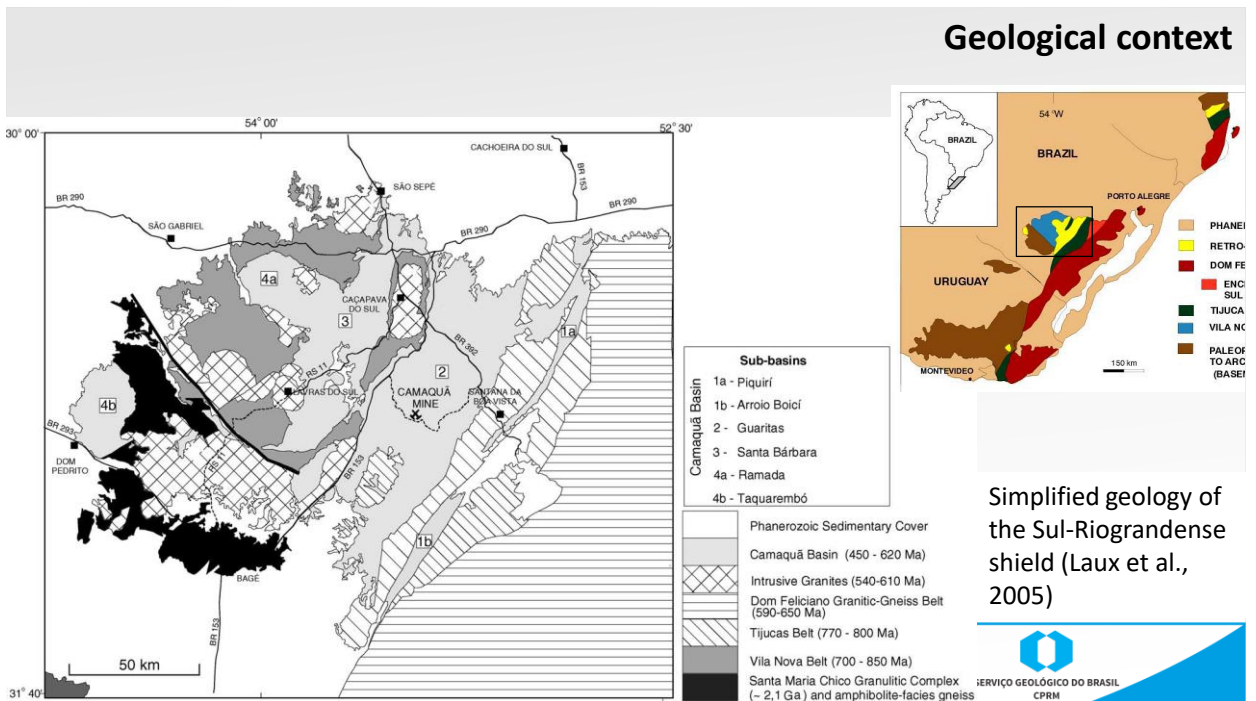
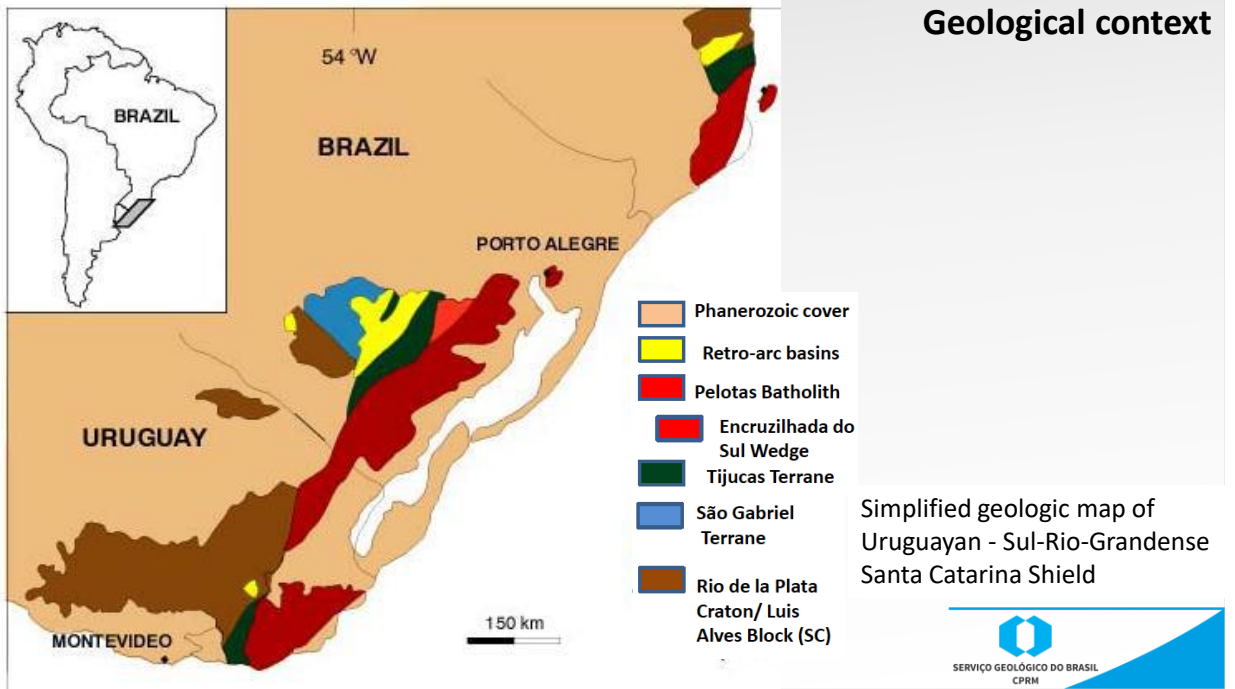


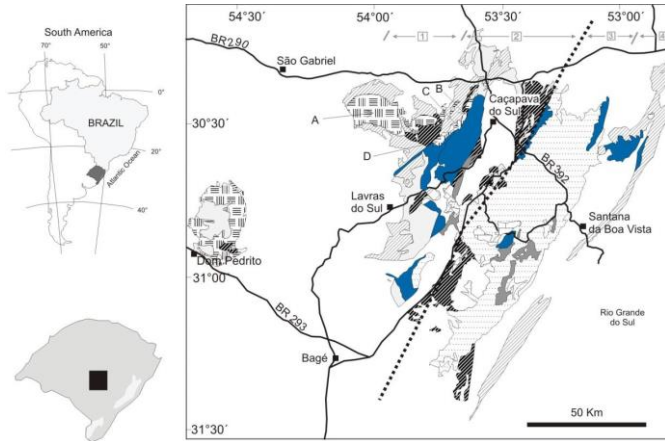
Summary

- Introduction
- Deposit Localization
- Geological context
- Cu (Au) and Pb-Zn Deposits
- Ore minerals
- U-Pb Age
- Isotope signature
- conclusions

Introduction

- The Minas do Camaquã orebodies are hosted by sandstone and conglomerate of the Neoproterozoic to Early Paleozoic Camaquã basin.
- The Camaquã basin was initially marine and progressively changed into a definite continental environment.
- The ore consists of massive sulfides in veins, pipes and stringers, and disseminated sulfides.
- The sulfide paragenesis in the primary ore consists of chalcopyrite, bornite, chalcocite, and pyrite.

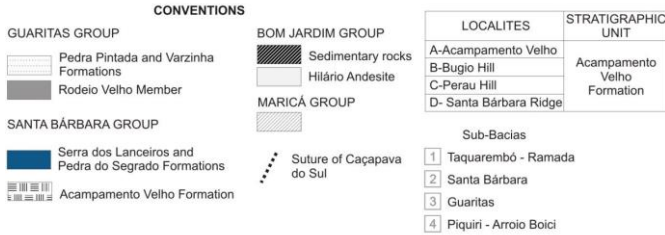




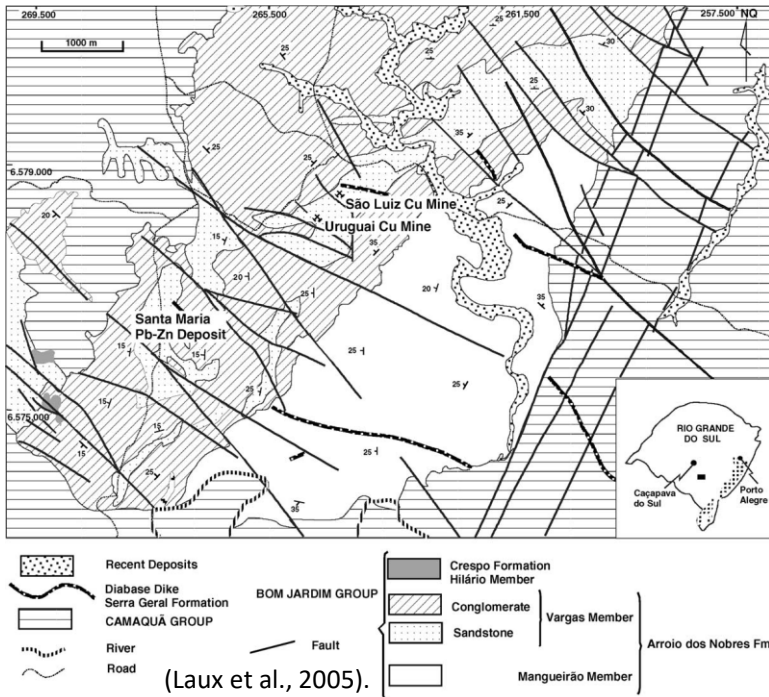
Geological context

The Camaquã Basin is locus depositional basin formed between 630 – 500 Ma, from the base to the top:

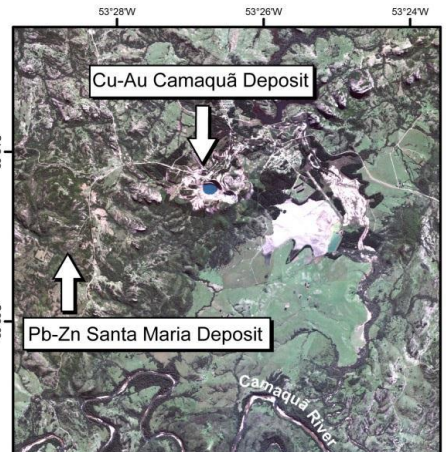
- Maricá Group (<630 to > 594 Ma)
- Bom Jardim Group (594 Ma to 580 Ma)
- Acampamento Velho – Santa Bárbara Group (574 Ma to 547 Ma)
- Guaritas Group (547 Ma to 500 Ma)



Simplified geology of the Camaquã Basin (Almeida et al., 2012)

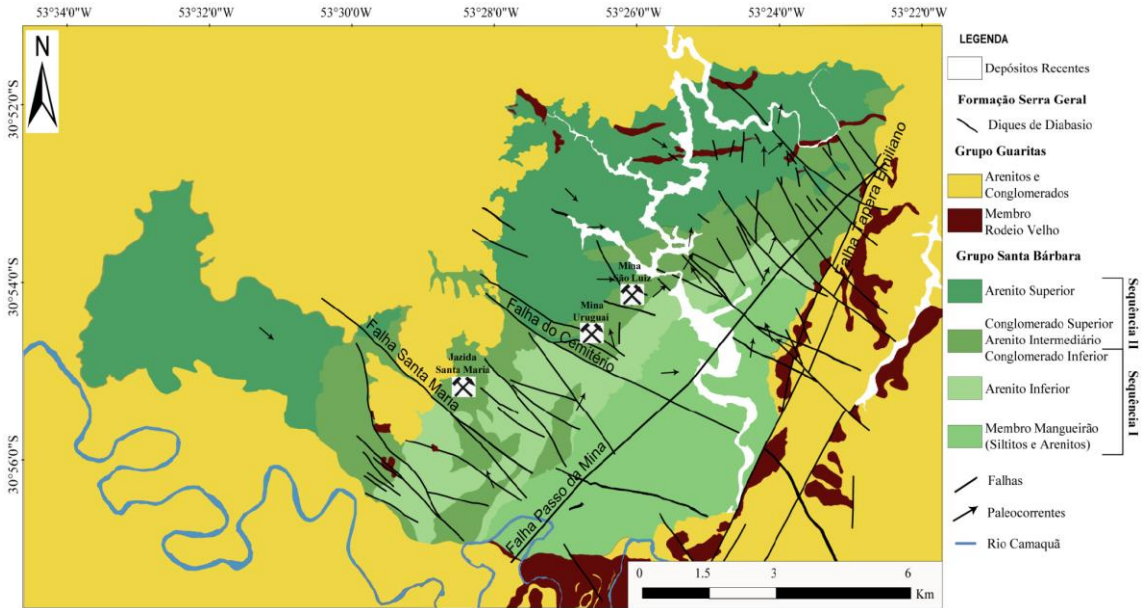


Geological context

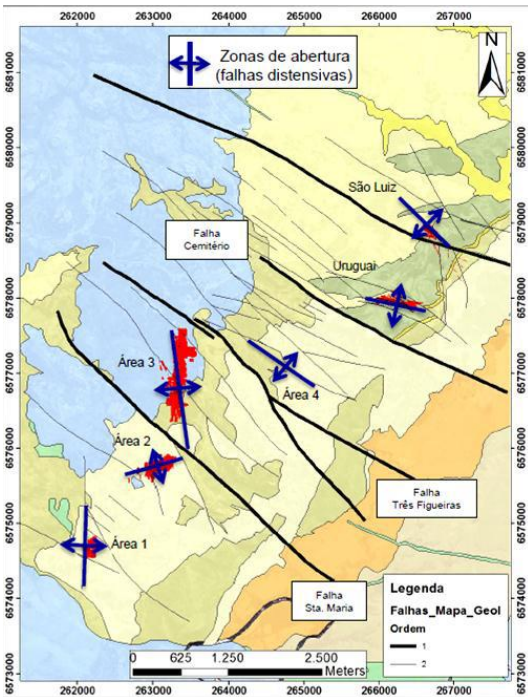


(Chemale Jr., 2014).





Geological and structural map of Minas do Camaquã region (Bicca, 2013).



Cu (Au) and Pb-Zn Deposits

Mineralization with strong structural control (ductile-brittle), associated with transtensional zones of 2^a order.

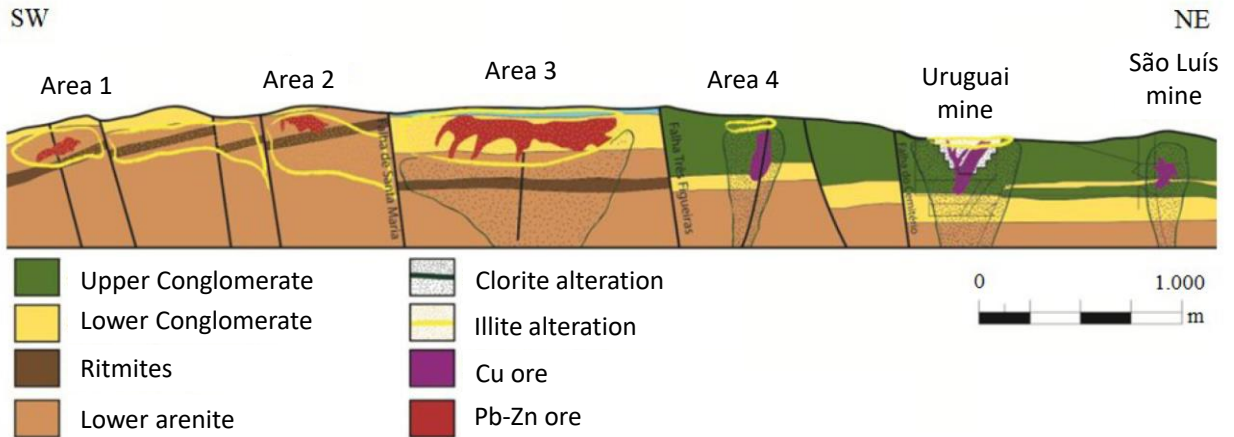
Hydrothermal alteration controls the distribution of metals

Hydrothermal alteration zoning : (1) illite → Pb-Zn (2) chlorite → Cu (Au).

(Samuel Lago, 2013).



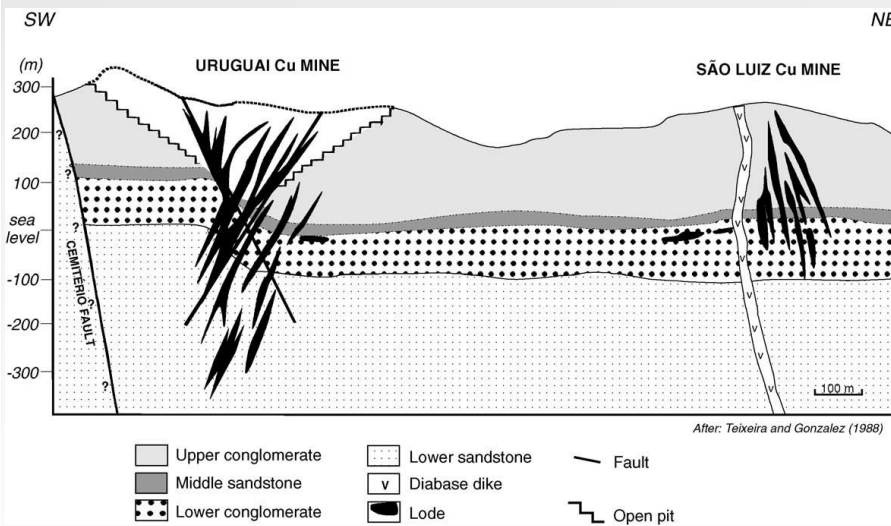
Cu (Au) and Pb-Zn Deposits context



Vertical section of Santa Maria and Minas do Camaquã deposits with related hidrothermal alteration (Modif. Santos, 2011, Nexa metals).



Cu (Au) Deposit context

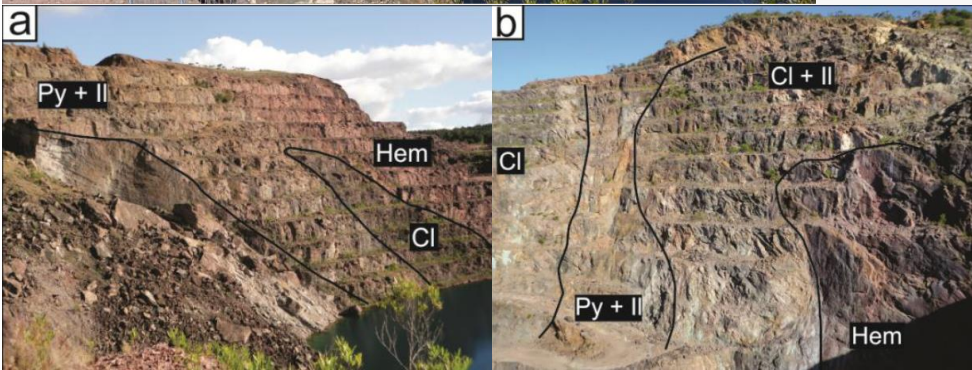


Minas do Camaquã Deposit (Laux et al., 2005).



Open pit of Uruguay Mine - Copper (Au) deposit (Chemale Jr, 2014)

Cu (Au) Deposit context



Hydrothermal alteration
(Lindenberg., 2014).



Cu (Au) Deposit context



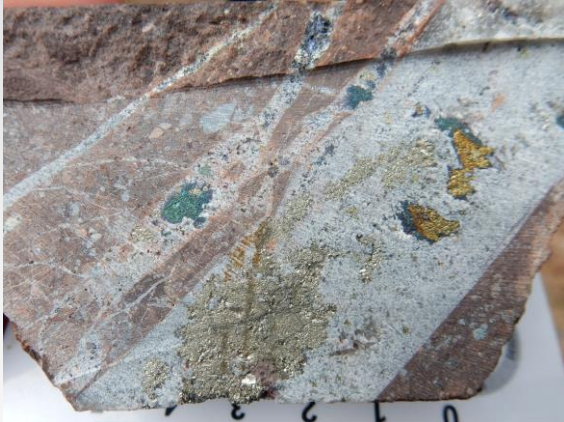
Level 180, Uruguay Mine (Minas do Camaquã, RS). Breccia with calcocite as cement, in fault zone (Laux, 1995)



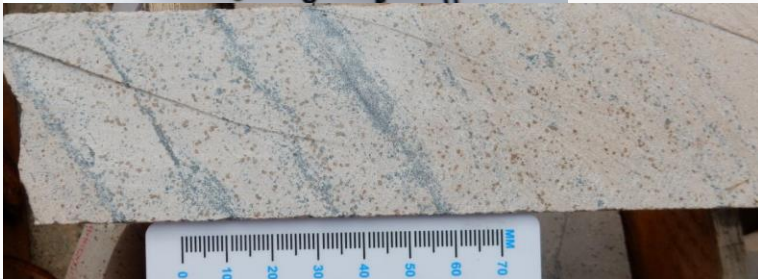
Nível 220, Uruguay Mine (Minas do Camaquã, RS). Breccia with cpy as cement, in fault zone (Laux, 1995)



Cu (Au) Deposit context



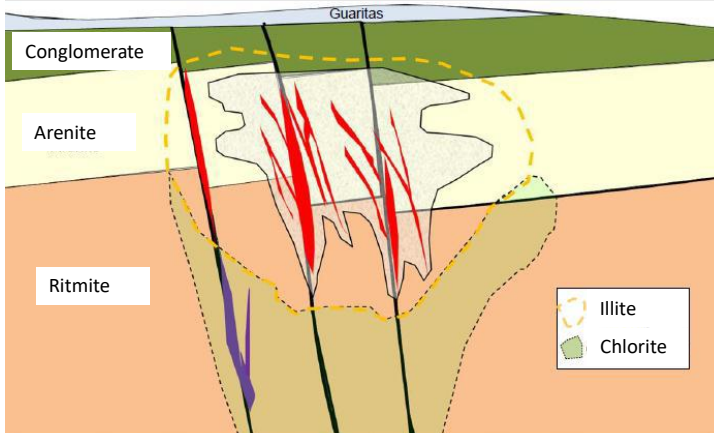
Stringer ore



Disseminated ore

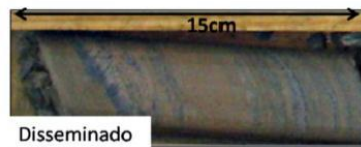


Pb-Zn Santa Maria Deposit (Samuel Lago, 2013).

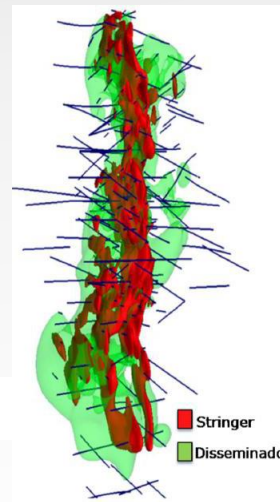


Stringer ore: >3% Zn+Pb
Vertical and lenticular body

Disseminated ore: 0.5% >Zn+Pb< 3%
Stratiform, thick and cover the stringer body



Pb-Zn Deposit context



Stringer
Disseminado

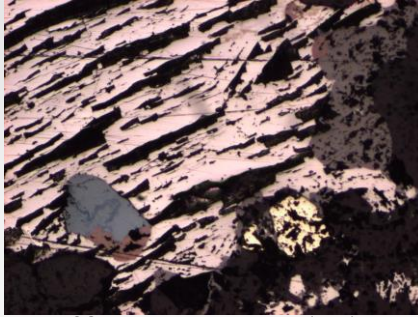
Samuel Lago, 2013



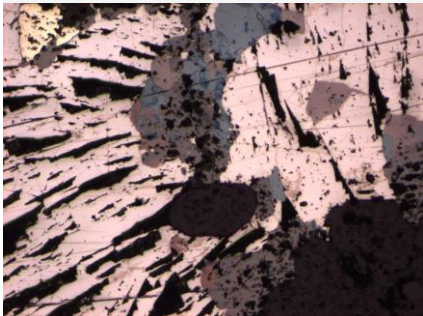
Ore minerals



PCSM7913_Polarized light (4X)



PCSM7913_Polarized light (10X)



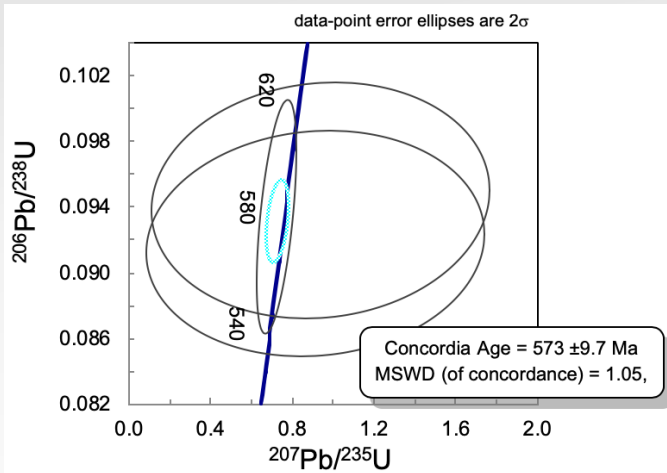
PCSM7913_Polarized light (10X)



7802A_Polarized light (4X)

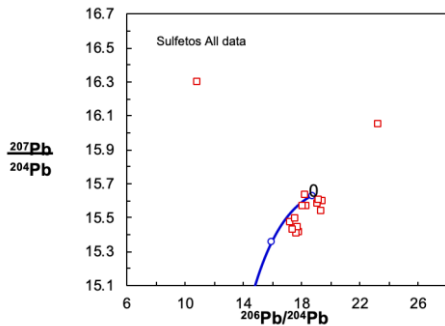
Microphotography of ore minerals
(Pb, Cu and Zn sulfides)

U-Pb age

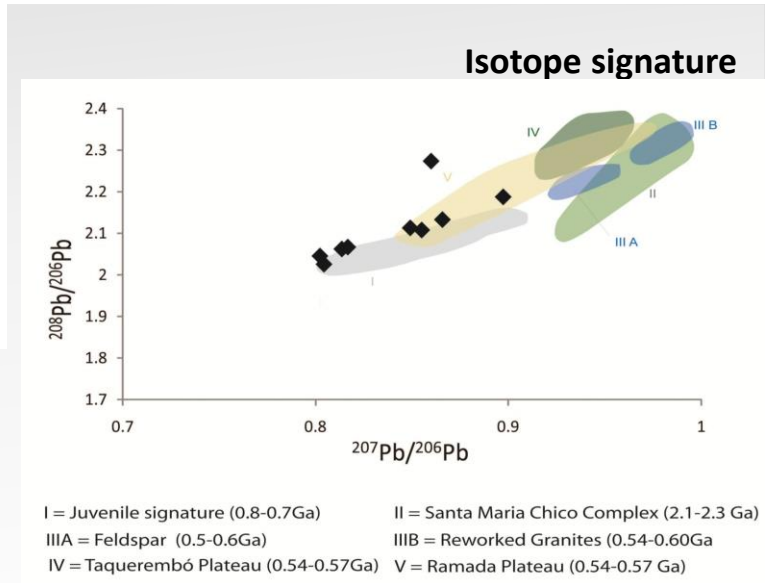


547 ± 6 Ma is the age of the hydrothermal process controlled by normal faults oriented at $N60^\circ - 70^\circ W$ and N-S.

U-Pb SHRIMP age for the intermediate volcanic lava of the siliciclastic hosted Cu-deposits.



$^{206}\text{Pb}/^{204}\text{Pb} \times ^{207}\text{Pb}/^{204}\text{Pb}$ diagram for the sulphides of the Camaquã Cu-deposits



$^{208}\text{Pb}/^{206}\text{Pb} \times ^{207}\text{Pb}/^{206}\text{Pb}$ diagram for the main units of the Sul-Rio Grandense Shield and sulphide mineralization (◆) (Takehara et al., 2010)



Conclusion

- Epithermal Cu (Au) and Pb-Zn (Ag) mineral deposits of intrusion related source, hosted in siliciclastic sedimentary rocks of Ediacaran age, are investigated.
- Pb- isotopes of Cu- and Pb-Zn-mineralization and U-Pb Shrimp dating of interlayered intermediated lava provided interesting clues on the source of the mineralization.
- The Pb-isotope data support that the most probable source for Pb-Zn mineralization is associated with volcanic-sedimentary rocks of the Camaquã Basin with strong contribution of the melted Paleoproterozoic between 0.58-0.54.



SERVIÇO GEOLÓGICO DO BRASIL – CPRM

ÁREAS DE ATUAÇÃO DA CPRM E OS OBJETIVOS DE DESENVOLVIMENTO SUSTENTÁVEL

ÁREA DE ATUAÇÃO SERVIÇOS COMPARTILHADOS

ÁREA DE ATUAÇÃO PROGRAMAS INTERNOS

SOBRE OS OBJETIVOS

Os Objetivos de Desenvolvimento Sustentável da ONU (ODS) são 17. Entre eles:



ÁREA DE ATUAÇÃO - GEOCIÊNCIAS

LEVANTAMENTOS GEOLÓGICOS



LEVANTAMENTOS AEROGEOFÍSICOS



AVALIAÇÃO DOS RECURSOS MINERAIS DO BRASIL



LEVANTAMENTOS GEOLÓGICO MARINHOS



LEVANTAMENTOS GEOQUÍMICOS



LEVANTAMENTO BÁSICO DE RECURSOS HÍDRICOS SUPERFICIAIS



PREVISÃO DE ALERTA DE CHEIAS E INUNDAÇÕES



ACROGEOLOGIA



LEVANTAMENTO BÁSICO DE RECURSOS HÍDRICOS SUBTERRÂNEOS



RISCO GEOLÓGICO



GEODIVERSIDADE



PATRIMÔNIO GEOLÓGICO E GEOPARQUES



ZONEAMENTO ECOLÓGICO-ECONÔMICO



GEOLOGIA MÉDICA



RECUPERAÇÃO DE ÁREAS DEGRADADAS PELA MINERAÇÃO



GEOPROCESSAMENTO E SENSORIAMENTO REMOTO



TECNOLOGIA DA INFORMAÇÃO



LABORATÓRIO DE ANÁLISE MINERAIS



MUSEU DE CIÊNCIAS DA TERRA



PALEONTOLOGIA



PARCERIAS NACIONAIS E INTERNACIONAIS



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