



# UNIVERSITÀ DEGLI STUDI DI MILANO

## Corso di Dottorato in Scienze della Terra



**13<sup>th</sup>-17<sup>th</sup> March 2023 - Short course (4 cfu, 20 hours) – Room to be established**  
**Dipartimento di Scienze della Terra “A. Desio”, via Mangiagalli 34, Milano**

### Geodynamics, Metallogeny and Georesources

by Prof. Patrick Ledru



#### PROGRAM

- Geodynamics and mineralizations
- Exploring georesources
- Metallogeny of the uranium mineral system



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**For information and to register, please contact:**

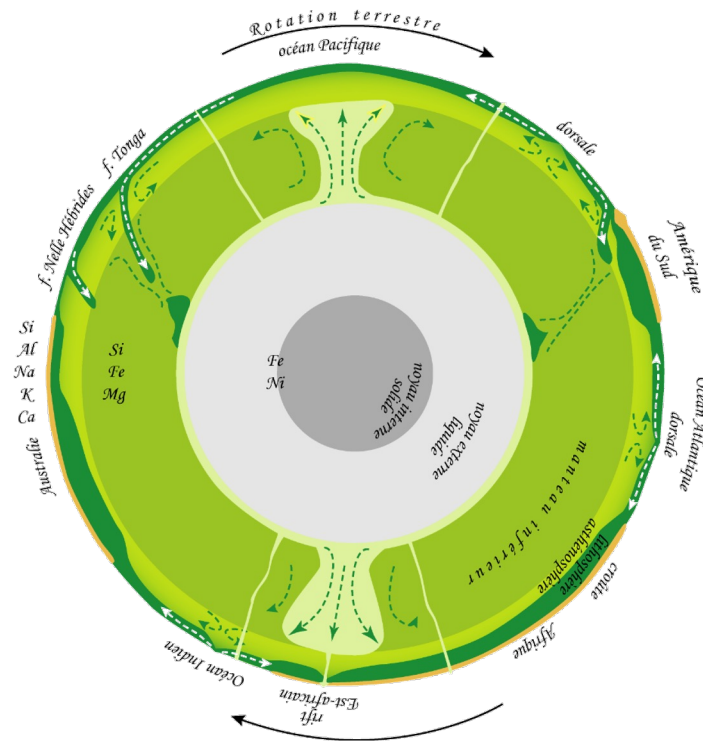
**Prof. M. Iole Spalla ([iole.spalla@unimi.it](mailto:iole.spalla@unimi.it)); Dr. Manuel Roda ([manuel.roda@unimi.it](mailto:manuel.roda@unimi.it))**

# Course description

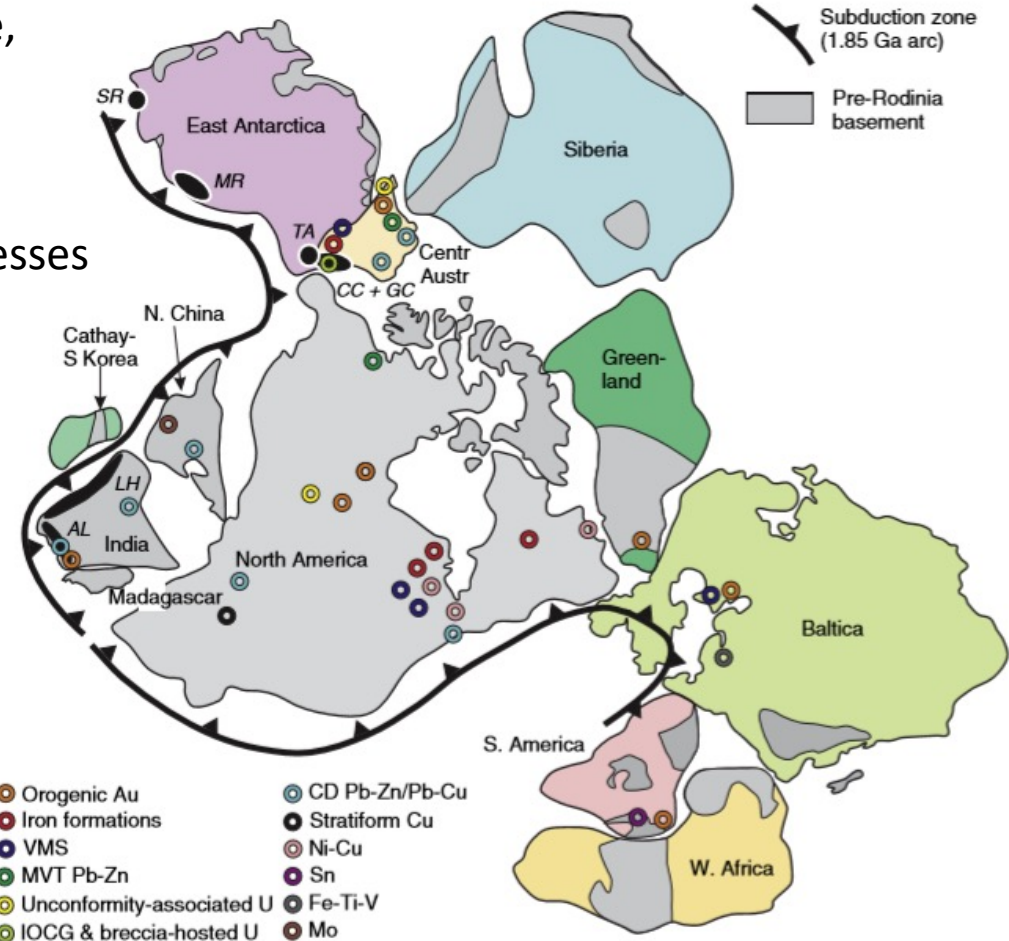
## • Geodynamics and mineralizations

• Geodynamic processes control the source, transfer, trapping and preservation of ore deposits

• Metallogeny marks the geodynamic processes



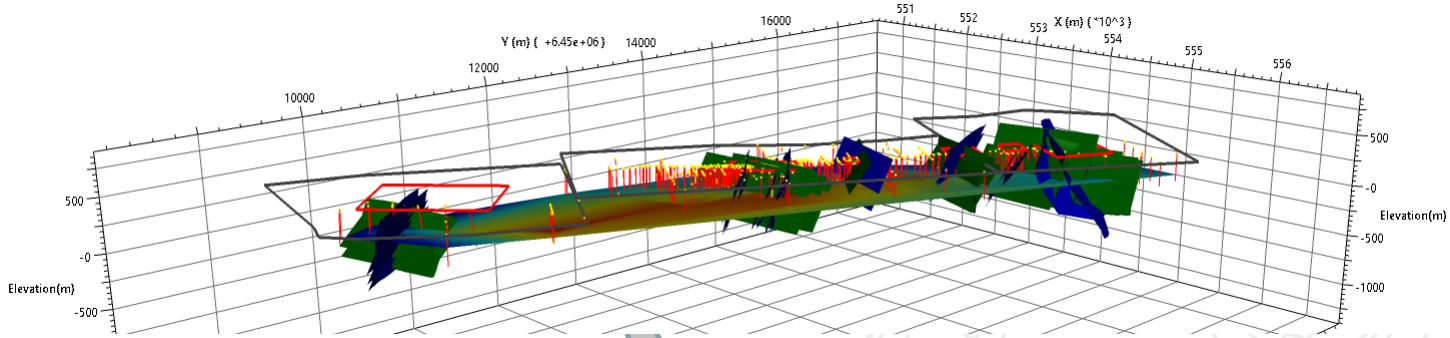
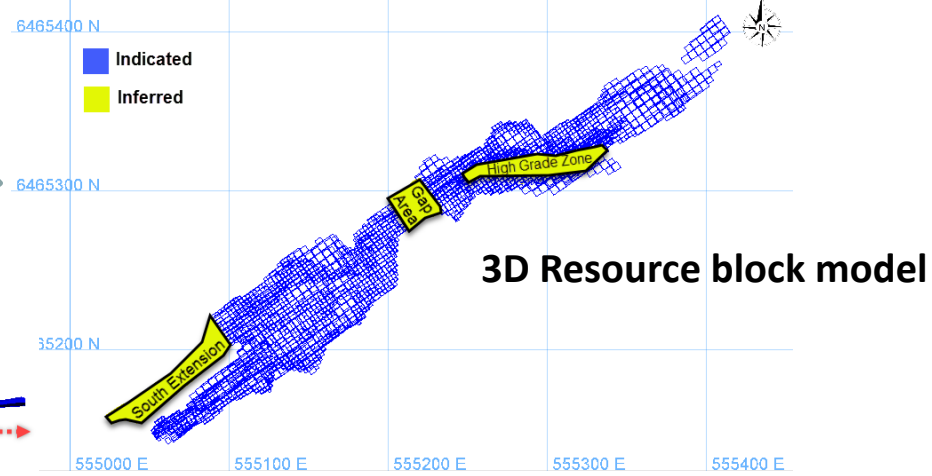
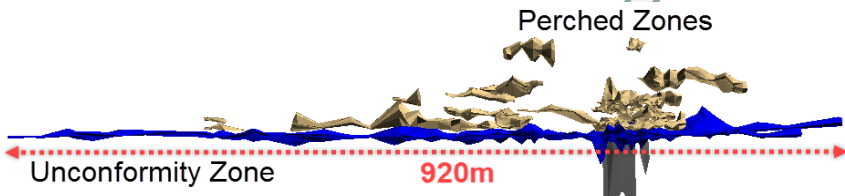
P. Kaur, N. Chaudhri / Ore Geology Reviews 56 (2014) 415–422



• Exploring georesources

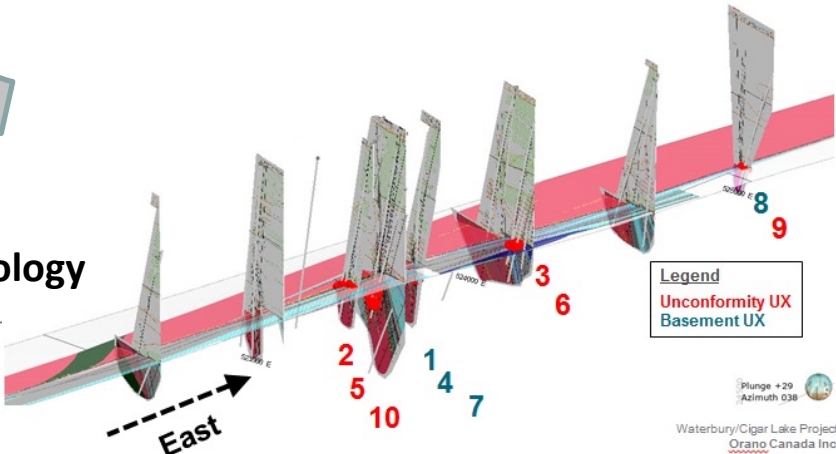
• Why, where, when, who, how?

• Resources and reserves



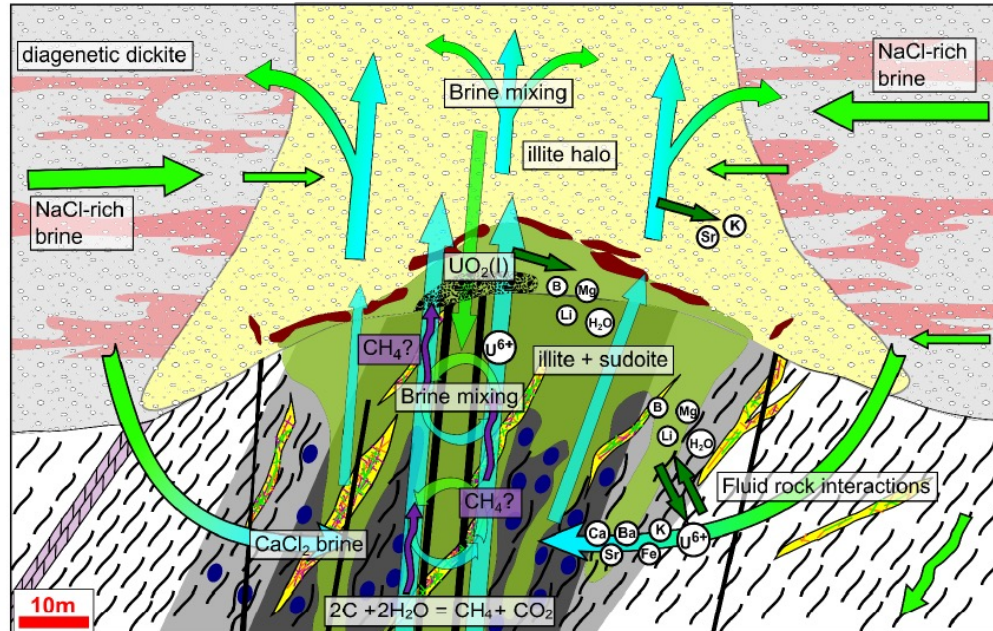
3D Common Earth Model

2D Cross sections & interpreted geology

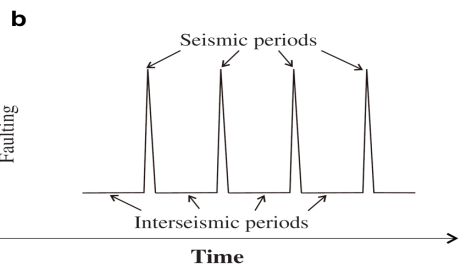
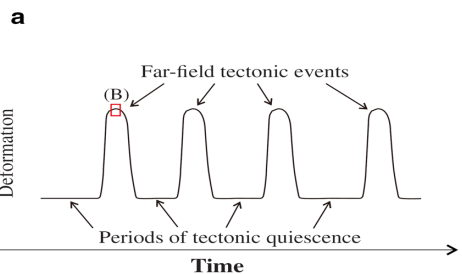


Legend  
Unconformity UX  
Basement UX

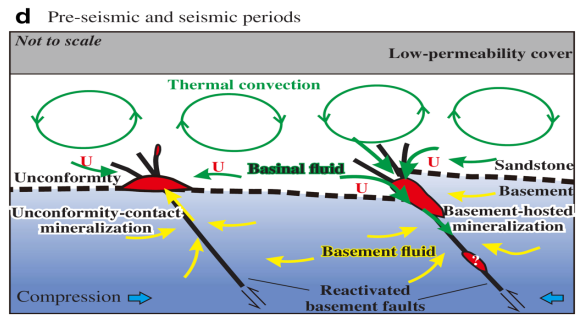
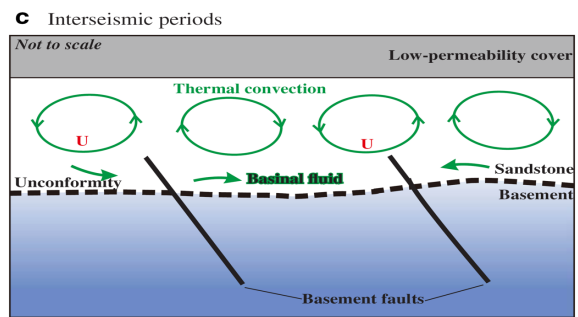




**1290-1380 Ma**  
 Primary mineralization  
 -  
 Reactivation of the E-W shear zone  
 -  
 Intense circulation and convection of the oxidized basinal fluids into the structure  
 -  
 Strong fluid-rock interactions with the basement lithologies, metal + U uptake and transport.  
 Evolution of the fluid toward a highly saline CaCl<sub>2</sub> dominant composition.  
 -  
 Syn ore alteration characterized by quartz dissolution, illite precipitation in the basin and illite, sudoite +/- Mg fofite in the basement  
 -  
 Graphite consumption and CH<sub>4</sub> production: a possible reducing agent for UO<sub>2</sub>(l) precipitation?  
**Legend**  
 Calc-silicates    Anagen gneiss  
 Pegmatites       Sandstones  
 CO<sub>2</sub> FIPs       Metapelite gneiss  
 C-O-H-N FIPs    2-5% Graphite  
 Brine FIPs       >5% Graphite  
 Graphitic cataclastite and breccia  
 >20% graphite



Li et al., 2020



• Metallogeny of the uranium mineral system

- Thermal, Hydraulic, Mechanical and Chemical modelling of fluid transfer and fluid rock interaction



# Course program

|           |          | 10.00-13.00   | 14.00-17.00  |
|-----------|----------|---|--|
| Monday    | March,13 | -   | Welcome and Course presentation<br>Geodynamics and mineralizations |
| Tuesday   | March,14 | -   | Project Generation: conventional and<br>unconventional resources   |
| Wednesday | March,15 | Exploring georesources: Targeting uranium, gold<br>and geothermal systems | Drilling, coring and structural geology                            |
| Thursday  | March,16 | Drilling, coring and structural geology<br>case studies                   | Metallogeny of the uranium system                                  |
| Friday    | March,17 | Metallogeny of the uranium system   | Resources and reserves<br>Course ending at 16.00                   |

