

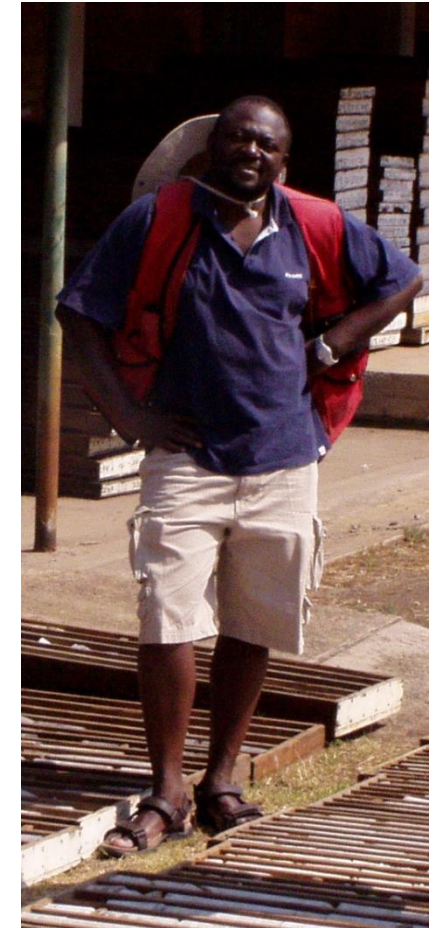
# Stratigraphic and mineralogical characteristics of the Fishtie Cu-Co deposit, Zambia

Subaru Tsuruoka and Murray Hitzman

Irish Centre for Research in Applied Geosciences, School of Earth Sciences, University College Dublin,  
Belfield, Dublin, Ireland

*This talk is dedicated to the memory of James Mwale, First Quantum Minerals geologist largely responsible for the discovery of Fishtie*

**iCRAG**  
IRISH CENTRE FOR RESEARCH  
IN APPLIED GEOSCIENCES



Ireland's European Structural and Investment Funds Programmes 2014-2020  
Co-funded by the Irish Government and the European Union

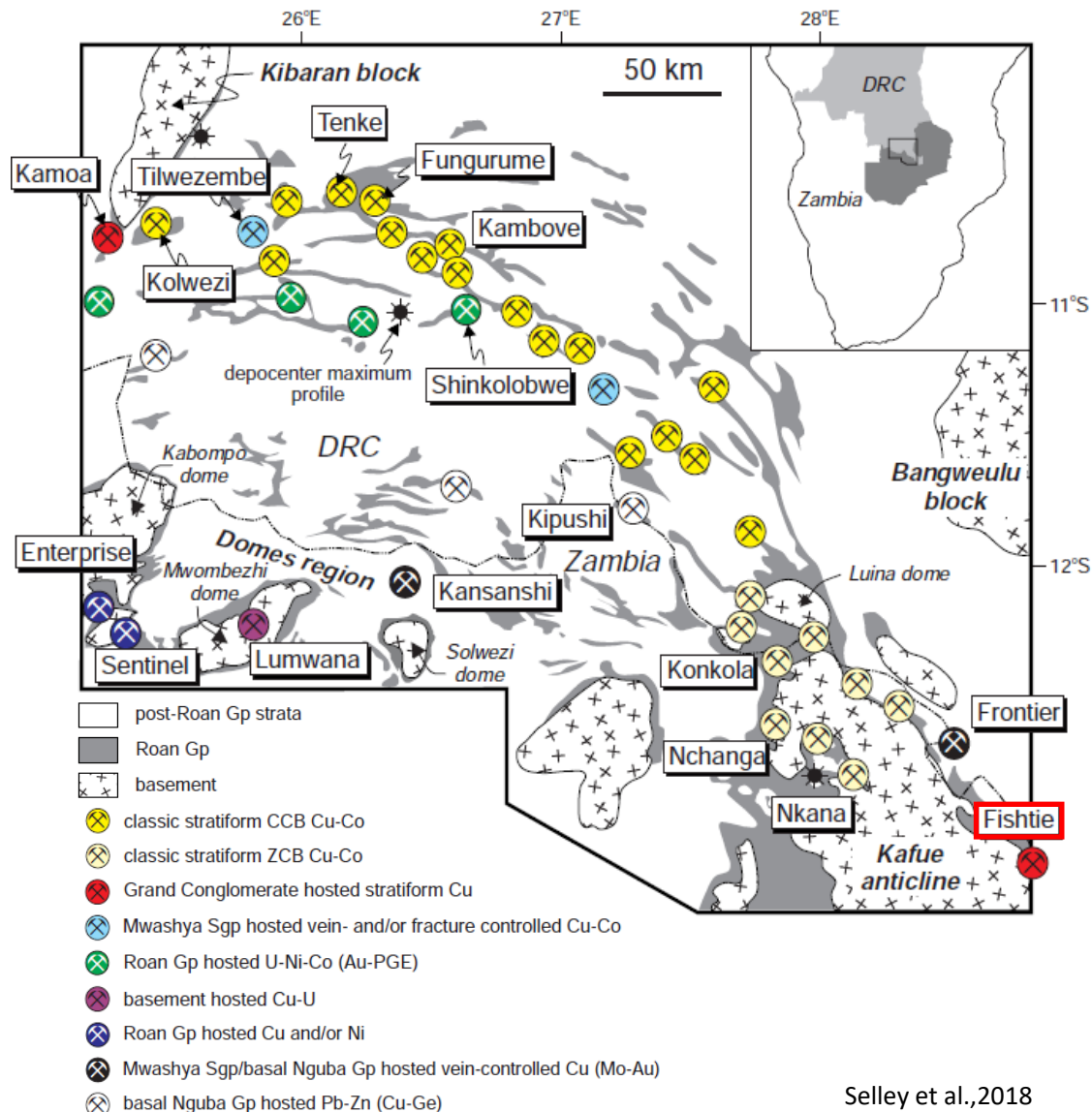


European Union  
European Regional Development Fund

Science Foundation Ireland  
sfi  
For what's next



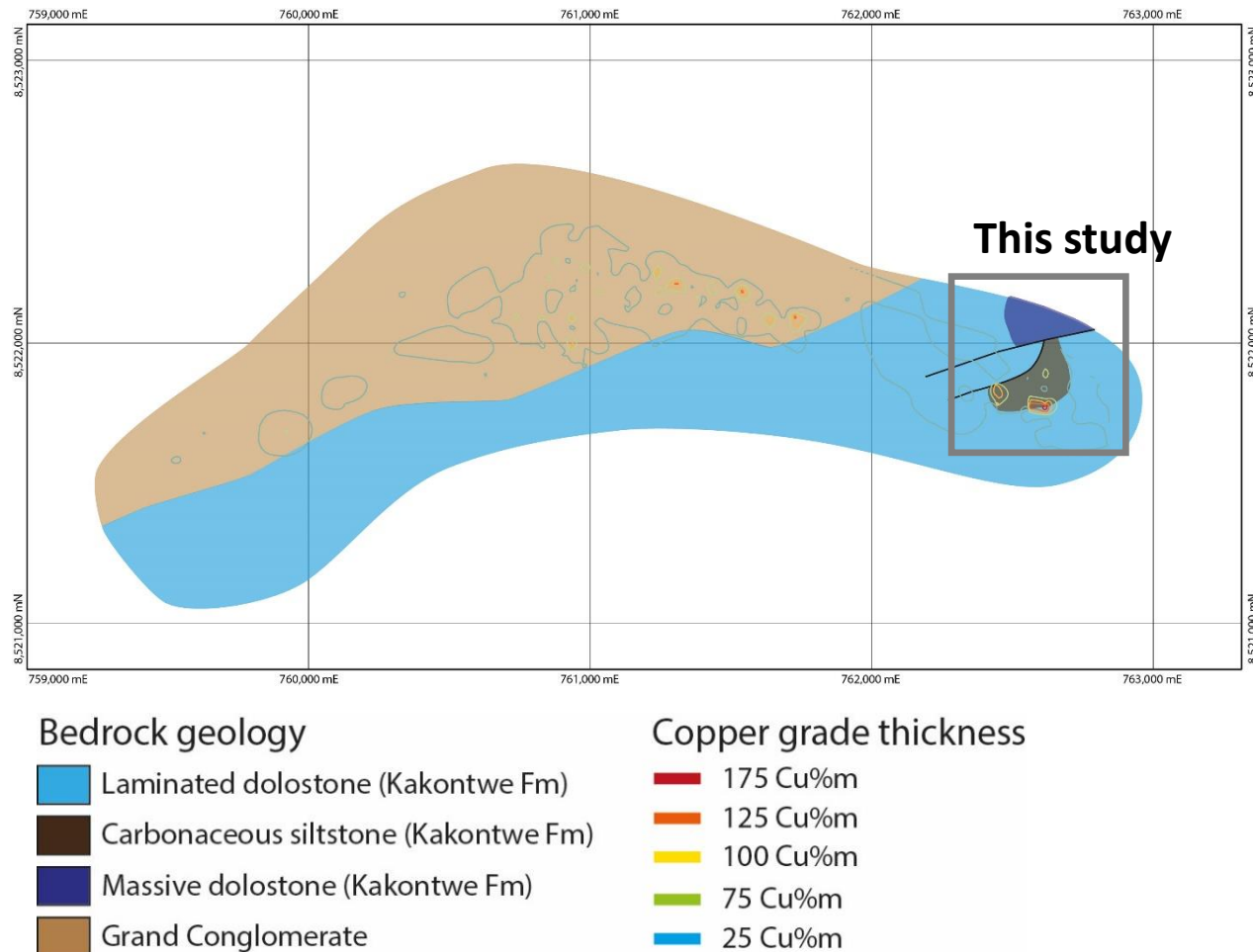
# Central African Copper Belt



Selley et al., 2018

- ✓ World's premier Cu province with 14 giant deposits (>2Mt Cu) within a ~400km belt straddling DRC to Zambia.
- ✓ World resources: ~15% of copper and ~70% of cobalt.
- ✓ Characterized by higher Cu grade than average porphyry Cu deposits and contain other metals including Co, Zn, Pb, Ni, and Au.
- ✓ Deposits are hosted in the Neoproterozoic sedimentary rocks of the Katangan Supergroup, which was deposited at an intracontinental rift setting.
- ✓ The Fishtie Cu-Co deposit is located in an outlier, the Lusale basin, to the southeast of the Zambian Copperbelt.
- ✓ The deposit was discovered by First Quantum Minerals in 2004 and is currently estimated to contain 55Mt ore with 1.04% Cu grade at a 0.5% cutoff grade.

# Fishtie Cu-Co deposit, Zambia



- ✓ At Fishtie, the Grand Conglomérat (Mwaele Fm.), which is interpreted as a Sturtian-age glacial diamictite, directly overlies basement schist and quartzite.
- ✓ Cu-Co sulfides are hosted in the Grand Conglomérat, overlying Kaponda Fm. siltstone, and particular facies of the Kakontwe Fm. dolostone.
- ✓ This study focuses on the eastern area of the deposit where a zone of high-grade Cu and Co mineralization is recognized and aims to refine the stratigraphic model by classifying different lithofacies of the Kakontwe Fm.
- ✓ This study is based on detailed logging of 42 exploratory drill holes totalling 8,300m and company drill hole data including core photos and company drill hole logs.



# Grand Conglomérat (Mwaele Fm.) at Fishtie

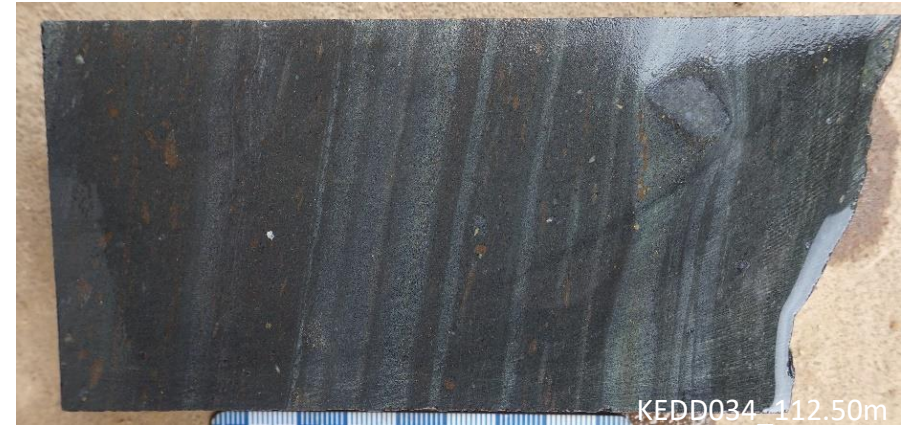
## 1. Diamictite

- ✓ Directly overlies the basement rocks at Fishtie
- ✓ Poorly sorted, sub-angular, polymictic, matrix-supported conglomerate; commonly clast-supported immediately above contact with basement
- ✓ Clasts are composed of quartzite, schist, granite, carbonate, mafic volcanic rocks



## 2. Siltstone

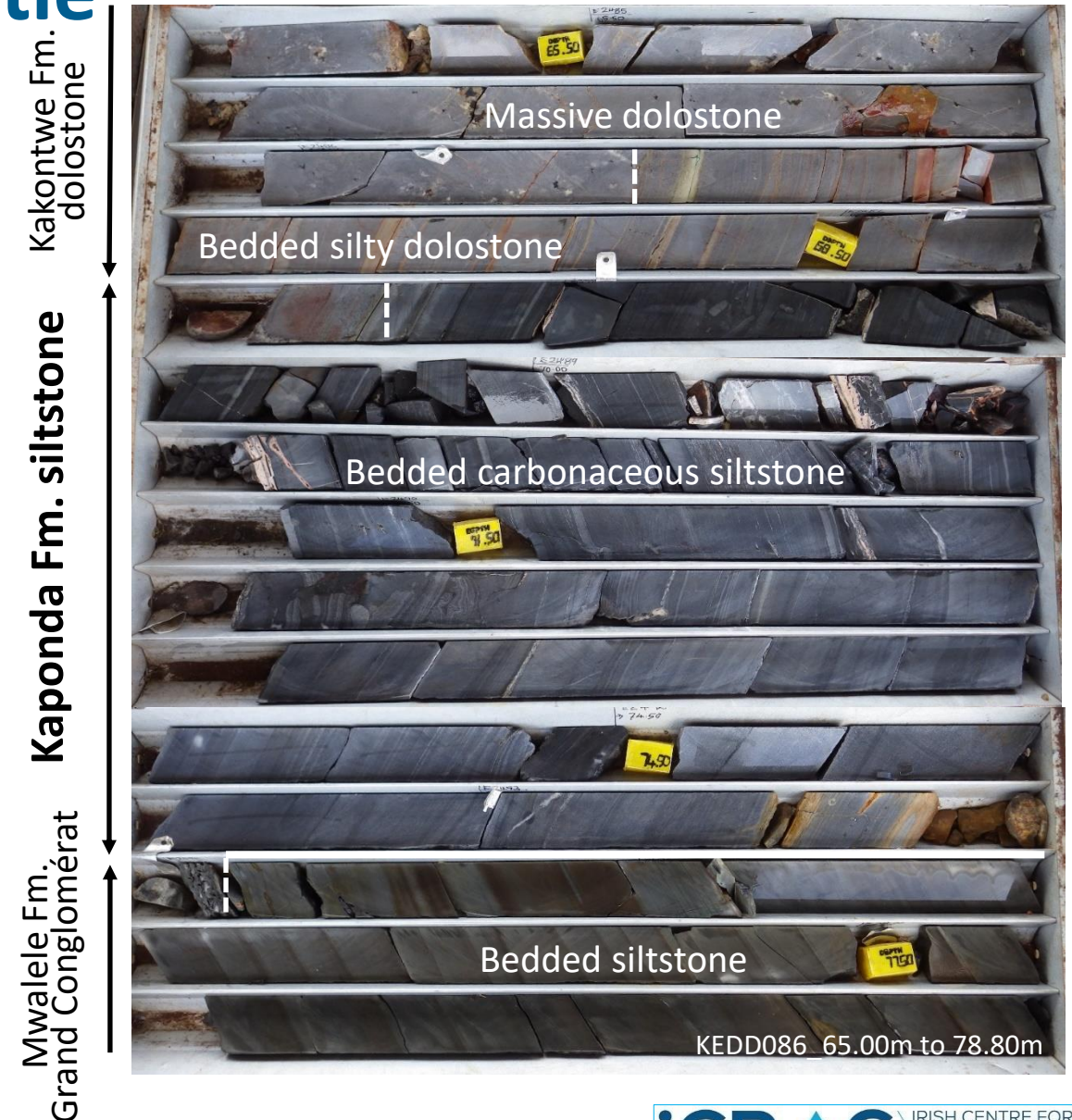
- ✓ Forms several horizons in the diamictite
- ✓ Common at the top of the Grand Conglomérat diamictite and grades into dolomitic siltstones of overlying Kaponda Fm.



# Kaponda Fm. Siltstone at Fishtie

## Bedded carbonaceous siltstone

- ✓ Gradually transitions from the uppermost siltstone of the Mwaele Fm. (Grand Conglomérat)
- ✓ Commonly carbonaceous
- ✓ Commonly well-mineralized
- ✓ Gradually transitions to the overlying silty dolostone of the lowermost Kakontwe Fm dolomite





# Kakontwe Fm. dolostone at Fishtie

## 1. Bedded Silty Dolostone

- ✓ Centimeter scale bedding of siltstone and dolostone
- ✓ Gradually transitions from lower Kaponda Fm. siltstone and represents the lowermost level of Kakontwe Fm. dolostone
- ✓ Generally not mineralized



## 2. Massive Dolostone

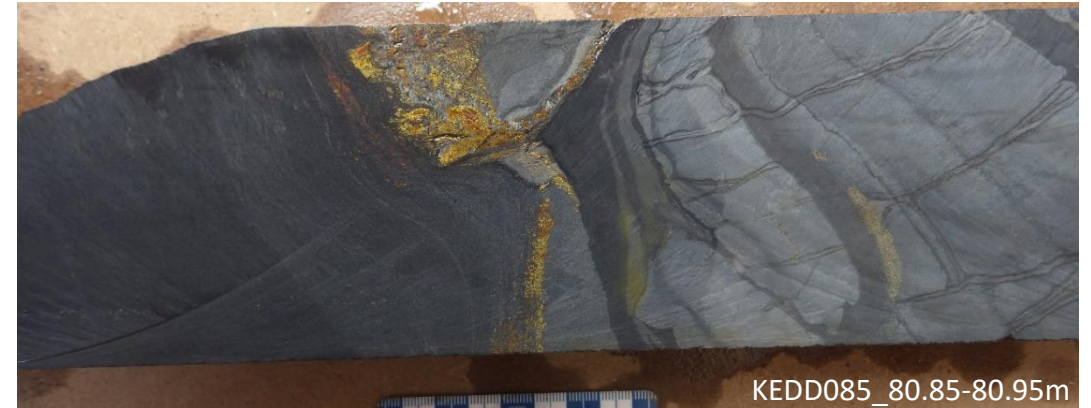
- ✓ Generally present above Bedded Silty Dolostone
- ✓ Millimeter scale banding of grey and white layers
- ✓ Some portions characterized by:
  - ✓ microbial texture
  - ✓ massive texture with rare anhydrite
- ✓ Commonly not mineralized



# Kakontwe Fm. dolostone at Fishtie

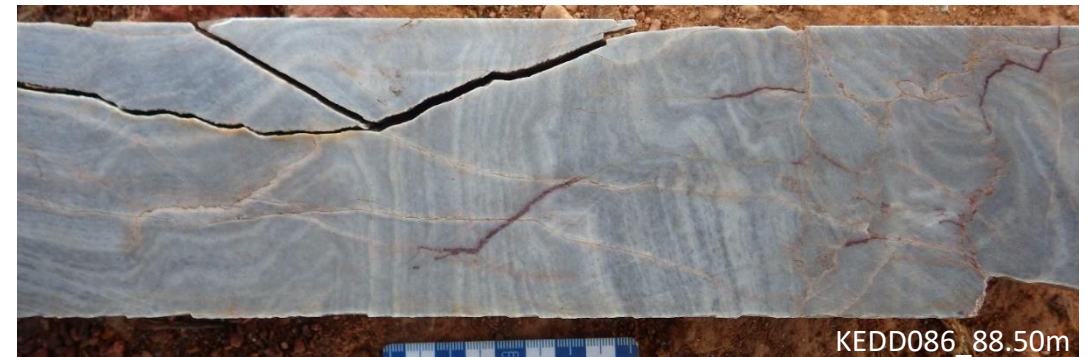
## 3. Bedded Dolomitic Diltstone

- ✓ Limited distribution in the eastern area above Massive Dolostone and below Laminated Dolostone
- ✓ Commonly carbonaceous
- ✓ Well mineralized

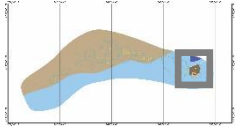


## 4. Laminated Dolostone

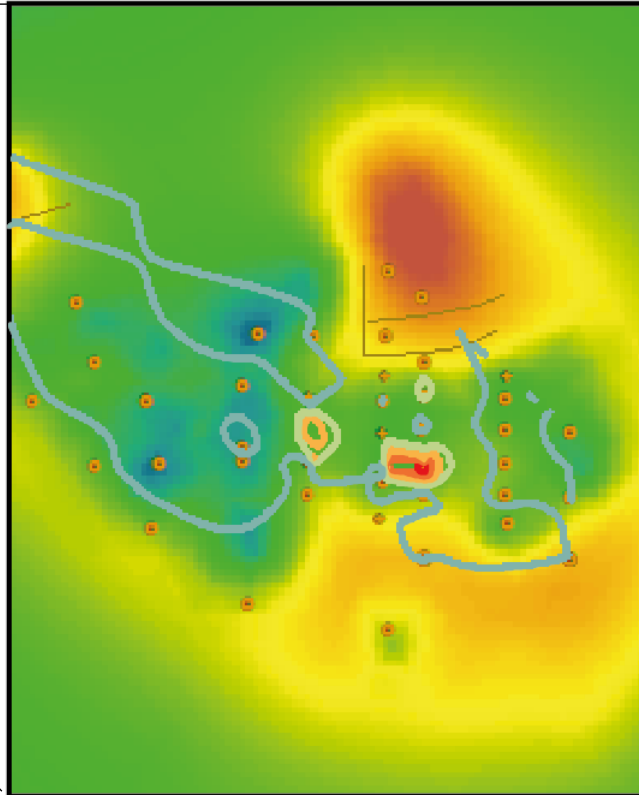
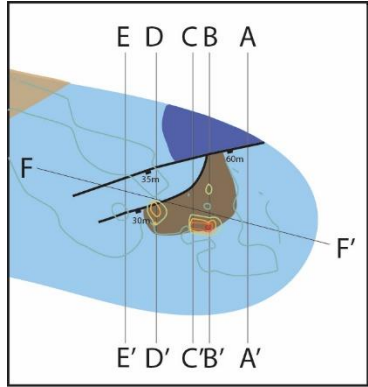
- ✓ Commonly at the top of Kakontwe Fm. and below the surface soil
- ✓ Sub-centimeter scale banding of grey and white layers
- ✓ Commonly not mineralized, barren cover



# Eastern area of Fishtie

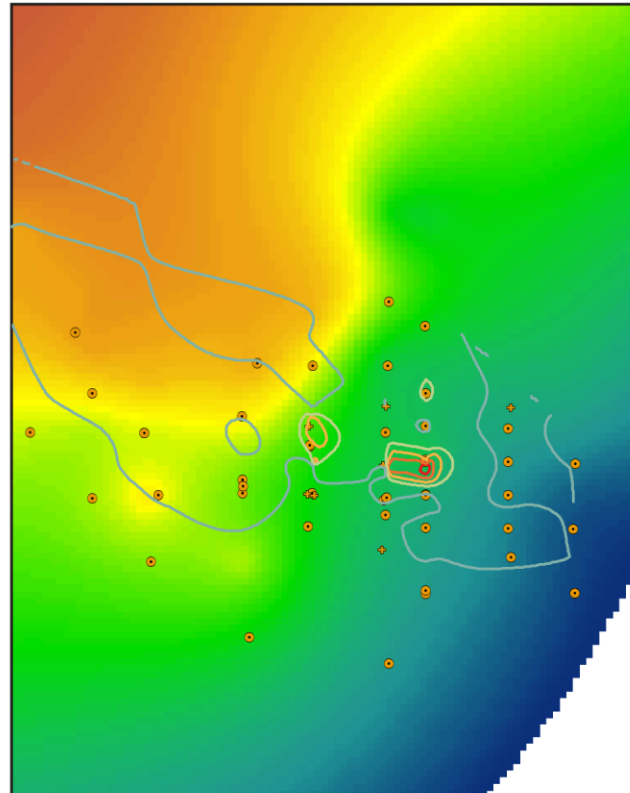


Mwaele Fm. (Grand Conglomérat) thickness isopach



High : 125m  
Low : 20m

Basement – Mwaele Fm. altitude contour map

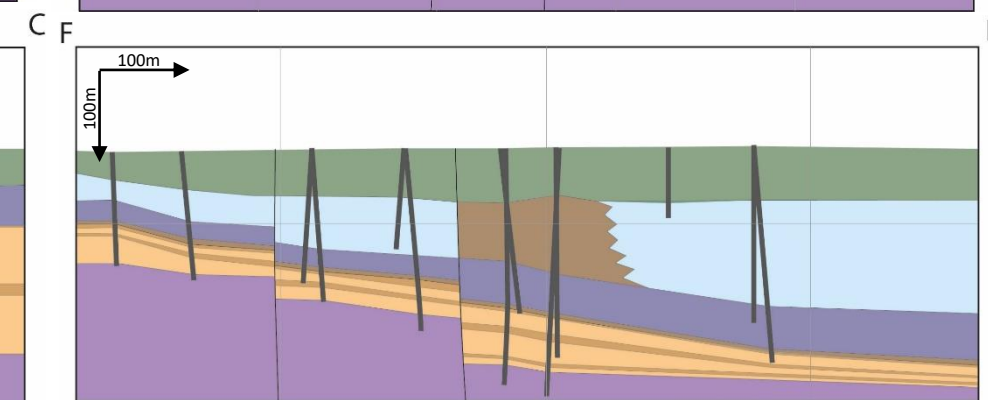
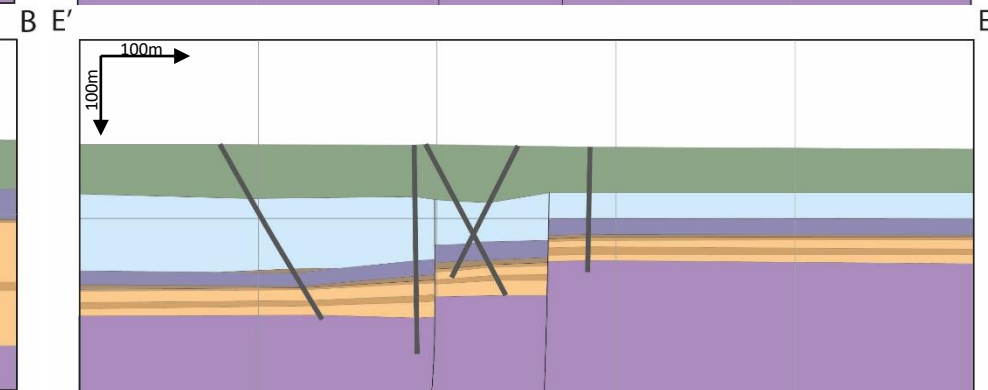
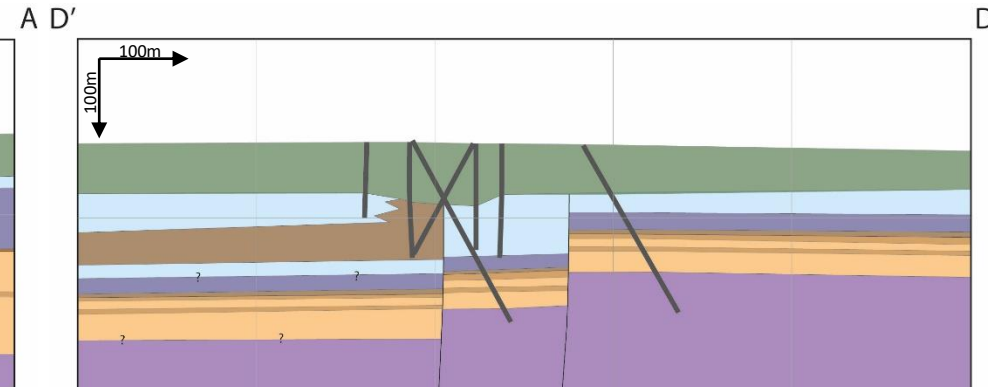
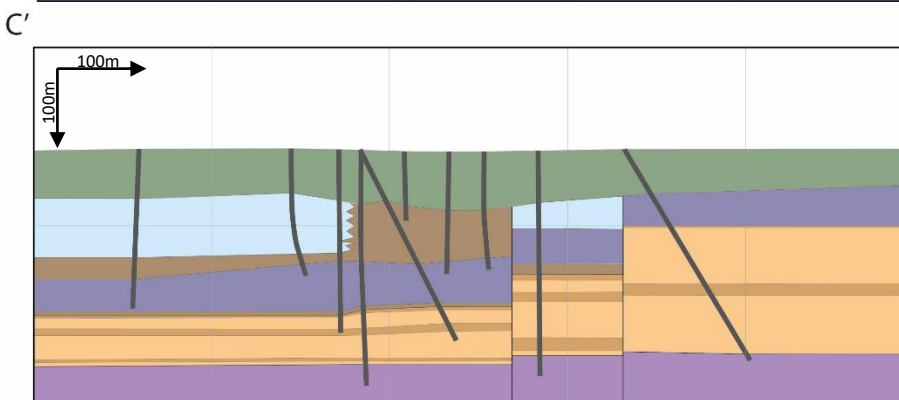
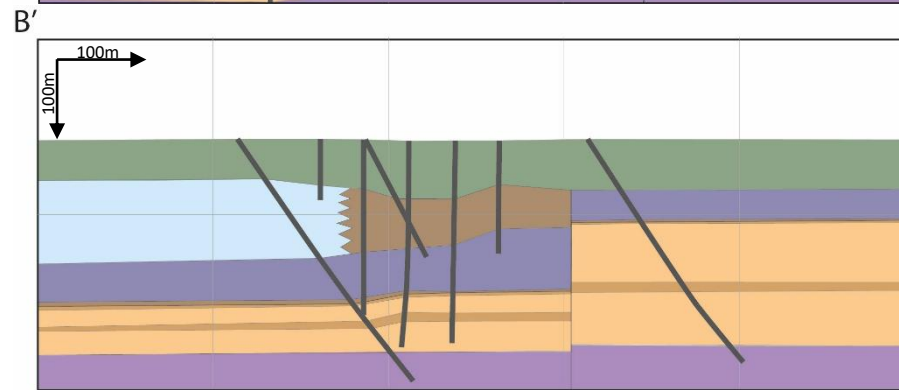
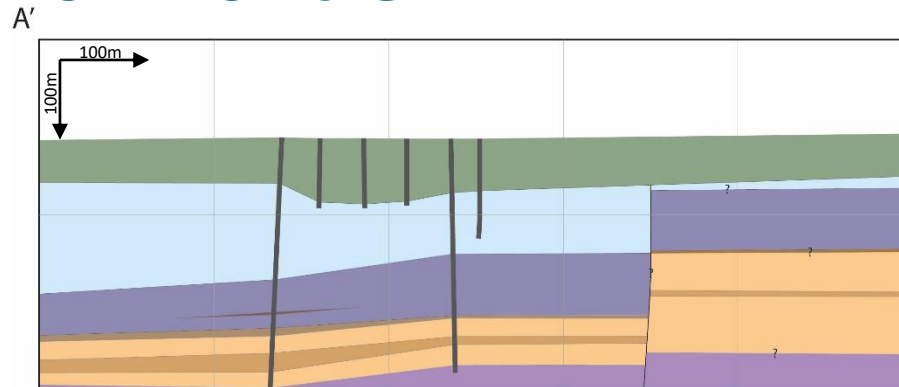
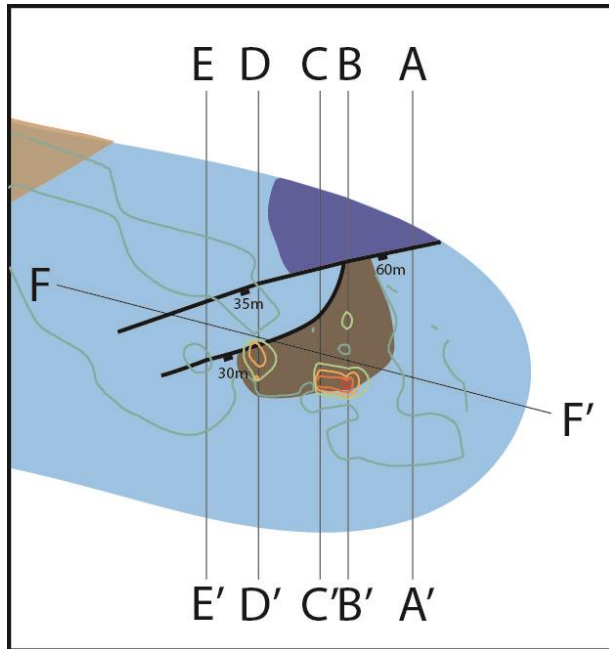


High : 1350m  
Low : 950m

- ✓ All data (detailed logging, log from core photos and company log data) are compiled in Leapfrog 3D modeling software
- ✓ Basement depth, thickness of formations are calculated
- ✓ 6 sections generated
- ✓ Significant thickness variation in Mwaele Fm. (Grand Conglomérat)
- ✓ Lateral drastic facies changes



# Eastern area of Fishtie



## Summary

- ✓ This study identified significant thickness variations in the Mwaele Fm. (Grand Conglomérat) and four different facies in the Kakontwe Fm. in the eastern area of the Fishite deposit.
- ✓ The observed thickness and facies variations in the Kakontwe Fm. are abrupt and appear to be related to syn-sedimentary normal fault movement (~100m total offset).
- ✓ Higher copper and cobalt grades in the eastern area suggests that syn-sedimentary fault structures controlled the location of both copper and cobalt mineralization.

# Acknowledgements

## ✓ First Quantum Minerals

James Mwale, Robert Kaemba, Munshya Zimba, Tapiwa Mupakati, Bubile Nkhara, Boyd Kangwa, Eric Kangwa, Jackline Lumamba, Anahela Makumba, Lucia Nsontaulwa

## ✓ iCRAG UCD

Koen Torremans, Helen Twigg, Eoin Dunlevy

### *Subaru Tsuruoka*

iCRAG Postdoctoral Research Fellow

University College Dublin, Belfield, Dublin, Ireland

[subaru.tsuruoka@icrag-centre.org](mailto:subaru.tsuruoka@icrag-centre.org)

