

Structural Geology & Resources 2022
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Mineral systems as chemical reactors with no mathematics

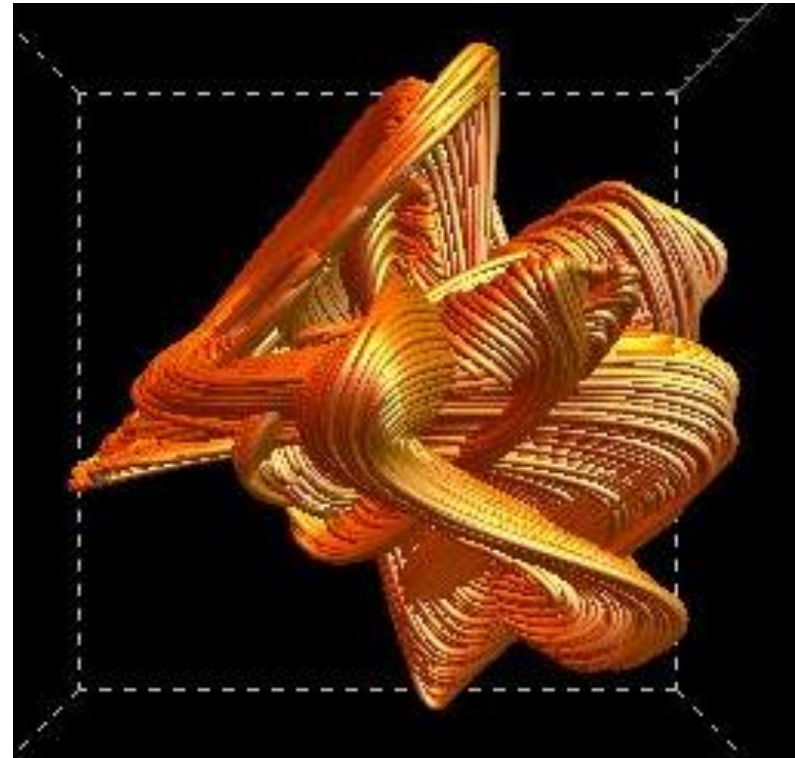
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Welcome!

Fingerprint for a mineralising system



What we promised 2 December 2021

Treating mineral systems as open flow chemical reactors introduces new ways of thinking and hence new ways of analysing the immense data sets from these systems.

At all scales the probability distribution of alteration minerals and of mineralisation are indicative of the endowment of a deposit.

Small deposits tend to have different probability distributions to large ones so that data from a single drill hole are indicative of endowment; different styles of mineralisation have different probability distributions.

Nonlinear prediction techniques allow interpolation and extrapolation where data are scarce and a range of nonlinear concepts (such as entropy and determinism) allow detailed delineation of anomalies in regional data sets.

The workshop is designed as a hands-on training of these new data-integration, interpretative and synthesis techniques.

What you expect

August/September 2022

I am a consultant geologist largely focussed on applied structural geology. A large part of my work is taking structural concepts and translating them into explicit mineralisation models that can be used in resource estimation. I am particularly interested in applying mineral systems approaches at the mine/lodescale, particularly the geometric aspects (e.g. fractal geometries). The 'mineral systems' concept is largely pushing out into industry in very large-scale applications like area selection for exploration, but personally I see a lot of value in 'mineral systems' (depending on how this somewhat nebulous concept is defined) as a way of deviating from prescriptive genetic models for orebodies and allowing for a more fundamental understanding of individual deposits at the lode-scale.

I have attended a short version of your thoughts at a ThinkerCafe workshop and enjoyed the radically different approach of looking at a Mineral System. I'll enjoy a more expanded version of your concepts and radical ideas so I can be challenged.

Non-linear systems are so interesting to study behaviours when applied to geological systems.

I hope to learn some new ideas and techniques for finding a new deposit in our current working area in Sandstone and getting a better understanding of contributing factors to forming economic mineralisation.

Does the timetable meet your expectations?

August/September 2022

Yes – It looks entirely appropriate, perhaps more of a mining geology focus than exploration – but that is just what I am personally seeking from the workshop.

Reading through the program I think I will not be disappointed and will be challenged and encouraged to think differently about mineral systems. I look forward to the roller coaster ride.

It would be fantastic to fun through a few practical examples which I think I can see in the proposed itinerary in the Excel section.

While the course explicitly states “no mathematics”, I’d love some guidance or direction to where I could better learn the mathematics necessary to understand the content.

The timetable looks really interesting but seems to touch on quite a bit of maths?

Timetable

9:00 Session 1: Summary and discussion of what people expect from this workshop?

9.15 – 9.45 Session 2: Irregular data: Gold abundance

Muscovite abundance

Vein arrays

Spatial distribution of mineralisation.

The over-arching question we want to address is: Is there any information in these data sets that is useful for exploration? Or is it all random?

The questions of interest:

How do we know if we are in a superior system?

When do we pull out?

Can we use the alteration assemblage to tell us about grade?

Can we use the spatial distribution of mineralisation to target likely new sites for mineralisation?

We want non-parametric data driven approaches with links to process, not parametric, model driven approaches.

9.45 – 10.30 Session 3: Mineral systems.

What is a mineral system?

Coupled nonlinear processes.

Takens' theorem. The concept that in a system all processes are interdependent and related. The information in one data set encodes all the data on the system.

Some examples using EXCEL. Periodic, quasiperiodic, chaotic signals and attractors.

10.30 – 10.45: *Coffee.*

10.45 – 12.30 Session 4: The nonlinear toolbox.

Wavelets and multifractals. Long range correlations.

Recurrence

Probability distributions.

12:30 – 13:15: *Lunch.*

13.15 – 14.15 Session 5: An example.

Sunrise Dam.

14.15 – 15.00 Session 6: Other examples.

Pb Zn; Regional distributions.

15.00 – 15.30: *Coffee.*

15.30 - 17.00 Session 7: Application to regional exploration.

Spatial distribution of mineralisation: spatial distribution is not a fractal, it is the spatial distribution of a particular probability distribution that is a fractal. What then is the spatial distribution?

17:00 - 17.30: Summary and wrap-up.