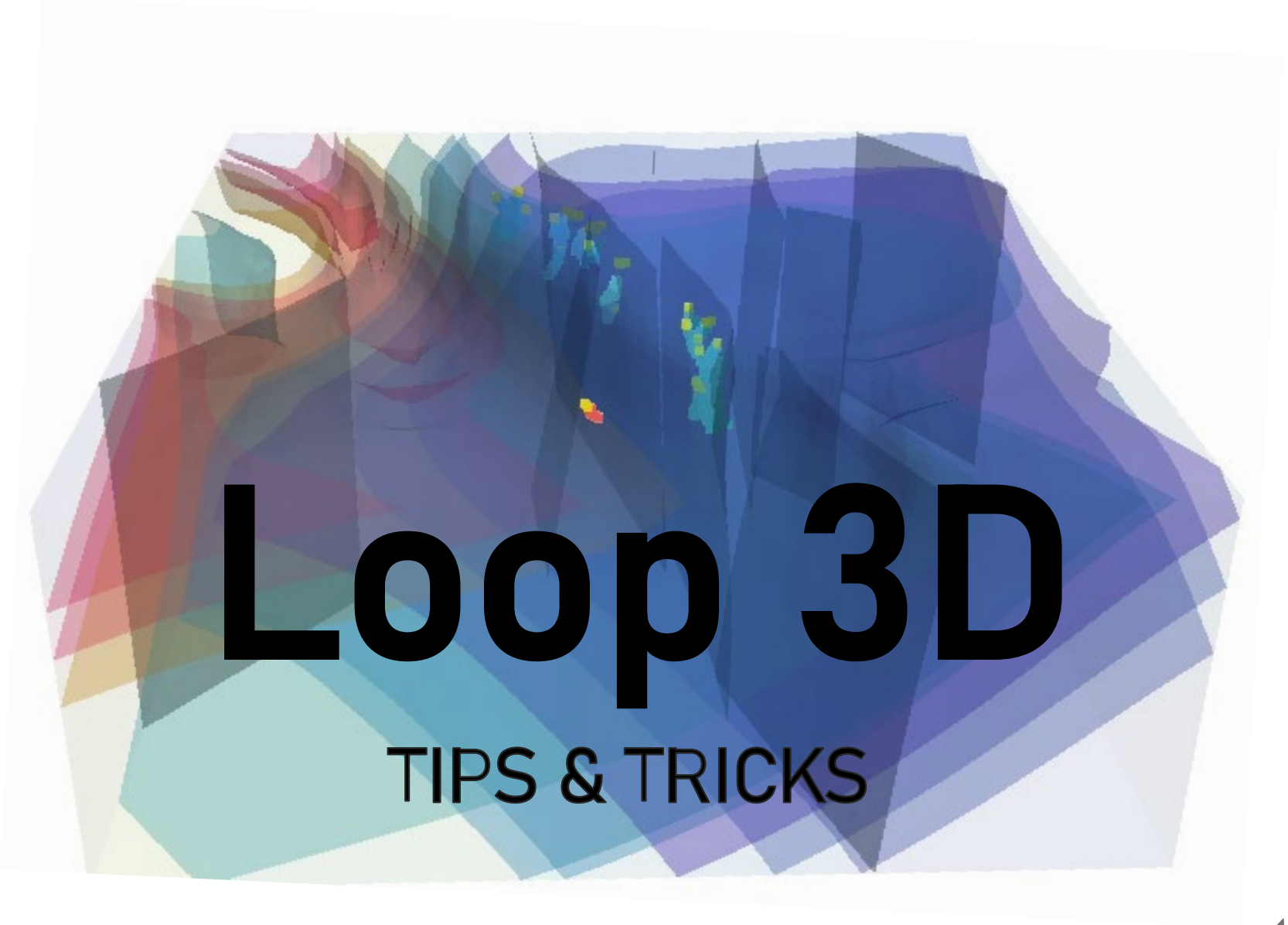
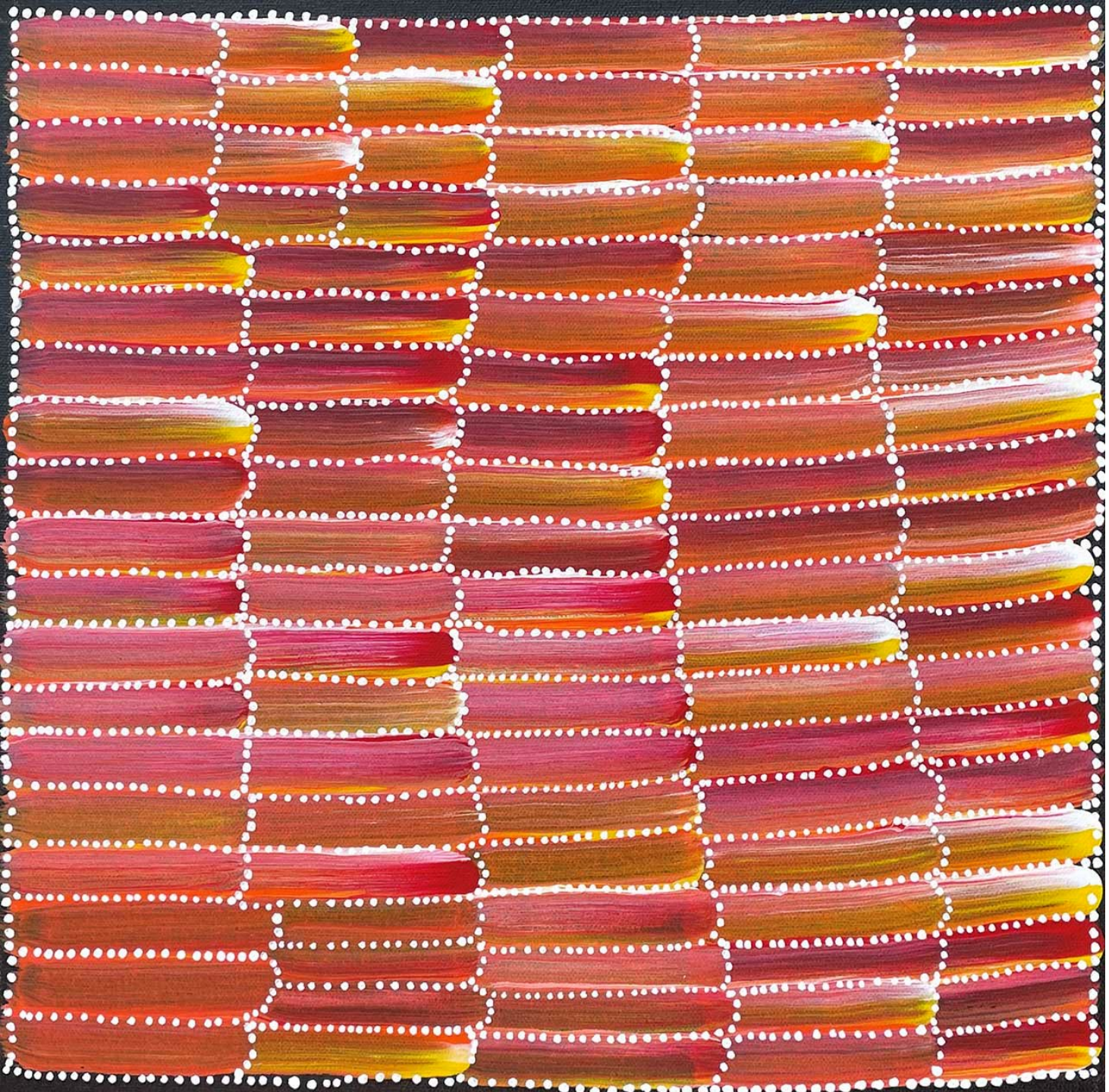


Loop 3D

TIPS & TRICKS

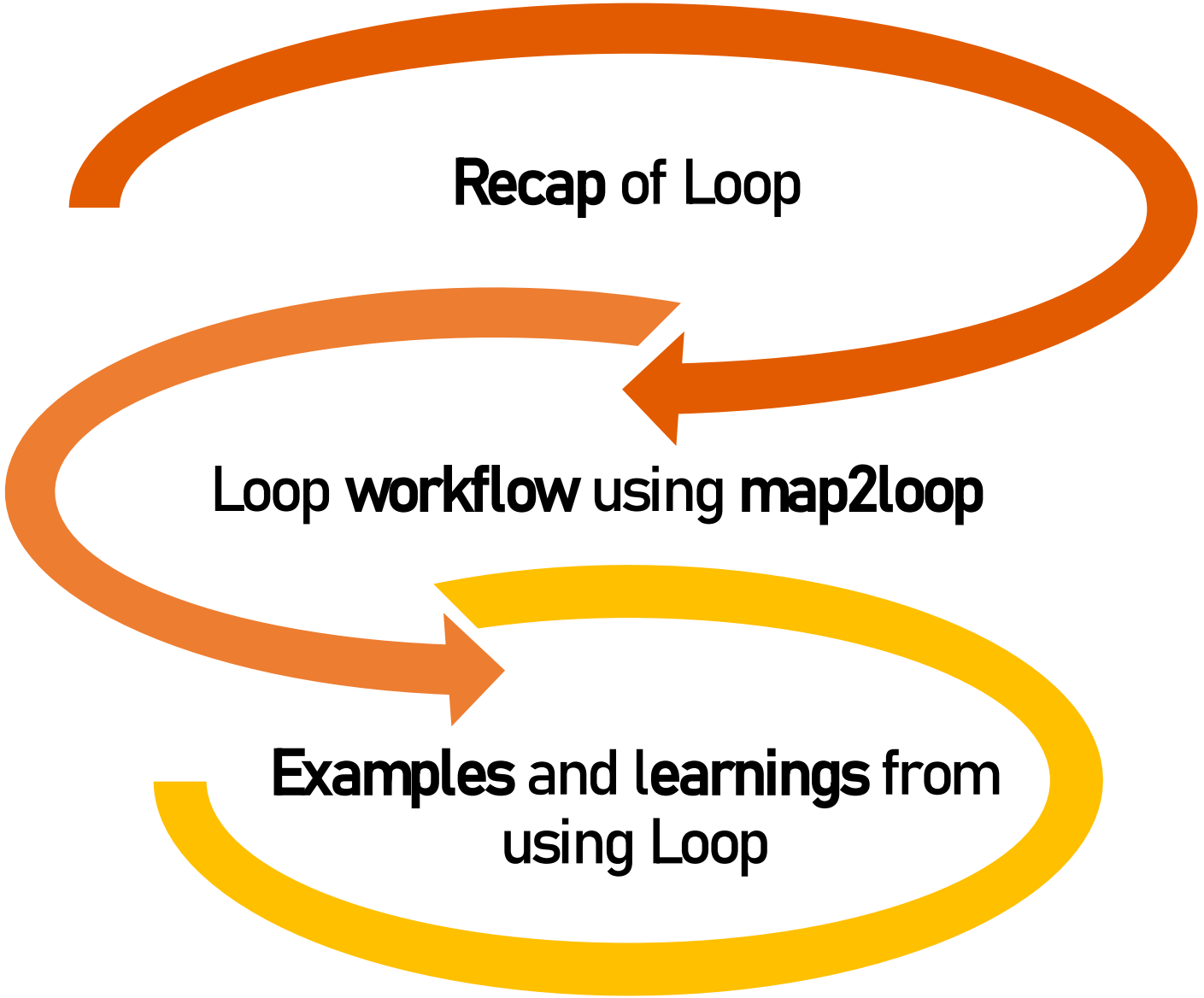
Ayla Edwards, Monash University



Acknowledgement of Country

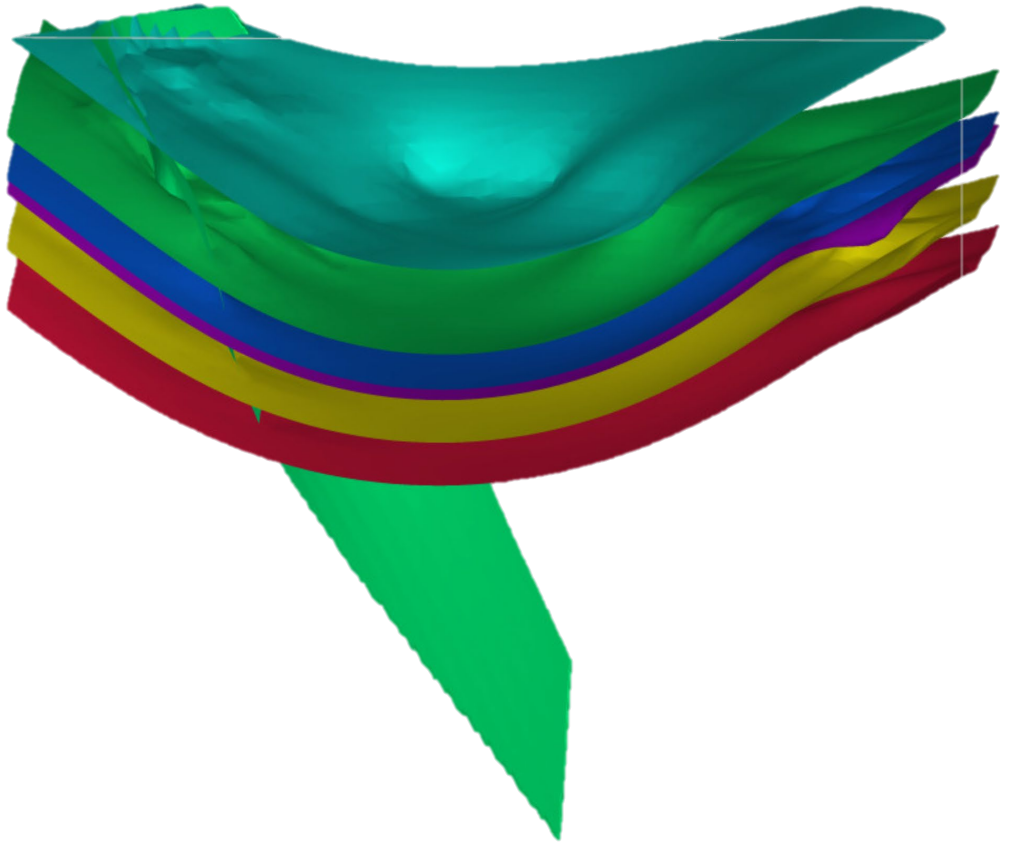
Painting: '*Anatye – Bush Yam*'
by Jeannie Mills Pwerle

Presentation Overview

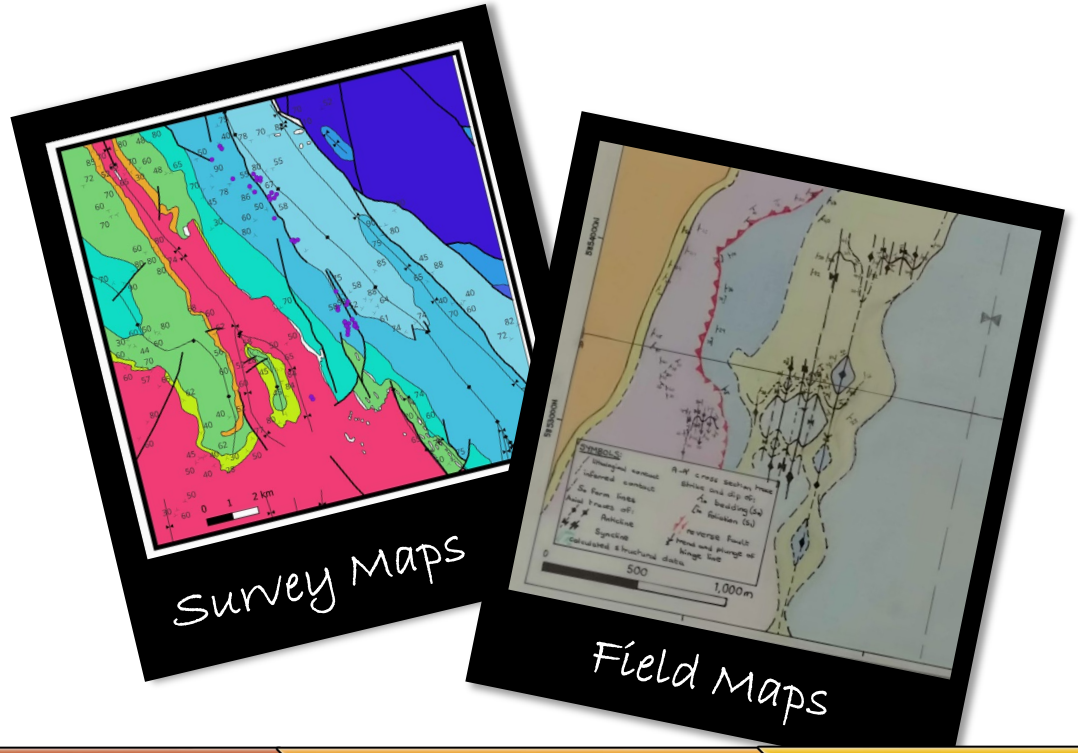


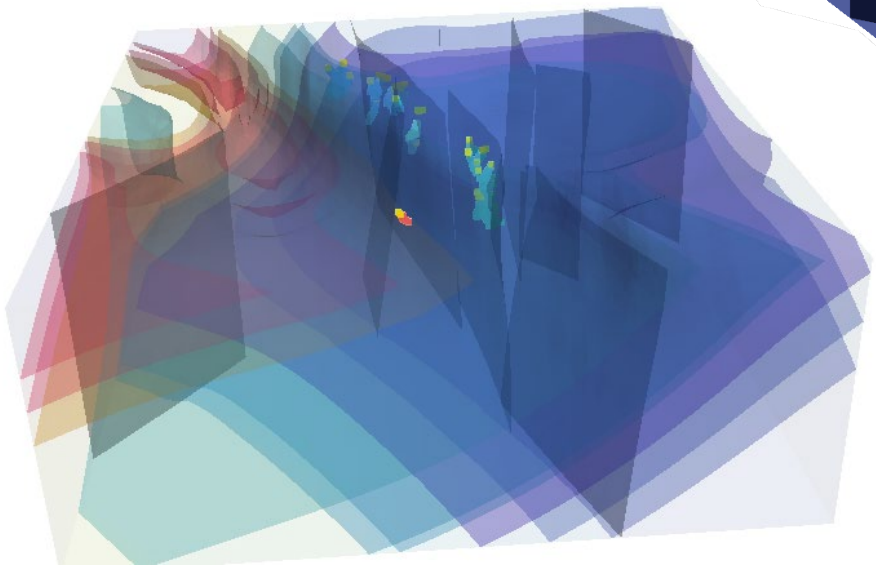
Rapid Recap

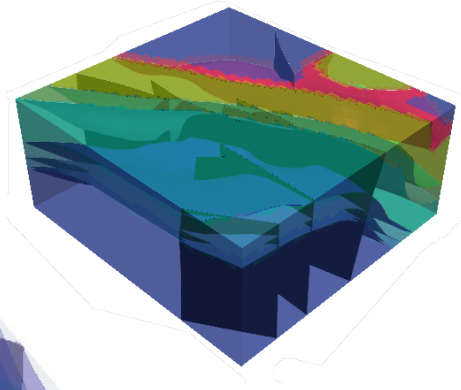
- **Open source** 3D geological **modelling software**
- **map2loop:** automates map data processing
- **LoopStructural:** transforms data into a 3D model
- **LoopResources:** geostatistical resource modelling and estimation



Workflow







Map → Pre-processing → map2loop → loopStructural → *Drilling Data* → Model

Loop CSIRO

map2loop Input Requirements

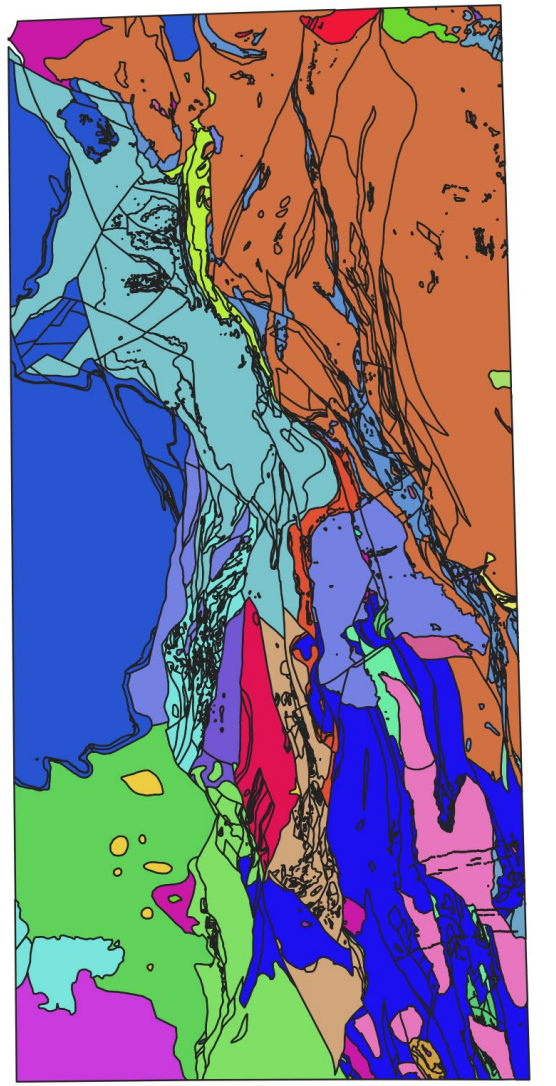
- **3 SHAPEFILES:**
  - **Polygon** → lithologies
  - **LineString** → linear features (e.g. faults)
  - **Point data** → orientation data
- Configuration file

OPTIONAL INPUTS:

- DEM or DTM file
- CSV file specifying unit colours

```
{
"structure" : {
  "orientation_type": "strike",
  "dipdir_column": "strike",
  "dip_column": "dip",
  "description_column": "feature",
  "bedding_text": "Bed",
  "overturned_column": "structypei",
  "overturned_text": "BEOI",
  "objectid_column": "geopnt_id",
},
"geology" : {
  "unitname_column": "unitname",
  "alt_unitname_column": "code",
  "group_column": "group_",
  "supergroup_column": "supersuite",
  "description_column": "descriptn",
  "minage_column": "min_age_ma",
  "maxage_column": "max_age_ma",
  "rocktype_column": "rocktype1",
  "alt_rocktype_column": "rocktype2",
  "sill_text": "is a sill",
  "intrusive_text": "intrusive",
  "volcanic_text": "volcanic",
  "objectid_column": "objectid",
  "ignore_codes": ["cover"],
},
"fault" : {
  "structtype_column": "feature"
```

map2loop- Shapefile Example



cobar_geo_3308 — Features Total: 3296, Filtered: 3296, Selected: 0

	fid	OBJECTID	Surface_1	NSW_CODE	Unit_Name	Descriptio	Supergroup	Group_Suit	Subgroup	Formation_
1	13595	13595	Lachlan Orogen	PZuch	Ungrouped Pala...	Poorly known, n...	NULL	Ungrouped Pala...	NULL	Ungrouped Pala...
2	13666	13666	Lachlan Orogen	PZui	Unassigned Pala...	Mixture of intrus...	NULL	Unassigned Pala...	NULL	NULL
3	13668	13668	Lachlan Orogen	Dbts_r	Square Head Fo...	Stratified matrix-...	NULL	Bootheragandra...	NULL	Square Head Fo...
4	17909	17909	Lachlan Orogen	Esa	Saint Arnaud Gr...	Marine turbiditic...	NULL	Saint Arnaud Gr...	NULL	NULL
5	15886	15886	Lachlan Orogen	Dmhi	Hillston Volcanic...	Crystal tuff with ...	Cobar Supergro...	Mount Hope Gr...	NULL	Hillston Volcanic...
6	14559	14559	Lachlan Orogen	Dmhi	Hillston Volcanic...	Crystal tuff with ...	Cobar Supergro...	Mount Hope Gr...	NULL	Hillston Volcanic...
7	17667	17667	Lachlan Orogen	Dwig	Gundaroo Sand...	Light red-brown...	Cobar Supergro...	Winduck Group	NULL	Gundaroo Sand...
8	14563	14563	Lachlan Orogen	Dmhi	Hillston Volcanic...	Crystal tuff with ...	Cobar Supergro...	Mount Hope Gr...	NULL	Hillston Volcanic...
9	17542	17542	Lachlan Orogen	Dwig	Gundaroo Sand...	Light red-brown...	Cobar Supergro...	Winduck Group	NULL	Gundaroo Sand...
10	17556	17556	Lachlan Orogen	Dwim	Marooba Forma...	Fine- to mediu...	Cobar Supergro...	Winduck Group	NULL	Marooba Forma...
11	17678	17678	Lachlan Orogen	Dwim	Marooba Forma...	Fine- to mediu...	Cobar Supergro...	Winduck Group	NULL	Marooba Forma...
12	17685	17685	Lachlan Orogen	Dwim	Marooba Forma...	Fine- to mediu...	Cobar Supergro...	Winduck Group	NULL	Marooba Forma...
13	16331	16331	Lachlan Orogen	PZui	Unassigned Pala...	Mixture of intrus...	NULL	Unassigned Pala...	NULL	NULL
14	18492	18492	Lachlan Orogen	Dmhh_i	Mount Halfway ...	Rhyolite to rhyo...	Cobar Supergro...	Mount Hope Gr...	NULL	Mount Halfway ...
15	18618	18618	Lachlan Orogen	Dwig	Gundaroo Sand...	Light red-brown...	Cobar Supergro...	Winduck Group	NULL	Gundaroo Sand...
16	18689	18689	Lachlan Orogen	Dmhc_l	Coando Volcani...	Lava flow deposi...	Cobar Supergro...	Mount Hope Gr...	NULL	Coando Volcanics
17	13721	13721	Lachlan Orogen	Dbts	Square Head Fo...	Comprises sever...	NULL	Bootheragandra...	NULL	Square Head Fo...
18	12611	12611	Lachlan Orogen	S__q	Moombooldool ...	Poorly exposed, ...	NULL	NULL	NULL	Moombooldool ...

What map2loop does:

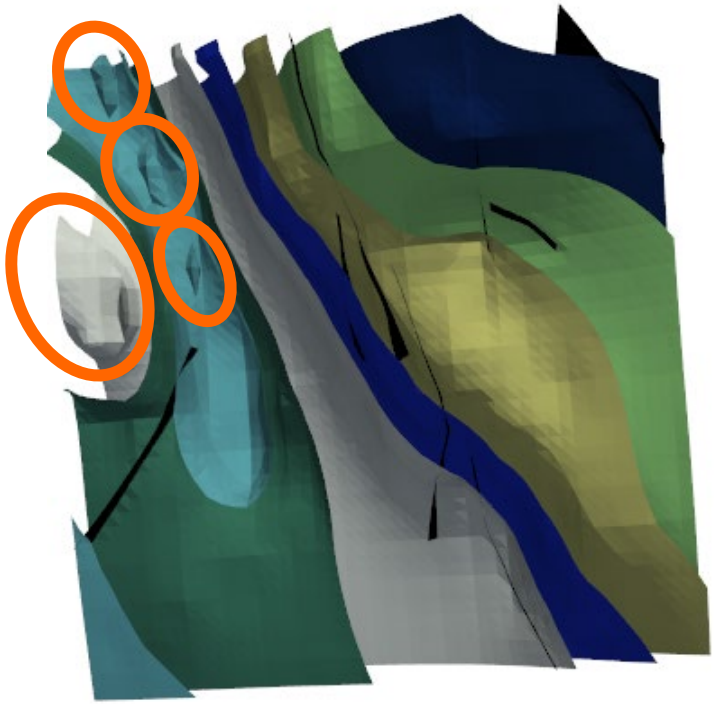
- Opens files
- Extracts **faults**
- **Fault interconnectivity** – cross cutting relationships
- Defines stratigraphy using **basal contacts** ***
- Calculates **unit thicknesses** using apparent dip ***
- **Formats** data

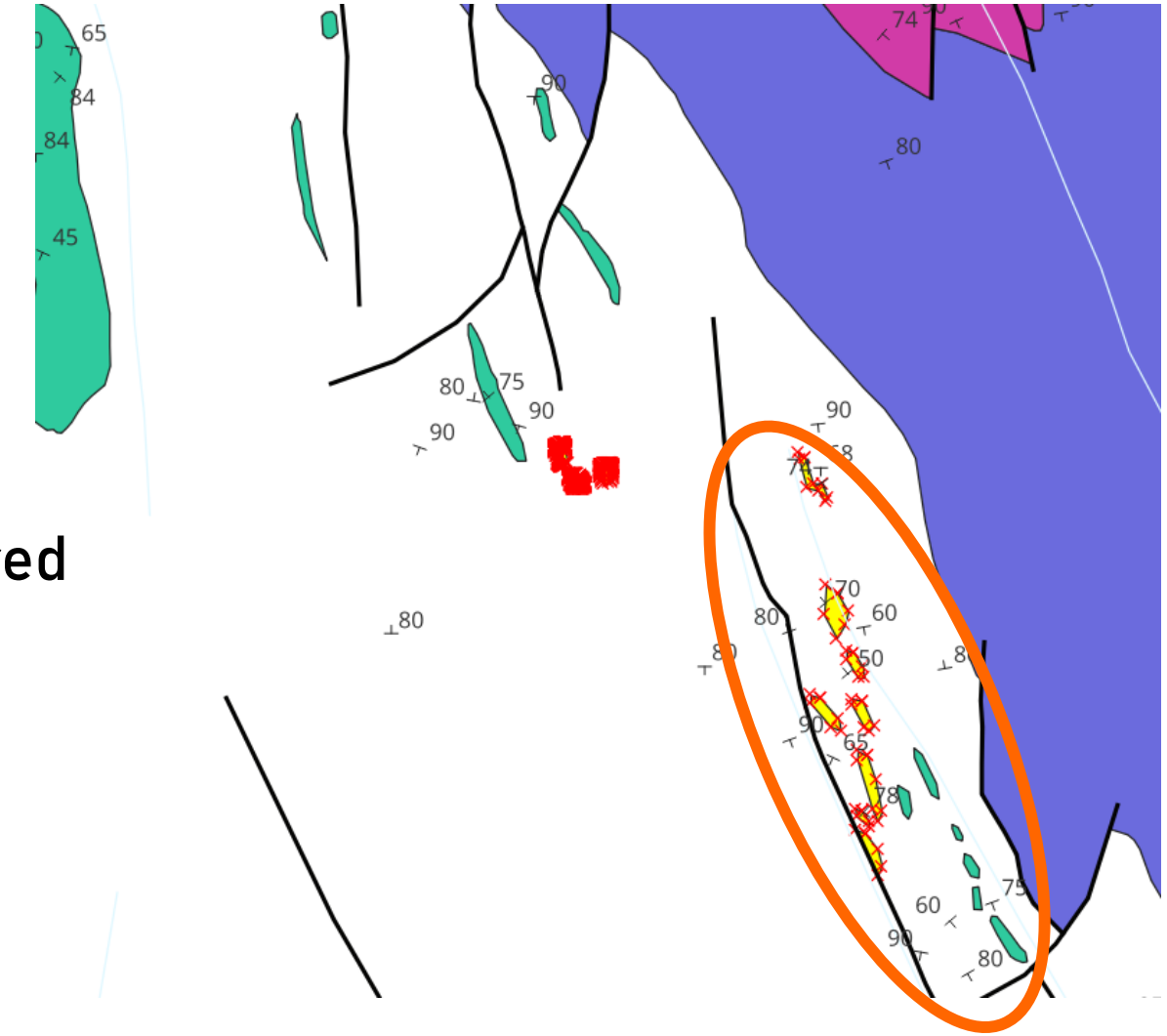
stratigraphic_Order	name	StructuralPoint_mean	StructuralPoint_median
0	Amphitheatre_Group__upper	2679.488288	2679.488288
1	Alley_Sandstone_Member	-1.000000	-1.000000
2	Biddabirra_Formation___sandstone	-1.000000	-1.000000
3	Biddabirra_Formation	1661.873261	1427.281370
4	CSA_Siltstone	1144.034718	610.091281
5	Great_Cobar_Slate	889.799351	552.262750
6	Chesney_Formation	-1.000000	-1.000000
7	Meryula_Formation	-1.000000	-1.000000
8	Ballast_Formation	-1.000000	-1.000000
9	Girilambone_Group	-1.000000	-1.000000

Most CHALLENGES
stem from
DATA QUALITY
and model
INTERPRETATIONS

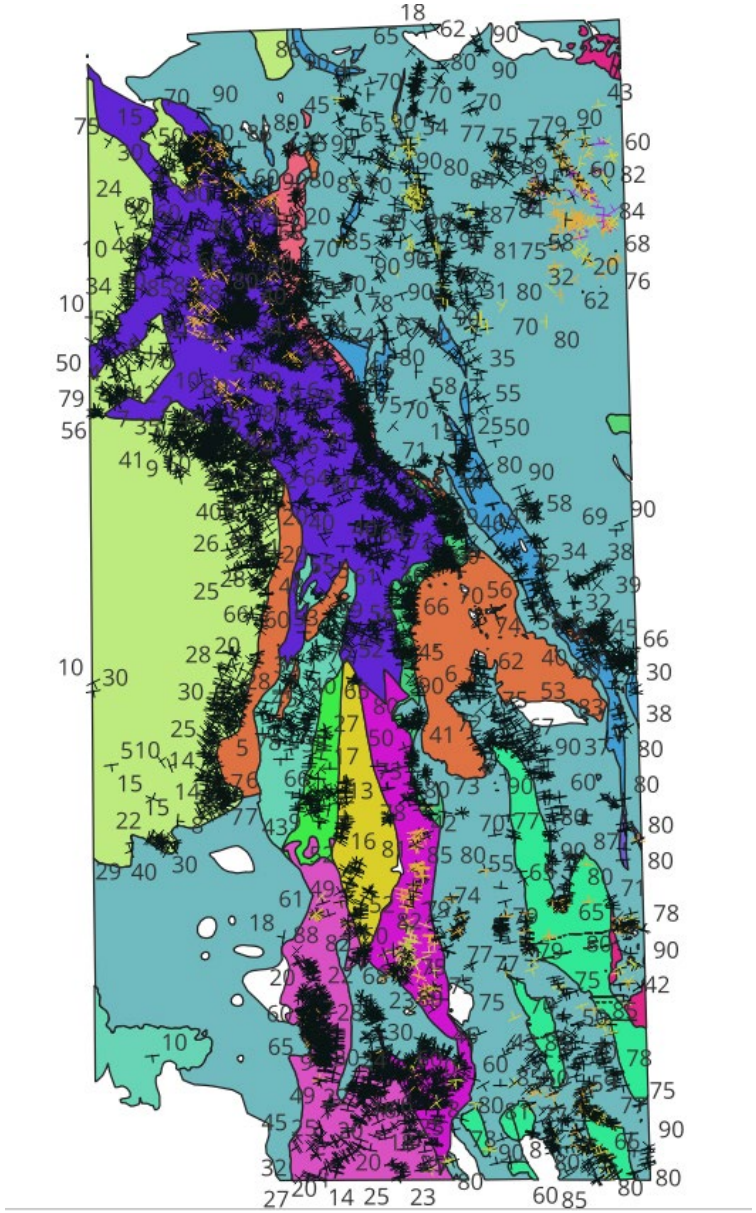
Pre-Processing of Data

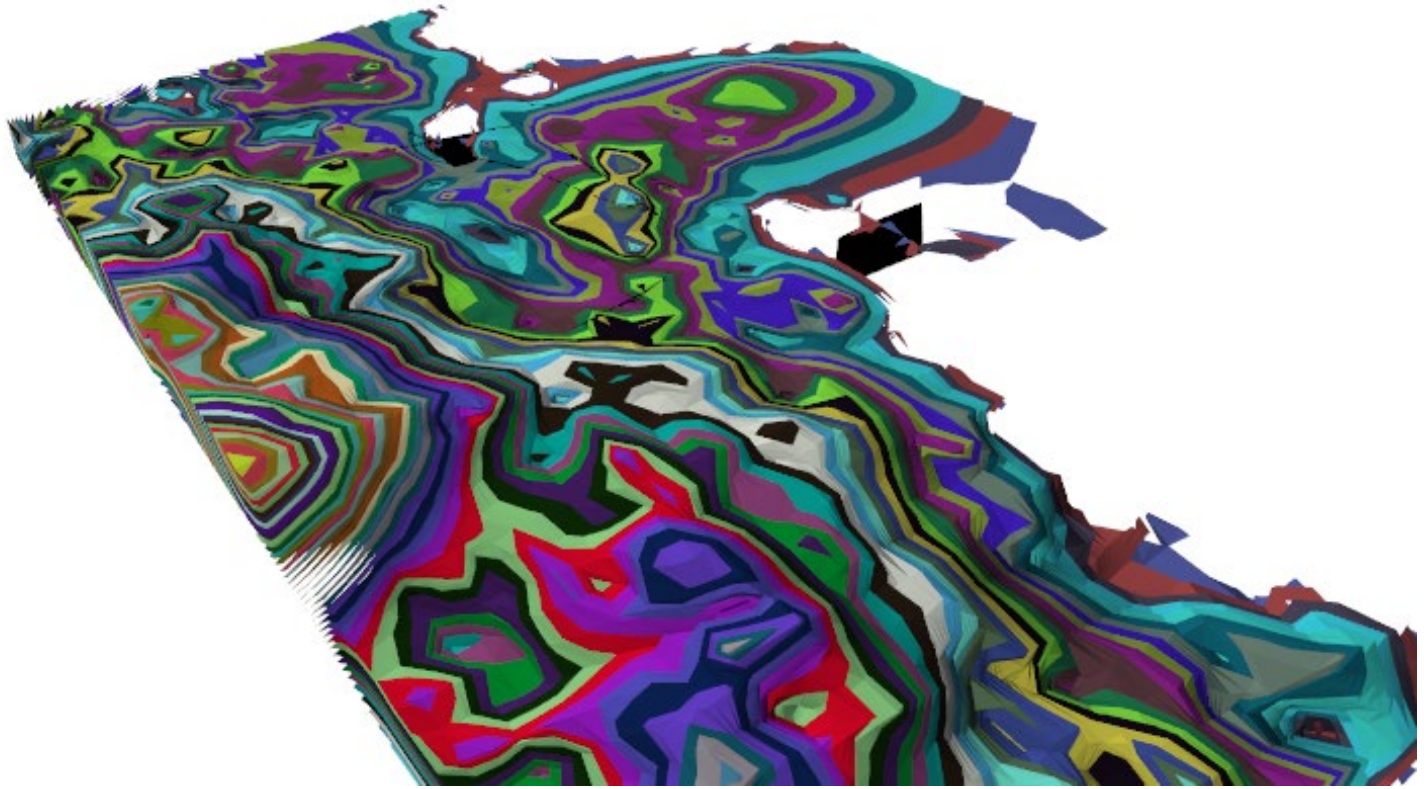
- Ensure **consistent scale** of data
  - Upscale structural measurements
  - Remove tiny litho lenses
  - Merge and simplify polygons if required





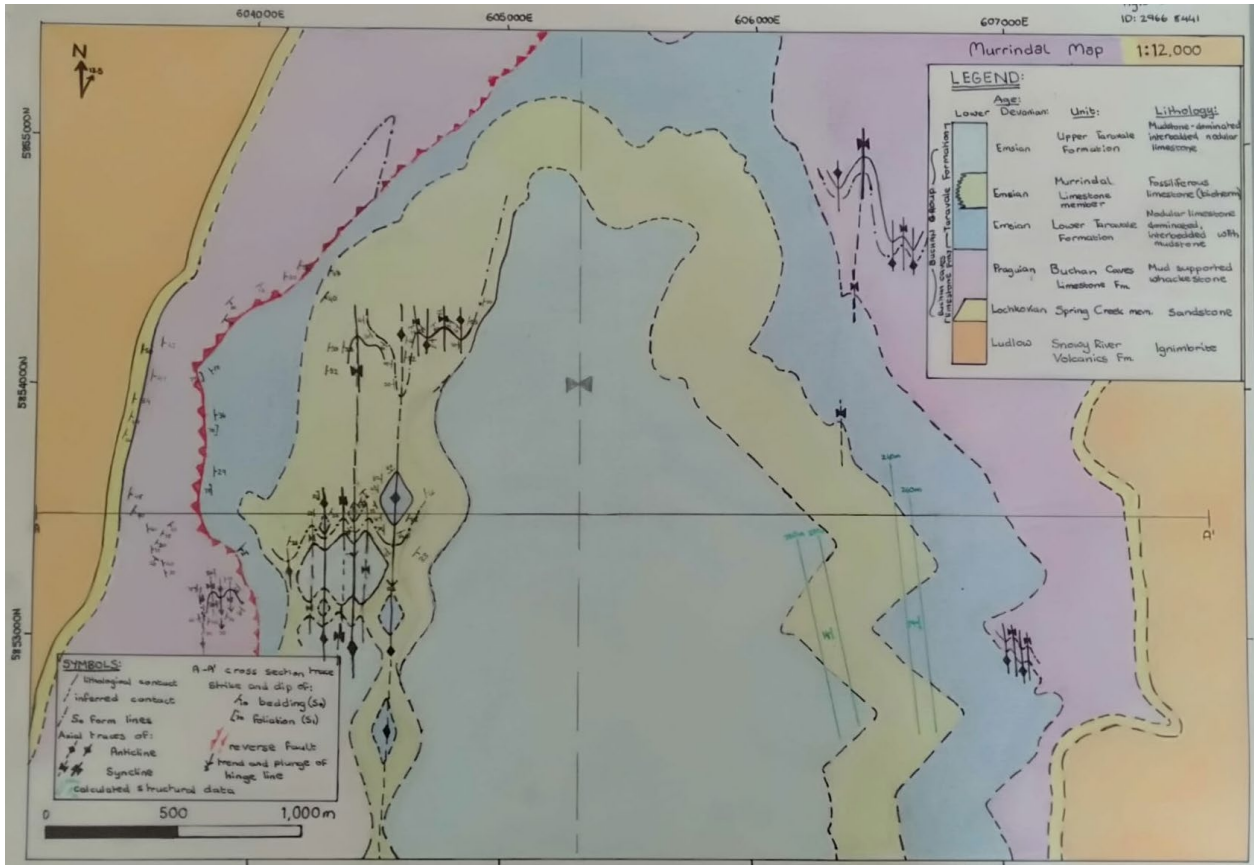
Example: uncleansed data



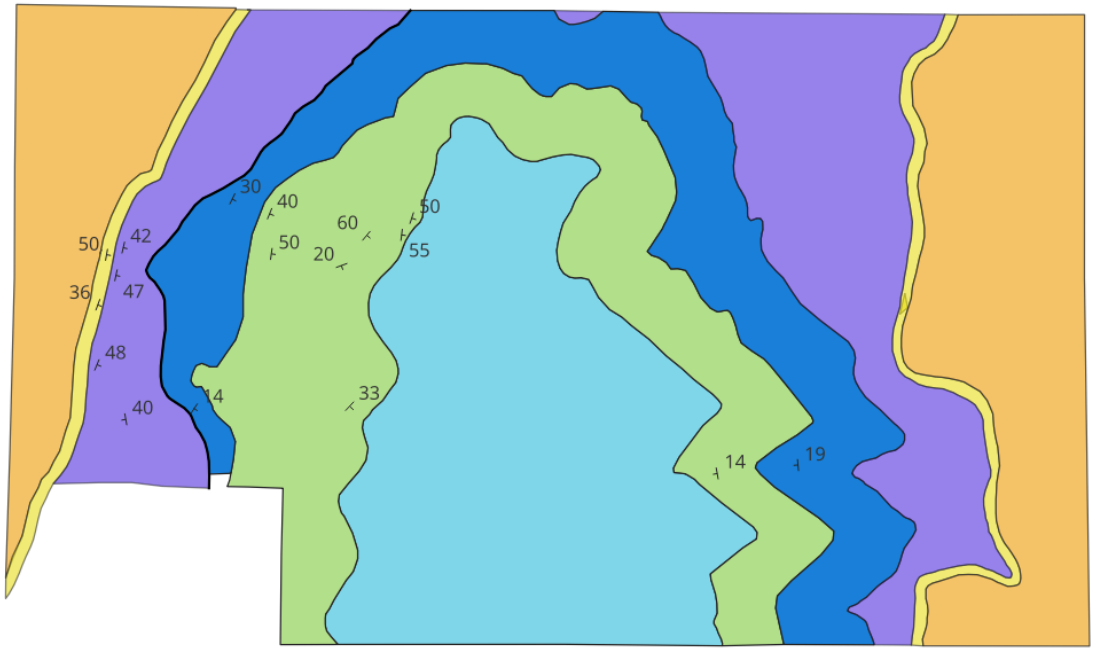


Sampling Resolution

- Sampler spacing will **influence geometries**

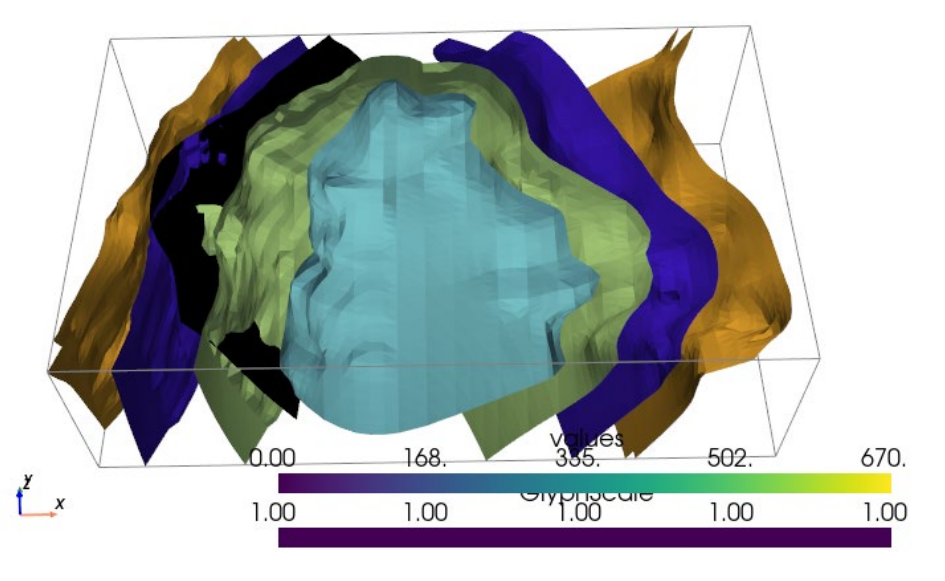


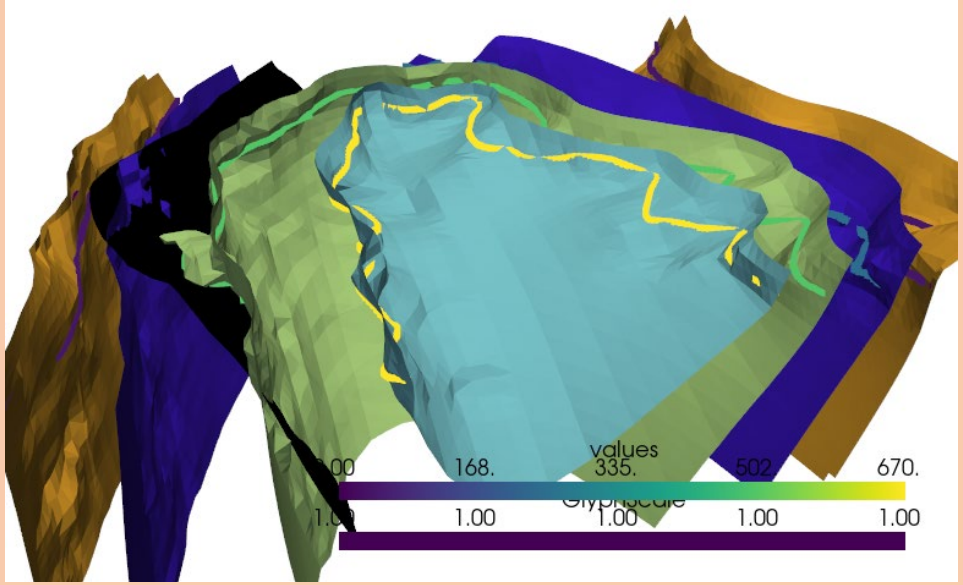
2nd year student field map – Buchan Synclinorium



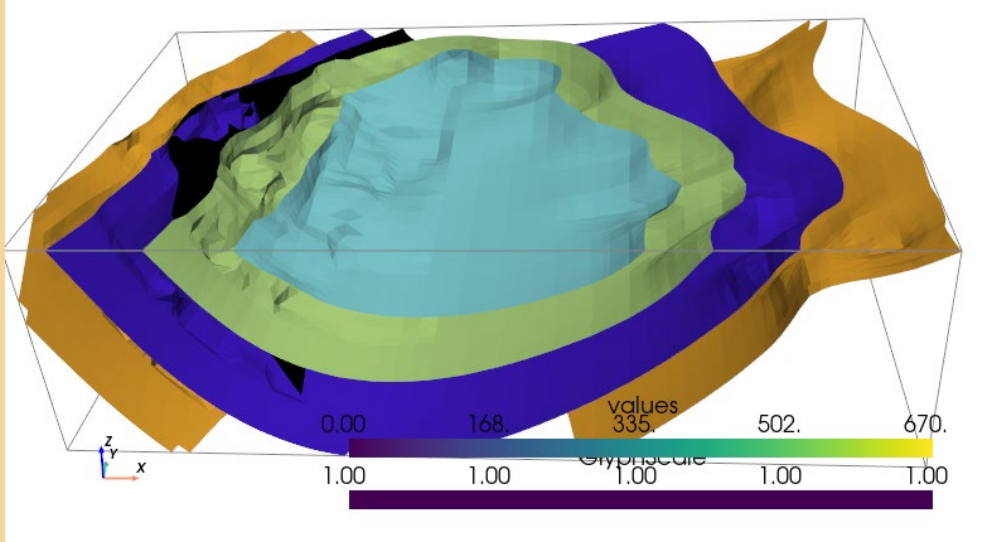
Upscaled digitised shapefiles

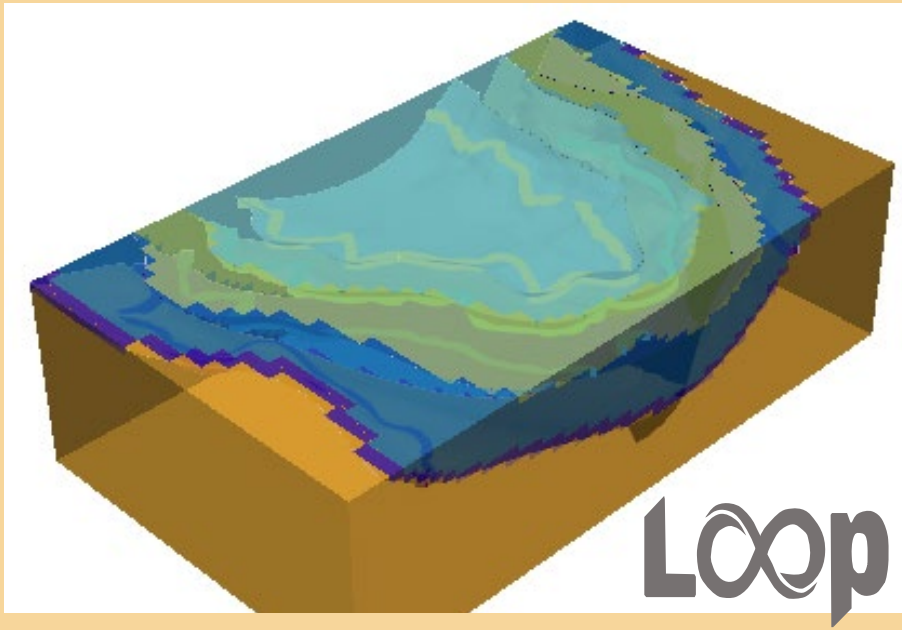
Geology sampler spacing = 1m





Geology sampler spacing = 10m



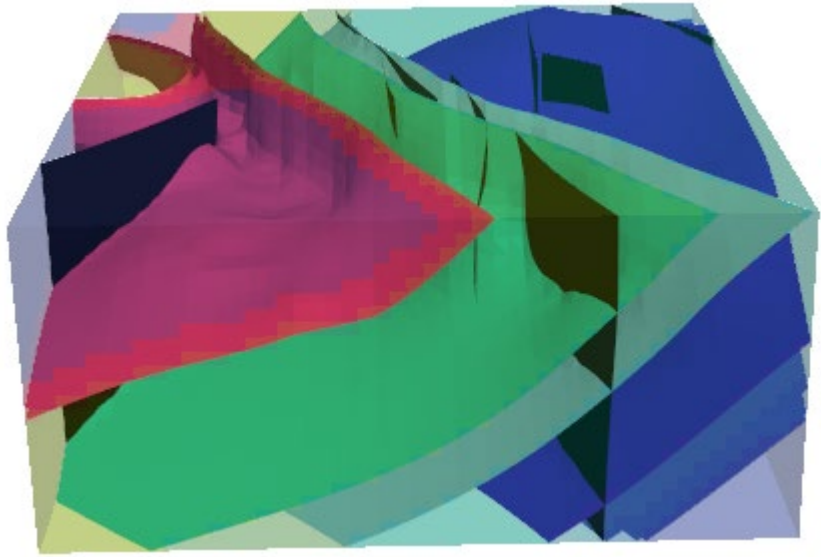


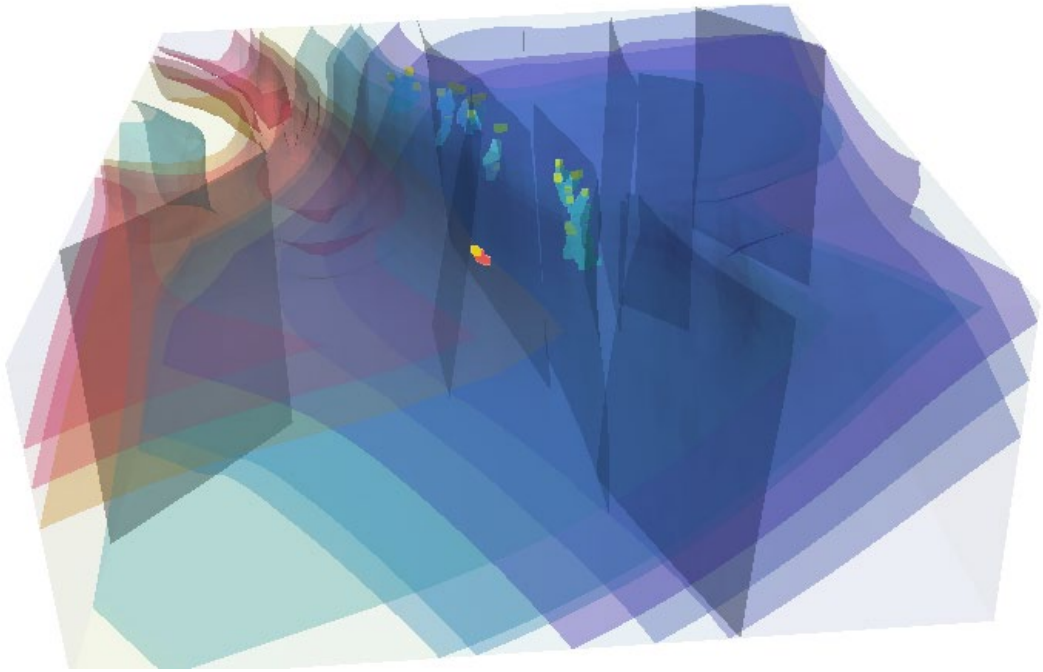
Loop

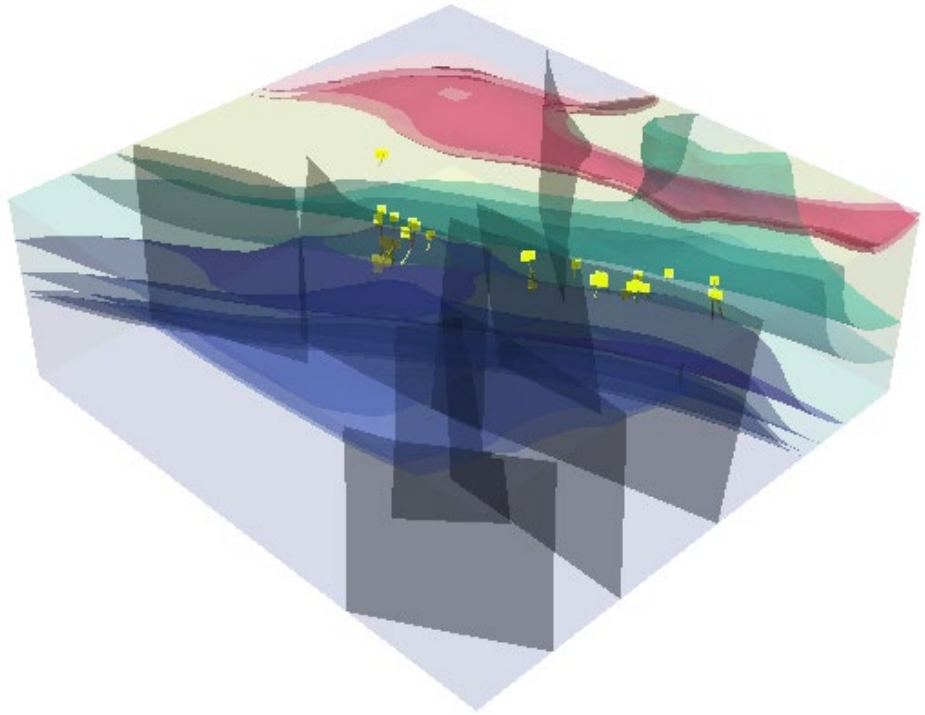
CSIRO

Thickness Variations

- **Calculations** are not always possible
- Can be **manually updated**
- **Constant thickness** used for each unit





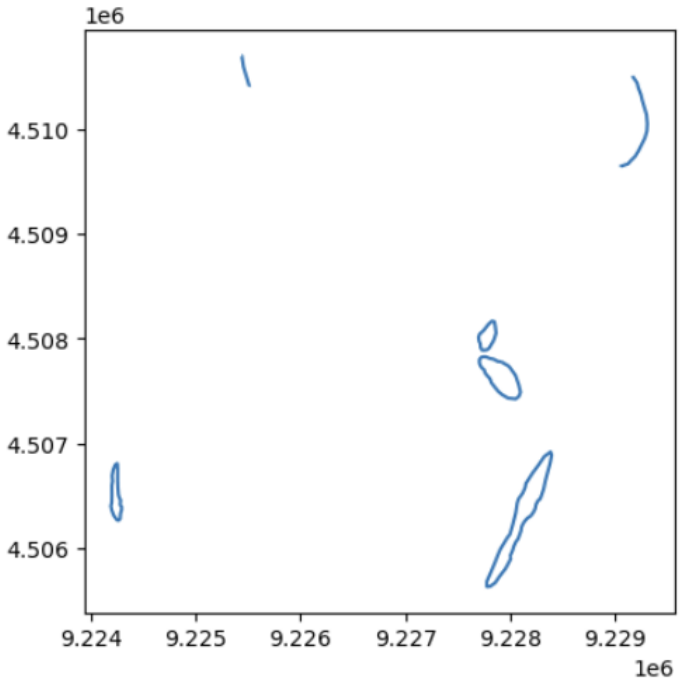


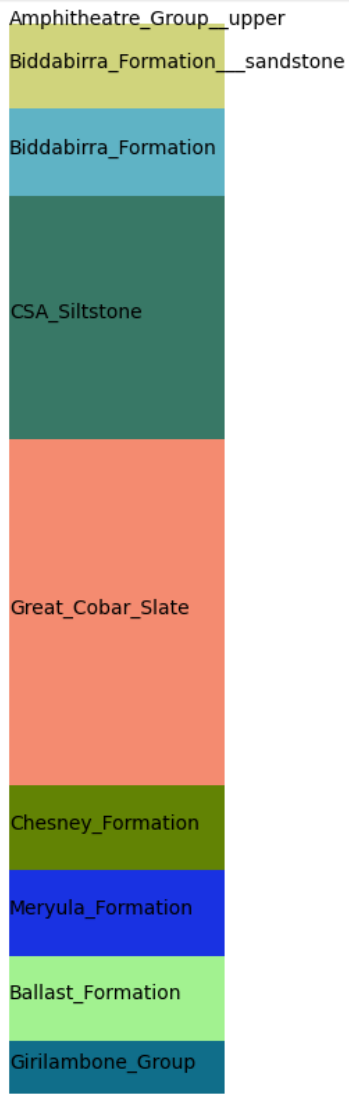
Stratigraphic Column Calculation

- Dependant on **basal contacts**
- **Known** stratigraphic column can be **input in map2loop**
- Model **unconformities** separately

```
[33]: proj.map_data.basal_contacts.plot()
```

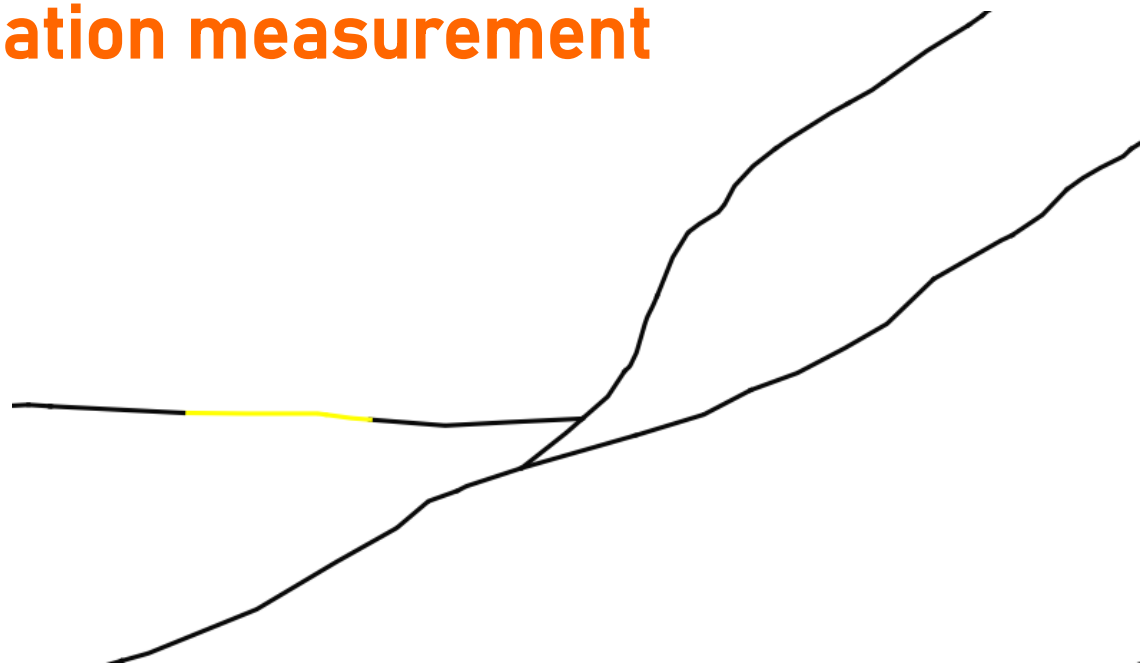
```
[33]: <Axes: >
```





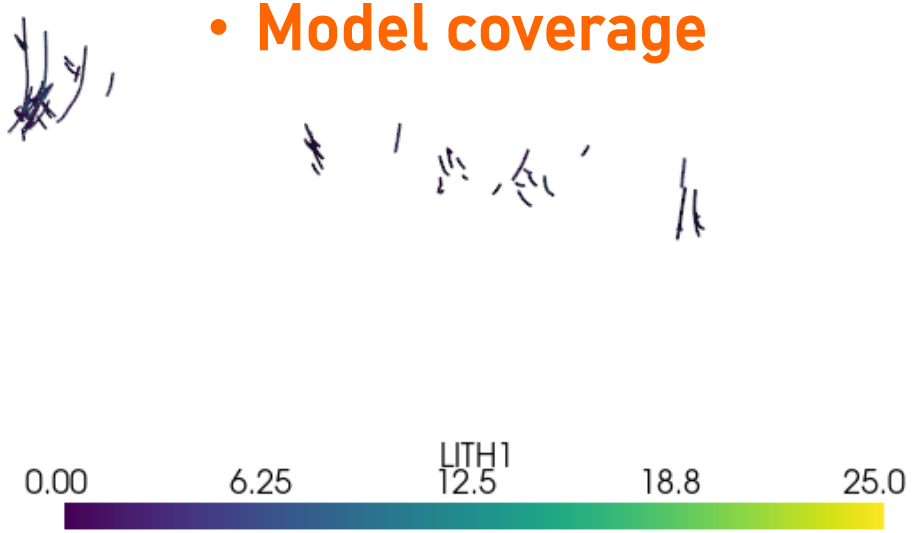
Faults

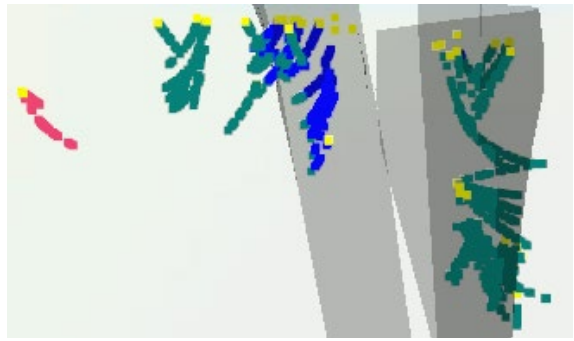
- Fault segments in **NSW geosurvey** datasets must be **joined**
- If your map does **not have any faults** in it, you will need to create a **blank lineString shapefile** to pass map2loop as an input.
- **single orientation measurement**

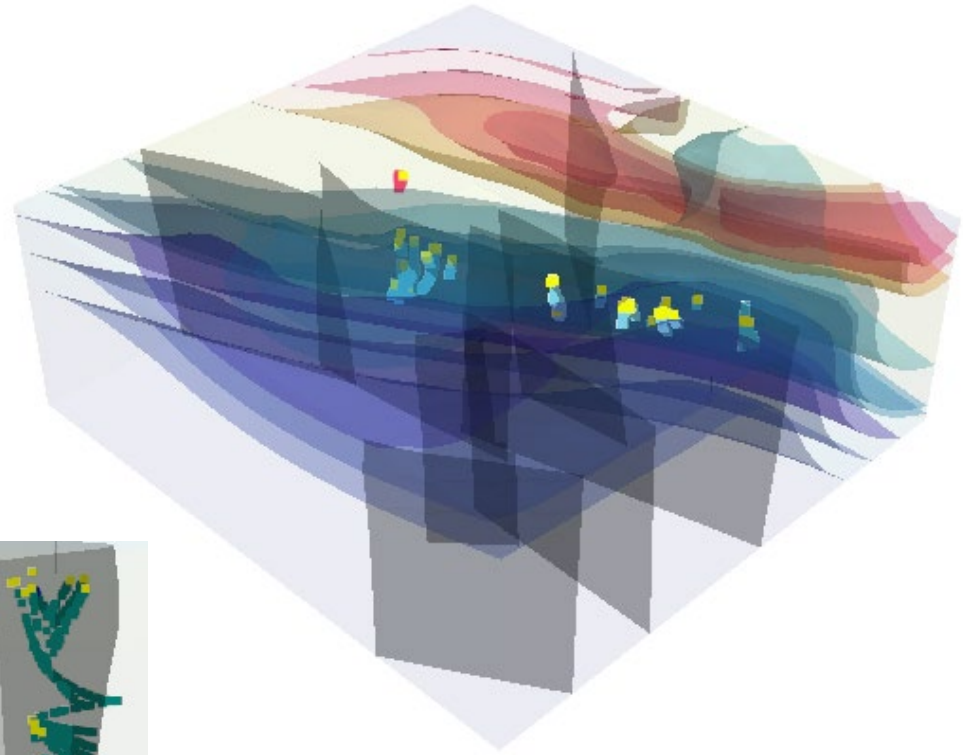


Incorporating Drilling Data

- Can be used as:
  - Additional **point data** (treated as xyz values for litho contacts)
  - Points to **define** a stratigraphic **surface**
  - Provide info on **unit thicknesses**
  - **Model validation**
- **Dependant** on **data quality**
  - Drill hole **depth**
  - **Model coverage**

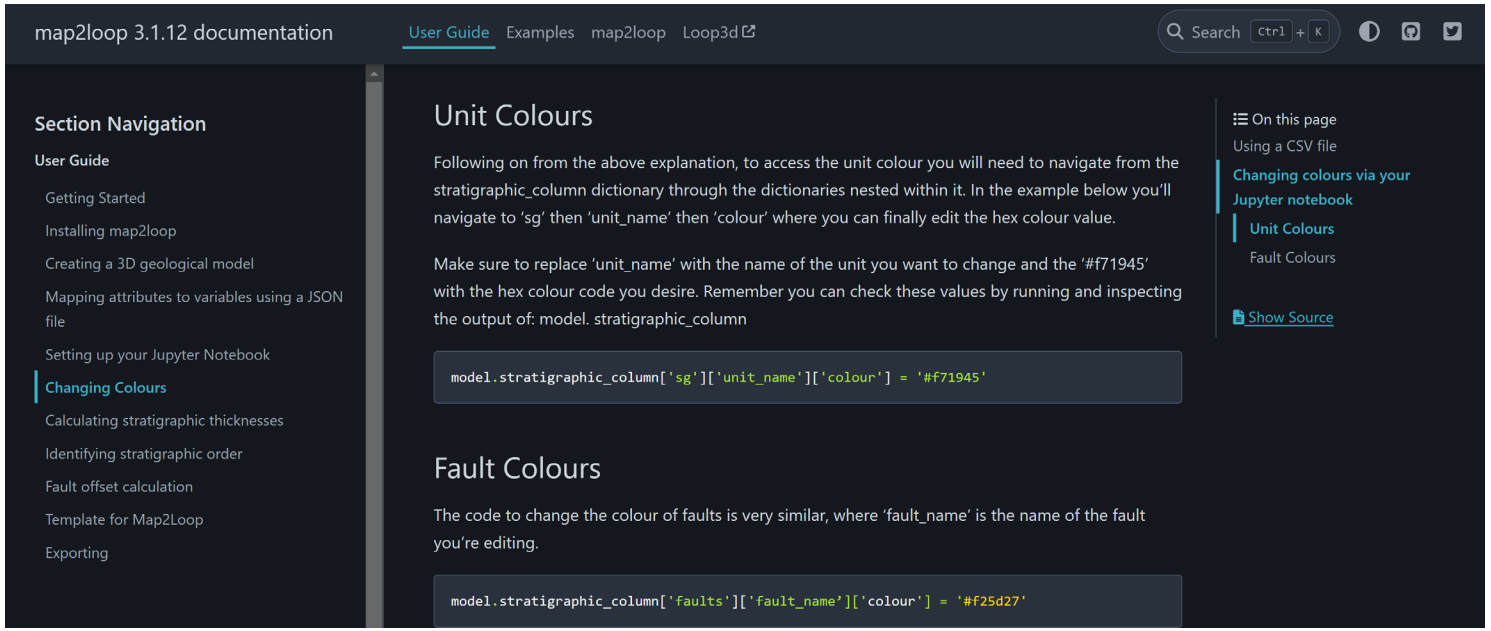






Where to Start?

- Basic user-guide **documentation**
- Code **templates** for map2loop workflow

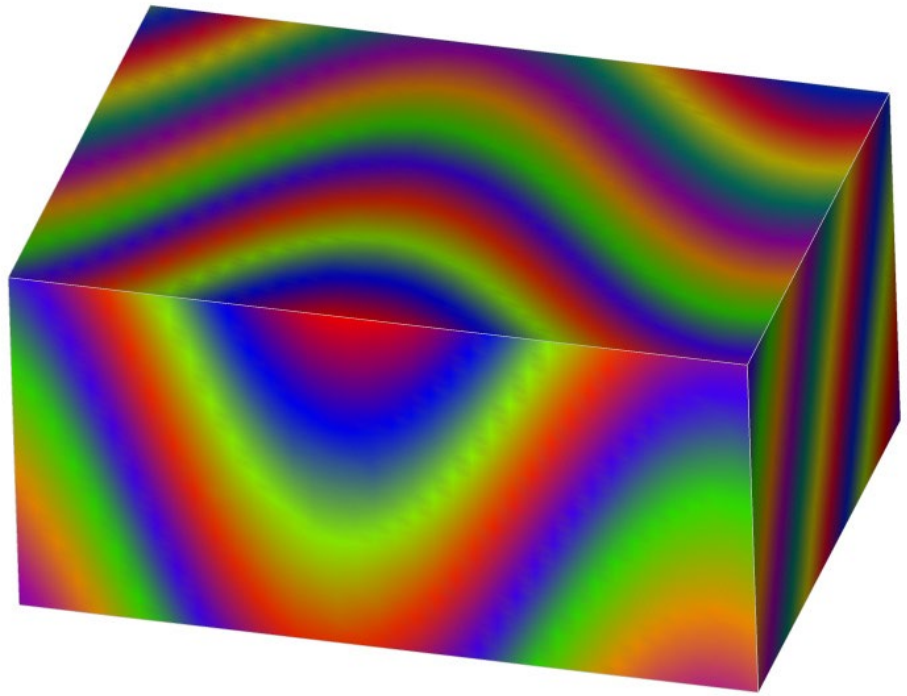


https://loop3d.org/map2loop/index.html

Stay in the Loop!

Visit Loop's website:

www.loop3d.org

Install Loop via GitHub:

github.com/Loop3D