During exploration, when log has failed to provide any stratigraphic framework diagnostic, continuous XRF can be used to determine where you are within the stratigraphy. Split cores or drill cuttings could be useful for non-destructive and fast acquisition of data.

**The ITRAX Core Scanner**

*Developed by Core Analytical Systems in Sweden*

- In a few hours, the scanner allows to acquire:
  - A high resolution optical image (1)
  - A micro-radiography record (2)
  - Very high resolution elemental analysis
  - The magnetic susceptibility

- Providing respectively:
  - Colour informations,
  - Micro-density and structural variations,
  - Records of down-core geochemical changes.

**How does fluorescence work ?**

- Data from Al to U are recorded,
- Detection limit of most elements: 20 ppm.

**Input materials**

- **Drill cuttings:**
  - 1 batch: 68 vials (340 meters depth covered).
  - 10 individual measures per vial (yellow dots)
  - Process time ~10 hours

- **Split core:**
  - 1 batch: 1.8 m covered,
  - Step size: 1 cm (see yellow dots),
  - 178 data points,
  - Process time ~1.5 hours.

**Output examples**

- **Fe**
- **Ca**
- **Si**
- **Ti**

**XRF result analyses**

- Based on their distribution, the elements yield useful informations about geological history and origin through proxies:
  - Sedimentation rates,
  - Oxic/anoxic conditions
  - Biogenic carbonate, silica
  - Redox conditions
  - Sediment grading
  - Provenance studies
  - Dynamic of particles

- Chatellier et al. (2011) systematically analyzed all the elements recorded in three ways individually, in combination with others, and in ratios.

- According to this study the best discriminating displays are ternary diagrams using ratios

- The best ratios for the Lorraine shale were Si/Ti, Mn/S and Al/Cu.

- The best diagnostic ratios for Utica shale were different (i.e. K/Ca, Rb/Sr and Ca/Ti).

**Conclusion**

- Numerous other tests on shales have given good results to precisely pinpoint location in the stratigraphy.
- The XRF study gives a good overview of samples in a fast and efficient way with a minimum of sample preparation.
- According to Chatellier et al., (2015), XRF Core scanning is an economic complement to the sediment description and incredibly valuable when no log exists.