

## **Gerhard Kuhn, Stefan Hoffmann, Hilmar von Eynatten (2014): Color reflectance and XRF core scanner data of ANDRILL sediment core AND-2A**

**Supplementary Information to: Panter, K.S. et al. (2009)** Petrologic and Geochemical Composition of the AND-2A Core, ANDRILL Southern McMurdo Sound Project, Antarctica. *Terra Antarctica*, 15 (1), 147-192, <http://hdl.handle.net/10013/epic.36329>.

### **Appendix: XRF core scanner instrumental drift and Ar correction**

#### **Instrumental drift**

Technical details of the Avaatech XRF core scanner are given in supplementary Table A2.1. Due to time constrain only the 10 kV and 50 kV instrumental settings (Table A2.2) were used on all the core segments. Figure A2.1 shows the measuring geometry of the Avaatech XRF core scanner.

A prepared standard material (SARM 4) sample surface was measured approximately every 24 hours to determine the drift of the XRF core scanner over time. Fig. A3.1 shows Cl, Fe, Ti, Si and K counts of the standard during the measuring period from 16 Oct. until 2 Dec. 2007. After the 31 Oct. 2007 a significant increase in the Cl counts and decrease in K and Si counts is obvious. Throughout the drilling period the salinity of pore water increased and during each measurement a highly concentrated salt solution dripped out of the core liner into the XRF scanner. After drying a fine salt dust contaminated the removable plastic window on the bottom of the He-flushed prism, the foil between the X-ray source and the prism, and the protective foil on the standard sample as well. The window below the prism was replaced approximately every day, so that the salt dust should not have affected the measurements on the spilt core surface. The measurements of Cl on the standard material reflect the salt dust on the foil of the standard sample. The decrease of K and Fe counts are most likely to be caused by the salt on the foil (Fig. A3.1). The elements Fe, Al and Ti do not seem to be influenced by the salt so strongly.

#### **Ar correction**

Measurements on fractures and irregular surfaces are still within the geochemical data set. A simple way to identify these inaccurate points is the measurement of Ar as an indicator for air between the He-flushed prism and the core surface. Ar is a main component of the atmospheric air and detectable with the Avaatech XRF core scanner. Furthermore the fluorescence energy of the lighter elements can be easily absorbed by air, so that the detectable counts are reduced and distort the geochemical data set. For the correction of the data set a reference sample was measured with 0.0, 0.8, 1.6, 2.4 and 3.2 mm distance between the prism and the sample surface. Fig. A3.2 shows the relationship between elements counts of the standard material plotted against the Ar counts in the air. Particularly the counts of the lighter elements Si and Al show a decreasing trend with increasing Ar counts. The heavier elements Fe and Ti with stronger fluorescence energy are not affected (Fig. A3.2). A critical limit of 300 Ar counts is set for the lighter elements and all data points above have to be removed from the data set. Below this limit the measured counts of the lighter elements show broad scattering. Above 300 Ar counts a significant decreasing trend in the element counts is obvious.

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#### **Avaatech XRF Core Scanner (2<sup>nd</sup> Generation, 2005)**

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X-ray source	Oxford (50 Watt, air cooled)
Target type	Rh
Detector	Amptek XR-100CR, energy dispersive (Si-PIN, 2-stage Peltier cooled, Ag collimator)
Detector Window thickness	Be 12.7 $\mu\text{m}$
Detector size	5 mm <sup>2</sup>
Power supply and shaping amplifier	Amptek PX2CR (20 $\mu\text{s}$ shaping time)
Multichannel analyzer	Amptek MCA-8000A (2048 channels)
Processing software	Canberra WinAxil Software package (Version 4.5.2)

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Table A2.1 - Technical details of the Avaatech XRF core scanner

Tube voltage [kV]	Tube current [mA]	Filter	Analyzable Elements
10	0.3	-	Al, Si, P, S, Cl, Ar, K, Ca, Ti, Cr, Mn, Fe, Co, Rh
50	0.7	Cu	Fe, Co, Ni, Br, Rb, Sr, Zr, Nb, Ag, Sn, Ba
30	1	Pd-thick	Fe, Ni, Cu, Zn, Ga, Br, Rb, Sr, Y, Zr, Ru, Rh, Au, Pb, Bi

Table A.2.2 - Instrumental measurement settings

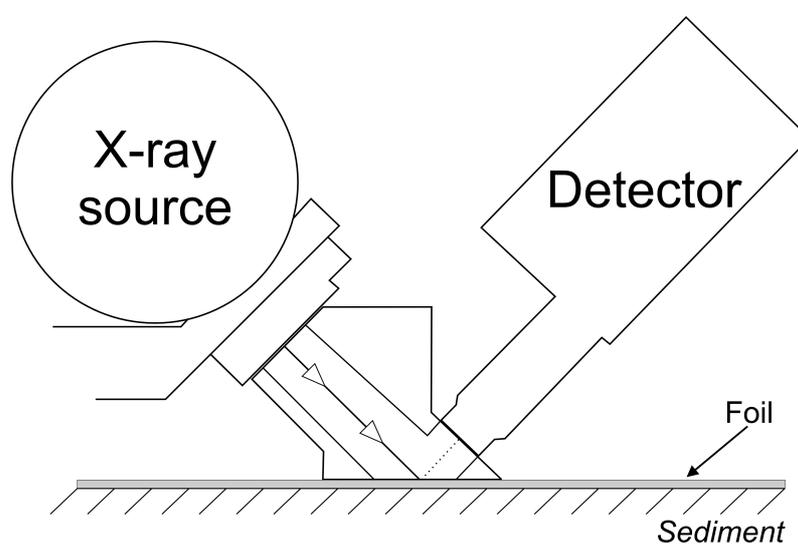


Fig. A2.1 - Geometry of the main components inside the Avaatech XRF core scanner.

All uncorrected XRF core scanner geochemical data are available for cooperative investigations at:  
 doi:10.1594/PANGAEA.834415 for the 10kV data set and at:  
 doi:10.1594/PANGAEA.834417 for the 50kV data set

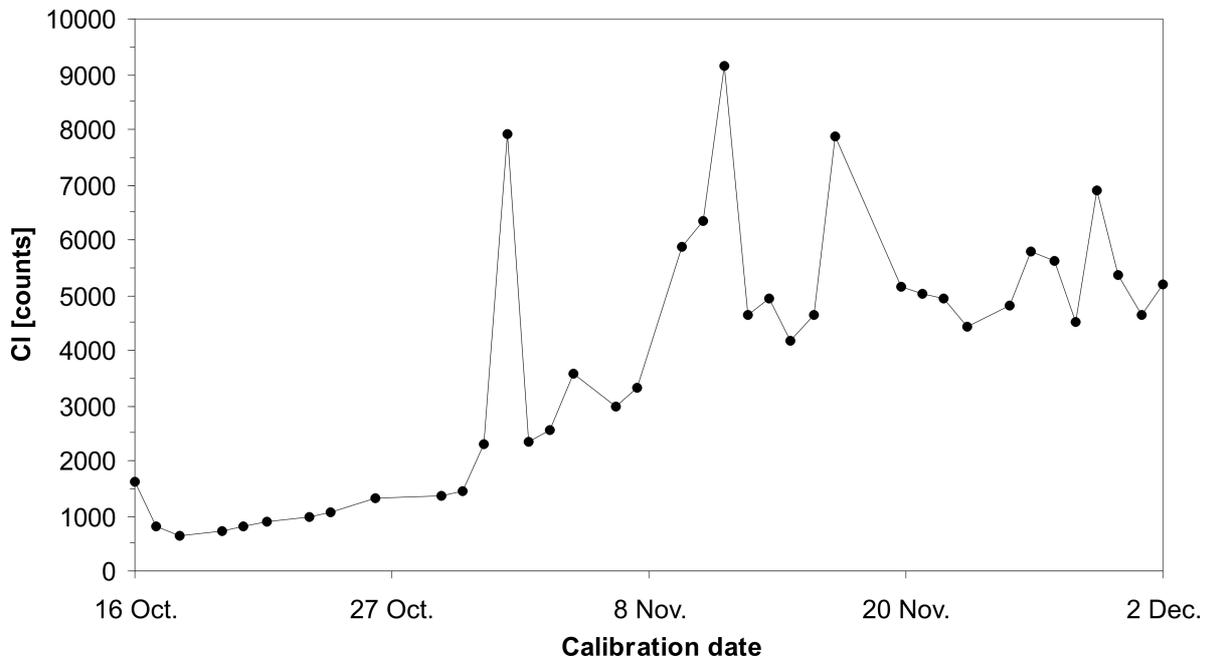
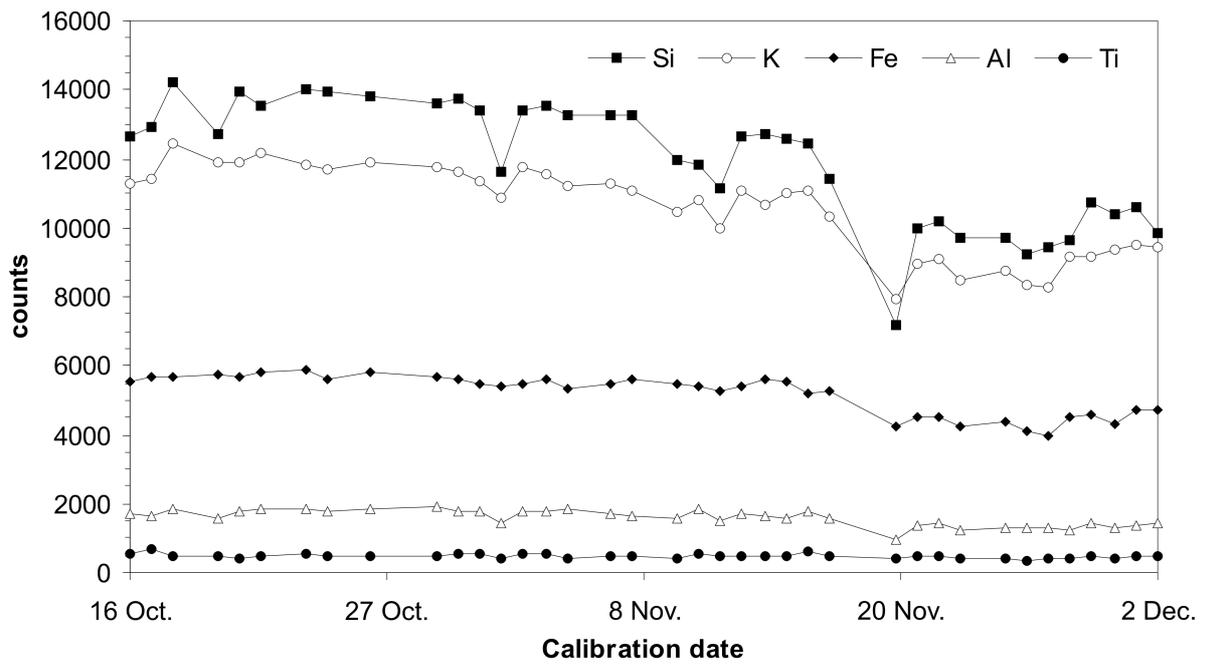


Fig. A3.1 - SARM-4 standard sample measured from 16 October until 2 December 2007

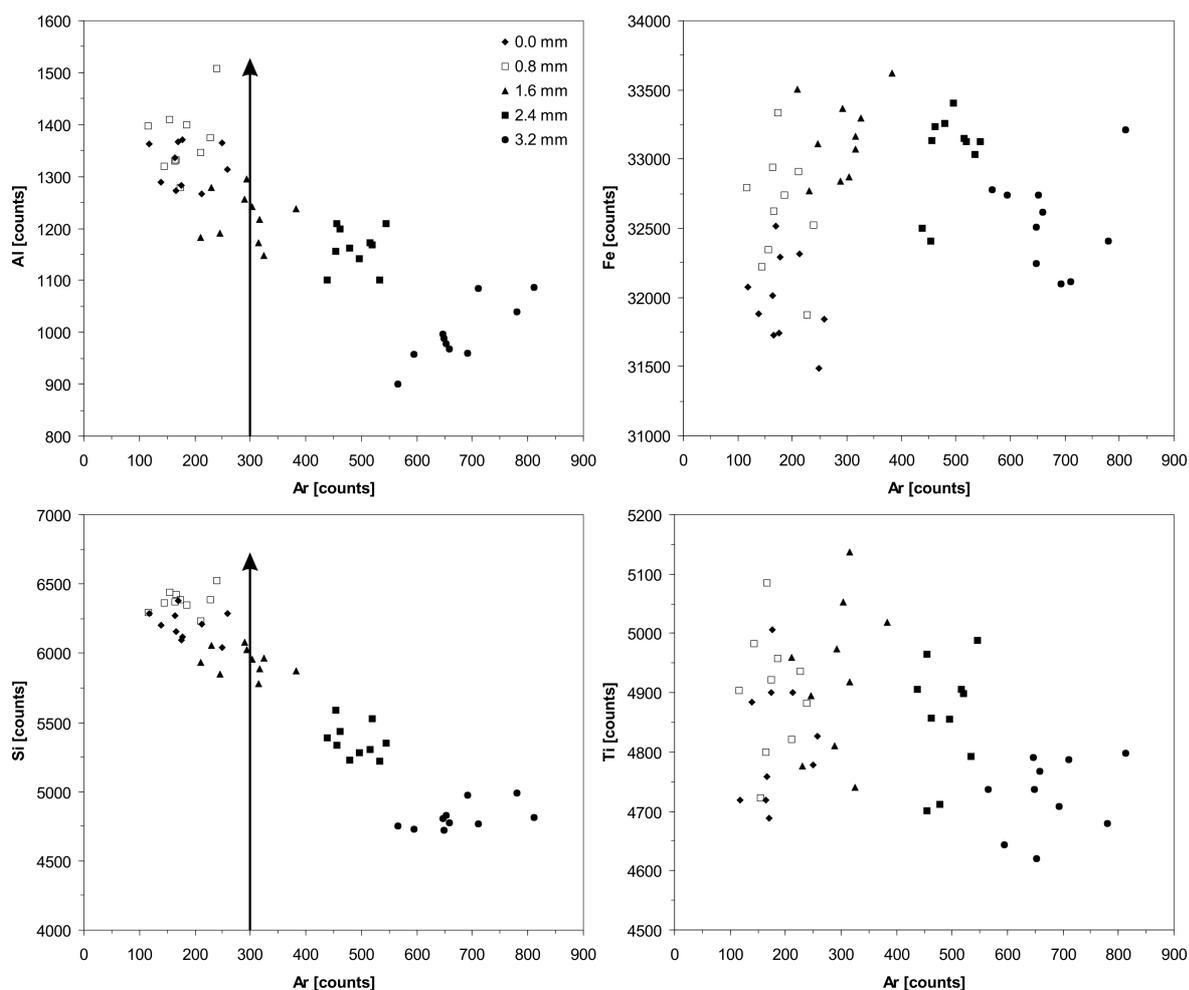


Fig. A3.2 - Ar measurements on the reference sample with different distances (symbols) between the sample and detector prism plotted against Al, Si, Fe and Ti counts.

## Appendix: Image Collection and Visual Color Reflectance

The XRF core scanner is equipped with a Jai CV-L105 3CCD high speed color lines scan camera for core imaging and color measurements. The camera provides a resolution of 2048 pixel for every single RGB color channel. A white calibration was performed with an aperture of 16, but for the imaging process the aperture was set to 8. The archive half of the core was scanned in meter sections and images are available at doi:10.1594/PANGAEA.771213. After the image scanning of each meter the RGB channels and the CIE-L\*a\*b\* color system values were measured along an individually fitted rectangle. Color data from that images are available at doi:10.1594/PANGAEA.834436

Additionally, a Minolta CM-2002 handheld spectrophotometer with 1 cm spot size diameter was used for high-resolution spectral color reflectance measurements. The handheld spectrophotometer measures the reflected light from the split core surface covering the visual spectrum from 400 nm to 700 nm with 10 nm resolutions. The measurements were carried out every 1, 2 or 5 cm down the core depending on the change in lithology. In regular intervals a white calibration was performed following the instructions of the Minolta CM-2002 manual (Minolta Camera Co. 1991). The core surface was covered with conventional plastic film to prevent contamination. Some measurement of the white standard with and without this plastic film were done for later corrections. For each meter of the core the CIE-L\*a\*b\* color system, Munsell and CIE 1931 norm color values in addition to the spectral values are available at: doi:10.1594/PANGAEA.834414

More information about the settings used can be found in Balsam et al., 1998. Image scanning and color reflectance measurements are done in the same manner as described in the Initial Science Report of the MIS Project (Pompilio et al., 2008, reference see Panter et al., 2009).