File S1

Methods and Statistical results

Using SXRF and LA-ICP-TOFMS to explore evidence of treatment and physiological responses to leprosy in medieval Denmark

Biology

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Content

1. Methods

Tooth thin section preparation

To optimise the chances of visualising an area of cementum not affected by taphonomic damages (e.g., cracks, remineralisation, fungi), and avoid restricting the field of view to acellular cementum where increments are tightly packed, the tooth root was sectioned longitudinally through the root apices. Single-rooted teeth (i.e., canines) were sectioned labio-lingually. For lower molars, a mesio-distal section enables to involve both root apices, while for three-rooted maxillary molars, the plane of section passed through the apices of the lingual root and the mesio-buccal root. Note that for molars, the plane of section was oriented to pass through the cusp tips as much as possible, in order to access the earliest information recorded during tooth growth.

Prior to sectioning, the teeth were embedded in epoxy resin for a minimum of 12 hours. A Buehler Linear Precision Saw Isomet 5000 was used in the cementochronology laboratory at *PACEA* (University of Bordeaux, France) to slice the tooth a bit off the desired plane of section. Subsequently, the tooth surface of the thicker half was first briefly polished using an abrasive disk P240 (NAC, Presi) with 58 µm particles size and resin disks (Imax-R, Presi) with 54 µm or 18 µm diamond particles embedded, and then glued on a glass slide (30 x 45 mm or 45 x 60 mm based on the size of each tooth) using epoxy resin at 65°C, under pressure for one hour. A further sectioning followed to produce tooth slices of ~300-400 µm, which were ground and lapped down to between 80-100 µm, first as described above and then using a fine diamond abrasive suspension at 9 µm, 3 µm and 1 µm (LDP polycrystalline diamond suspension, Presi) deposited on polishing clothes (PAD MAG, Presi).

SXRF data acquisition and processing

Experiments were performed on the P06 Beamline (Boesenberg et al., 2016; Schroer et al., 2010), Petra III, at DESY (Deutsches Elektronen-Synchrotron, Hamburg, Germany). The storage ring was operated in 480-bunch mode using top-up filling mode with a current of 120 mA ± 0.5 mA, and an undulator gap of 11.07 mm. The primary X-ray beam was monochromatised to 16.6 keV using a double crystal Si111 monochromator and focused using a Kirkpatrick-Baez (KB) mirror system (JTEC, Japan) to 500×500 nm^2. The experimental configuration consisted of two Vortex EM silicon drift detectors, Hitachi High-Tech Science America, Inc., the second of which was collimated. Both detectors were positioned symmetrically at scattering angles of 135 degrees at a distance of 9 mm from the focal point. The use of dual-detector "backscatter" geometry enables maximising the solid angle during analysis of thin polished samples (~100 µm-thick in this study), and imaging large area SXRF with micrometric resolution using millisecond dwell times (Falkenberg et al., 2017). This setup allowed capturing the Kα emission lines from Si to Sr and the Lα emission lines of Hg and Pb. The Mg signal, however, is drastically lowered by absorption through the sample itself and the air path. Furthermore, the Mg Kα emission line is at 1.254 keV, which is not well-suited for the primary energy (16.6 keV). To note that some interferences within the spectrum may affect the sensitivity for detecting elements, such as Pb or Hg.

Spectral peak deconvolution and integration was performed using the core of PyMca 5.5.0 (Solé et al., 2007), whilst calibration was performed by an in-house script. Image analysis was performed in HDIP v-1.3.3.1073 (Teledyne CETAC Technologies, Bozeman, MT, USA). The X-ray yield calculations were performed assuming a hydroxyapatite matrix ($Ca_{10}(PO_4)_6(OH)_2$) with density of 2.85 g.cm^{-3} for the enamel phase and of 1.6 g.cm^{-3} for the dentine phase (Djomehri et al., 2015). Elemental mass fractions were determined by calculating an areal density sensitivity from measurements of standard Ti, Fe, and Cu foils with areal density of 59.0, 55.0, and 47.9 µg.cm^{-2}, respectively (Micromatter Technologies Inc. Canada), and measured thickness of the samples. Tooth section thickness was measured throughout the whole surface of the specimen in five positions for canines and eight positions for molars. The average tooth section thickness was also taken into account in the x-ray mass attenuation coefficients of the hydroxyapatite phase during attenuation correction

(Szczerbowska-Boruchowska, 2012). Glass slides substrates were included in the overall sample model as appropriate (i.e., background subtraction). Normalisation to the incoming X-ray flux was applied. In the calibrated data, SXRF concentrations are reported by mass fraction ($\mu g.g^{-1}$, i.e., ppm), and/or areal density ($g.cm^{-3}$). Pb images contain no quantitative data (i.e., relative Pb content is expressed in arbitrary units 'a.u.'), as L-lines were not modelled.

LA-ICP-TOFMS imaging of Odense 533M and Næstved 211C

LA-ICP-TOFMS imaging was performed at the Department of Chemistry, Ghent University (Belgium) with a setup consisting of an Iridia 193 nm ArF* excimer-based laser ablation system (Teledyne Photon Machines, Bozeman, MT, U.S.A.) coupled to an icpTOF 2R (TOFWERK AG, Thun, Switzerland) TOF-based ICP-MS instrument. The laser ablation system was equipped with the Cobalt Long-Pulse ablation cell and the aerosol rapid introduction system (ARIS), which introduced an Ar make-up gas flow (~1.05 $L.min^{-1}$) into an optimised He carrier gas flow of 0.60 $L.min^{-1}$ before entering the plasma. The LA-ICP-MS system was optimised via ablation of NIST SRM612 (National Institute for Standards and Technology, Gaithersburg, MD, U.S.A.), with tuning for the highest intensities for $^{24}Mg^{+}$, $^{115}In^{+}$ and $^{238}U^{+}$, whilst maintaining low oxide formation (<1% $^{238}U^{16}O^{+}/^{238}U^{+}$) and a ratio of $^{238}U^{+}/^{232}Th^{+}$ ratio ~1. Imaging was performed in fixed dosage mode 1 and with an energy density of 3 $J.cm^{-2}$, at a repetition rate of 250 Hz, using a circular spot size of 4 or 2 µm, with a vertical interspacing between the lines between 20 and 2 µm. The images were recorded using bracketing with NIST SRM612. The icpTOF 2R ICP-TOFMS was operated in standard operation mode with a mass coverage range of 14-254 m/q. The read-out frames of 3.8 ms were synchronised with the laser ablation repetition rate, with a transfer delay of 53.7 ms. The iCAP Q was equipped with the LA injector of 2.5 mm inner diameter and nickel sample and skimmer cones with a skimmer cone insert of 2.8 mm in diameter. The RF power was set to 1500 W, and an auxiliary Ar gas flow rate of ~0.90 $L.min^{-1}$ and a plasma Ar gas flow rate of 15 $L.min^{-1}$ were used.

Statistical analysis

The classical correlation tests involving Pearson's r and Spearman ρ (rho), (with α=0.05) were computed in RStudio using the function cor.test(), and adjusting the method to "pearson" or "spearman". However, the Pearson correlation is sensitive to outliers, which may weaken the strength and the significance of the results. A more robust correlation test involving the Minimum Covariance Determinant (MCD) was calculated using the corr.plot() function. The MCD is a highly robust estimator of multivariate location and scatter (Hubert et al., 2018; Rousseeuw and Driessen, 1999; Santos, 2020). This procedure runs the correlation test on a user-defined percentage of the data (here quan= 0.8, meaning 80% of the data are kept) representing the "good part" of the data, thus removing values detected as outliers. Some elements such as Fe, Mn or Pb showed a substantial root surface enrichment, which may considerably disturb the computation of the tests. However, the MCD procedure may not remove all of the datapoints related to the root surface, but also exclude hotspots or high concentrations occurring within the cementum thickness, which could be related to a biological signal and, thus, be meaningful. Therefore, the classical and robust tests were also run by excluding the datapoints of the root surface and sub-surface defined by a peak in Pb, Mn or Fe, to assess if the significance of the correlation tests would be affected and change. All detailed results are reported below, and the classical Pearson results are plotted in blue while the MCD correlation is plotted in red. Correlation coefficient matrices were computed using the Spearman method, and plotted using 'corr.plot', which enables displaying the rho values following a colour code, and crossing out rho values when p-values are not significant.

References

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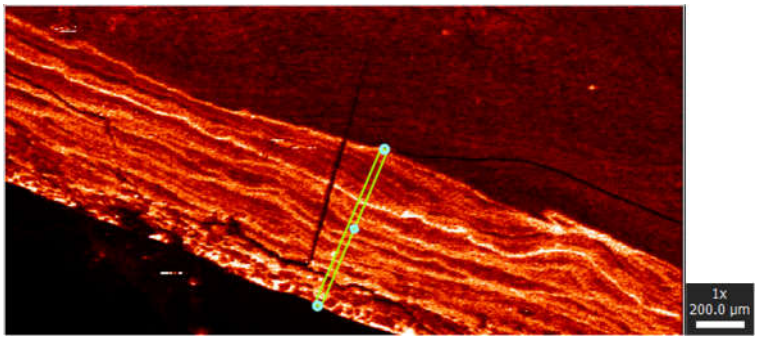
2. Results

Statistical analysis

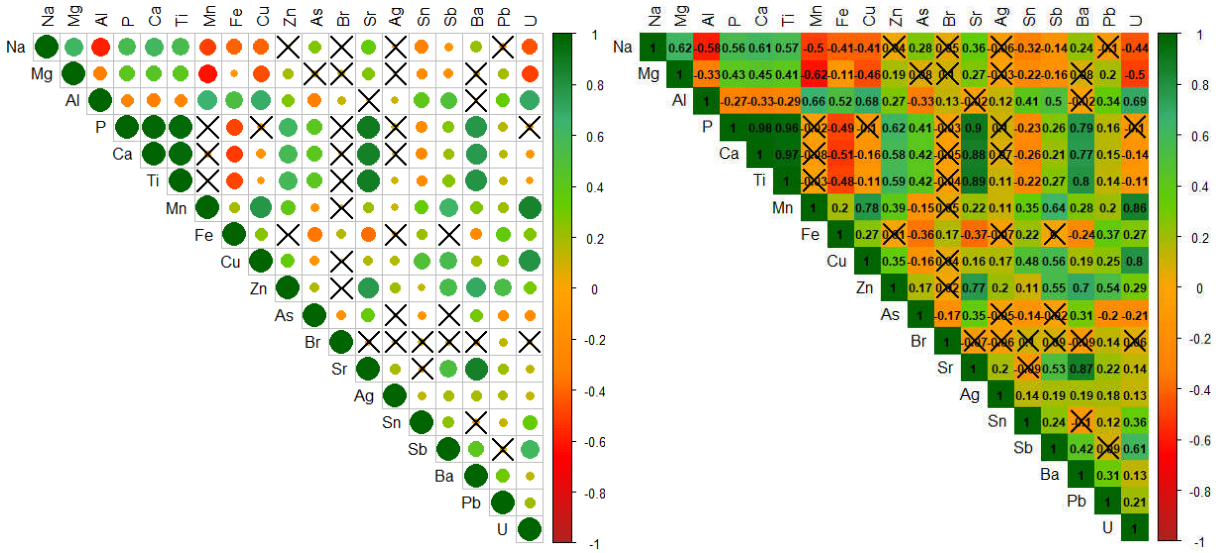
Næstved 211C – Cellular Cementum (total thickness=721 µm)

Correlations between pairs of elements

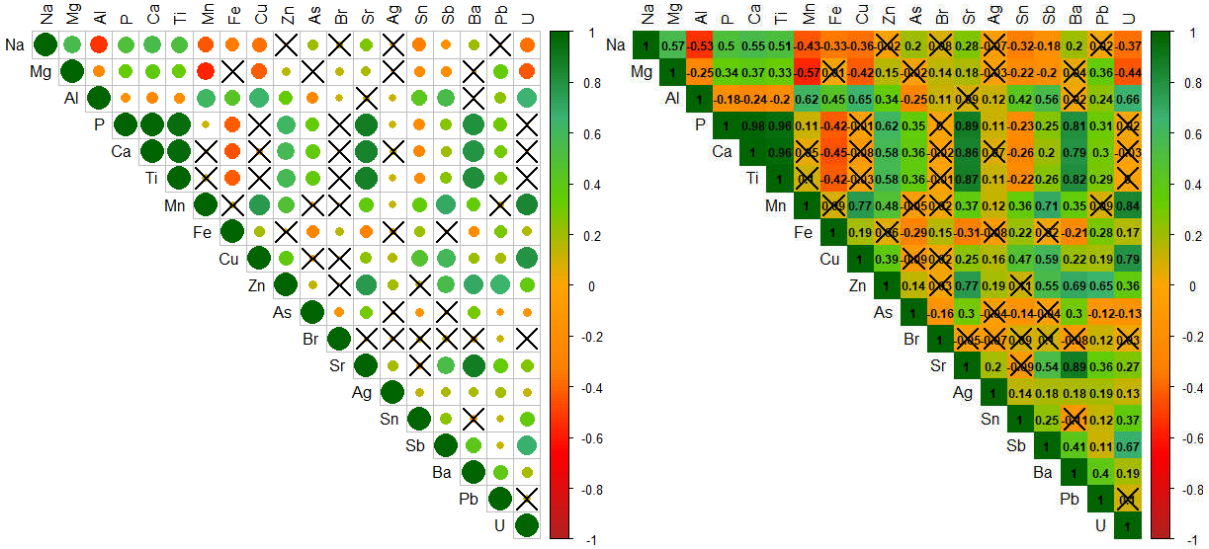


Zn map (yellow path indicates where the measurements are taken)

Summary: whole cementum thickness, Spearman correlations.



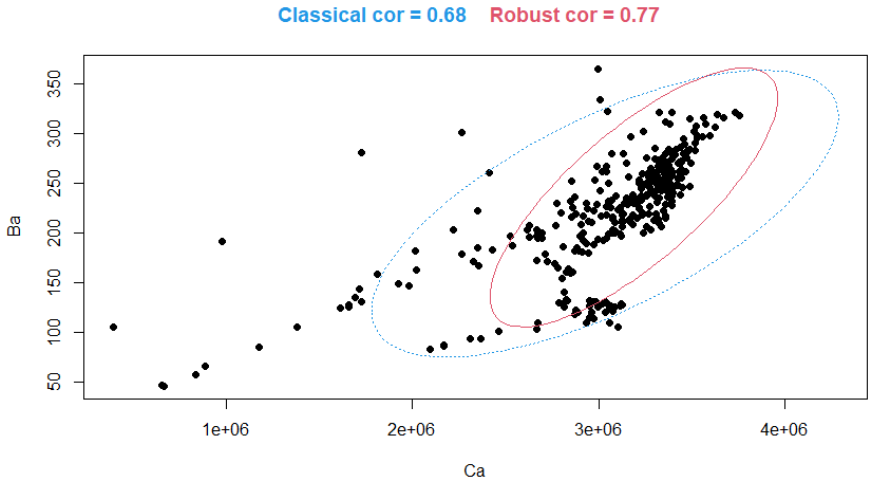
Summary: removing the first 30 µm of root surface, Spearman correlations.



wRS: without Root surface [Pb = ~27 µm; Fe = ~15µm; Mn = ~200µm; Al = ~17 µm]

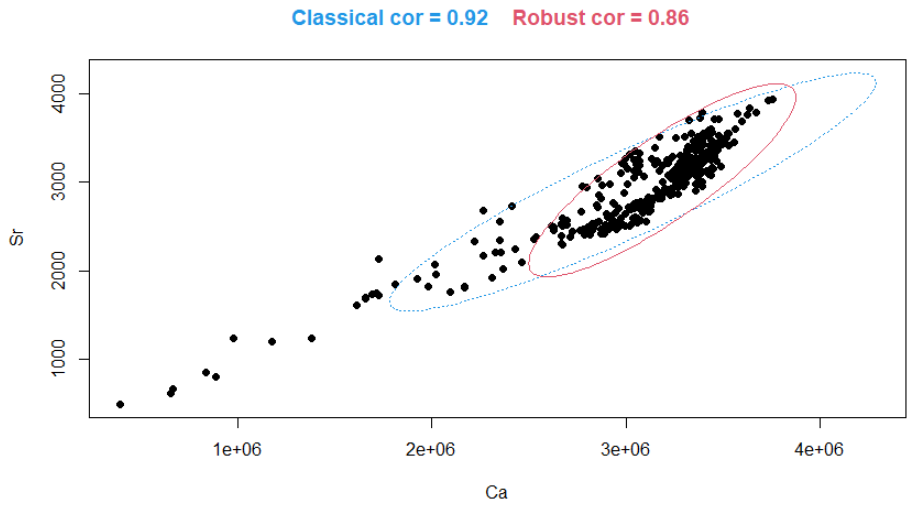
- **Ca vs Ba**

Classical test	Pearson's product-moment correlation data: Aa211C_CC$Ca and Aa211C_CC$Ba t = 16.927, df = 338, **p-value < 2.2e-16** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.6153113 0.7310395 sample estimates: **cor** **0.6773442**	Spearman's rank correlation rho data: Aa211C_CC$Ca and Aa211C_CC$Ba S = 1527564, **p-value < 2.2e-16** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.7668058**
MCD (α=0.05; quant=0.8)	$cor.rob **0.7691947**	



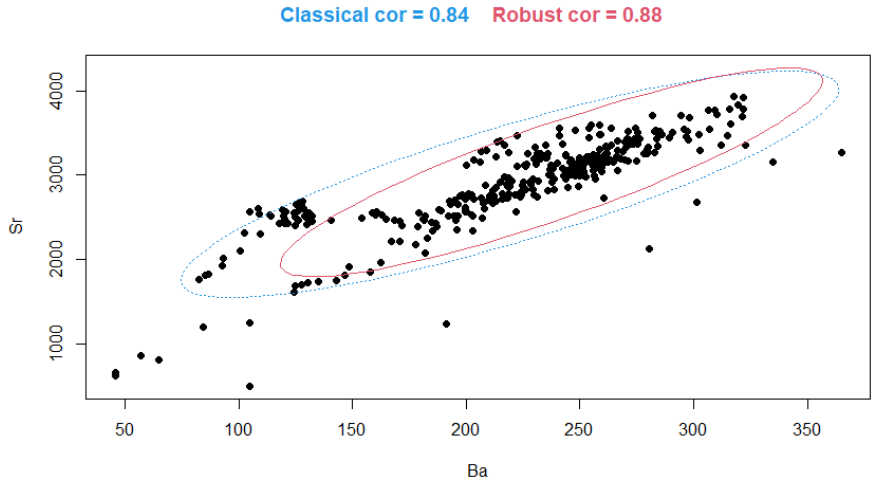
- **Ca vs Sr**

Classical test	Pearson's product-moment correlation data: Aa211C_CC$Ca and Aa211C_CC$Sr t = 43.337, df = 338, **p-value < 2.2e-16** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.9026035 0.9353623 sample estimates: **cor** **0.9205867**	Spearman's rank correlation rho data: Aa211C_CC$Ca and Aa211C_CC$Sr S = 815088, **p-value < 2.2e-16** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.8755707**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.8612135**	



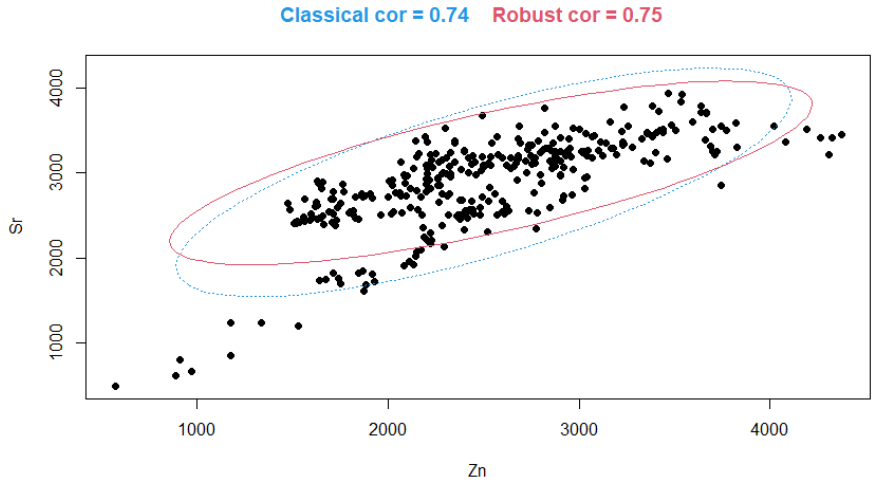
- **Ba vs Sr**

Classical test	Pearson's product-moment correlation data: Aa211C_CC$Ba and Aa211C_CC$Sr t = 29, df = 338, **p-value < 2.2e-16** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.8110749 0.8725568 sample estimates: **cor** **0.8445774**	Spearman's rank correlation rho data: Aa211C_CC$Ba and Aa211C_CC$Sr S = 844406, **p-value < 2.2e-16** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.8710951**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.8781067**	



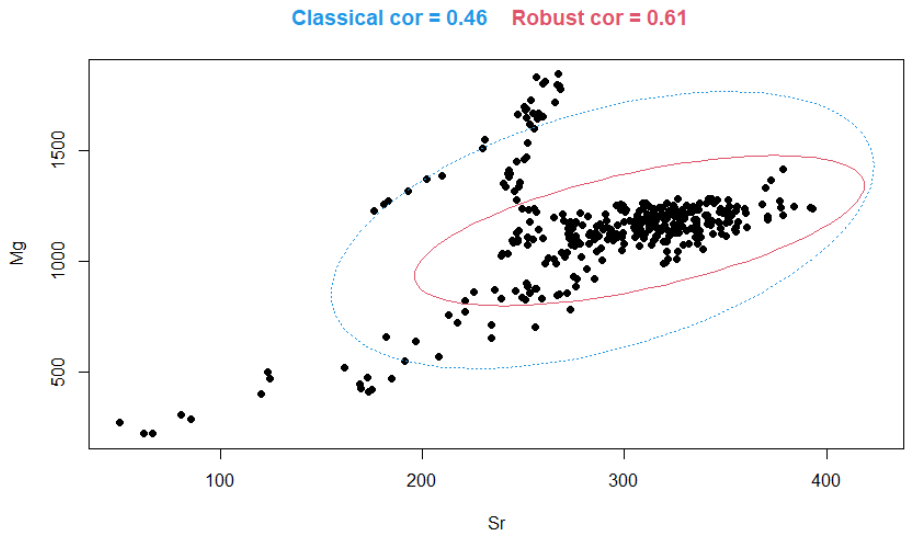
- **Zn vs Sr**

Classical test	Pearson's product-moment correlation data: Aa211C_CC$Zn and Aa211C_CC$Sr t = 20.166, df = 338, **p-value < 2.2e-16** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.6865859 0.7837428 sample estimates: **cor** **0.7389826**	Spearman's rank correlation rho data: Aa211C_CC$Zn and Aa211C_CC$Sr S = 1506568, **p-value < 2.2e-16** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.770011**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.7459763**	



- **Mg vs Sr**

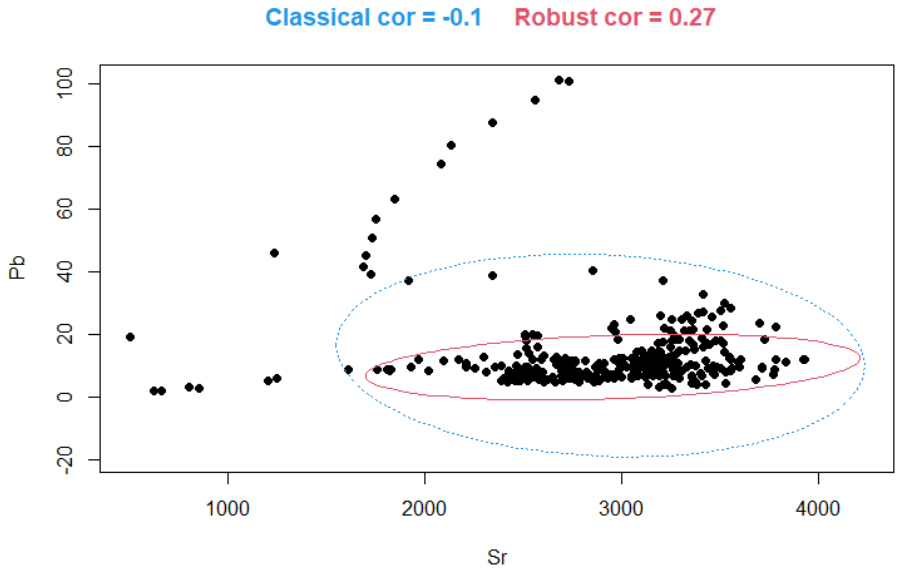
Classical test	Pearson's product-moment correlation data: Aa211C_CC$Mg and Aa211C_CC$Sr t = 9.5244, df = 338, **p-value < 2.2e-16** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.3718262 0.5399413 sample estimates: **cor** **0.4599964**	Spearman's rank correlation rho data: Aa211C_CC$Mg and Aa211C_CC$Sr S = 4795796, **p-value = 5.916e-07** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.2678856**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.607433**	



- **Pb vs Sr**

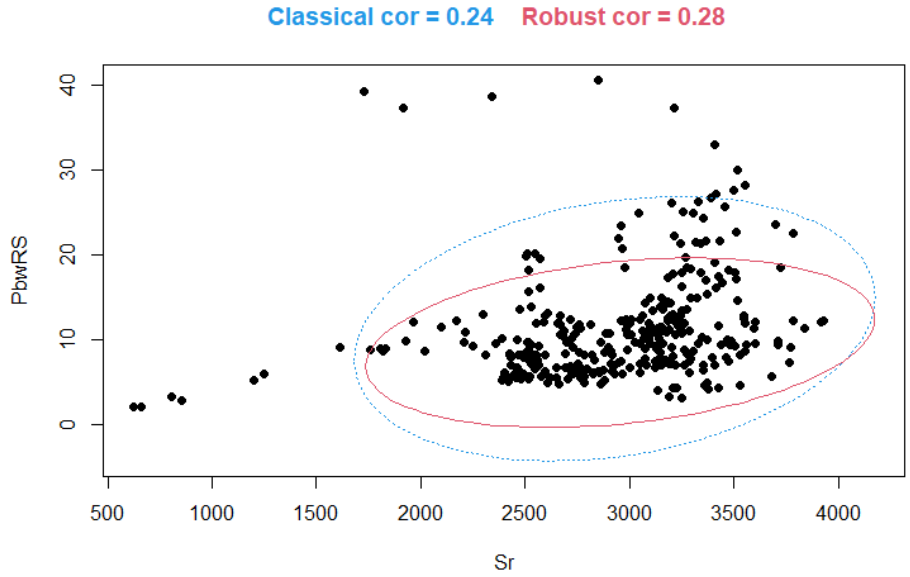
Whole cementum thickness:

Classical test	Pearson's product-moment correlation data: Aa211C_CC$Sr and Aa211C_CC$Pb t = -1.9403, df = 338, **p-value = 0.05318** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.20898408 0.00142329 sample estimates: **cor** **-0.1049548**	Spearman's rank correlation rho data: Aa211C_CC$Sr and Aa211C_CC$Pb S = 5138998, **p-value = 6.42e-05** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.2154932**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.2704948**	



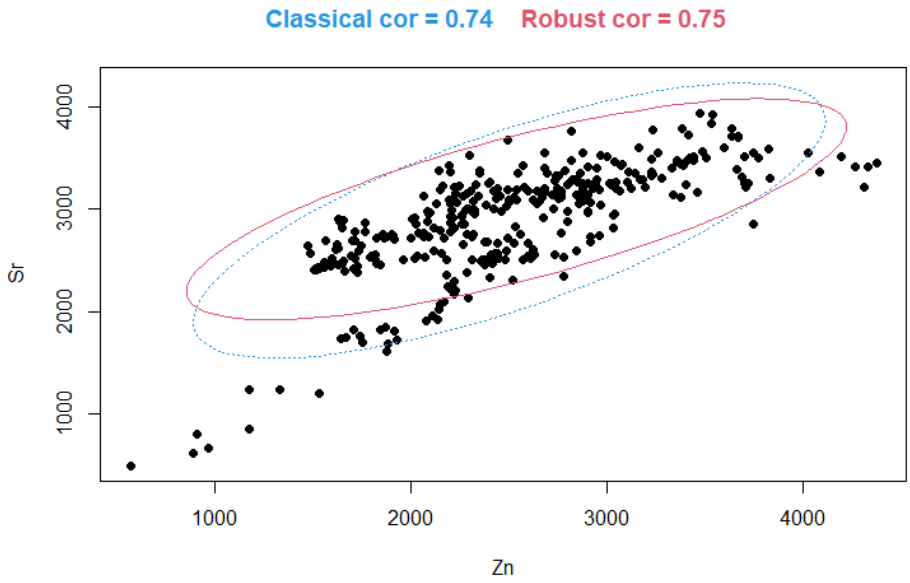
Removing 27 µm of Pb-enriched root surface:

Classical test	Pearson's product-moment correlation data: Aa211C_CC_wRS$Sr and Aa211C_CC_wRS$Pb t = 4.4666, df = 325, **p-value = 1.098e-05** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.1355669 0.3400778 sample estimates: **cor** **0.2404895**	Spearman's rank correlation rho data: Aa211C_CC_wRS$Zn and Aa211C_CC_wRS$Pb S = 2159708, **p-value < 2.2e-16** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.6293986**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.2800147**	



- **Sr vs Zn**

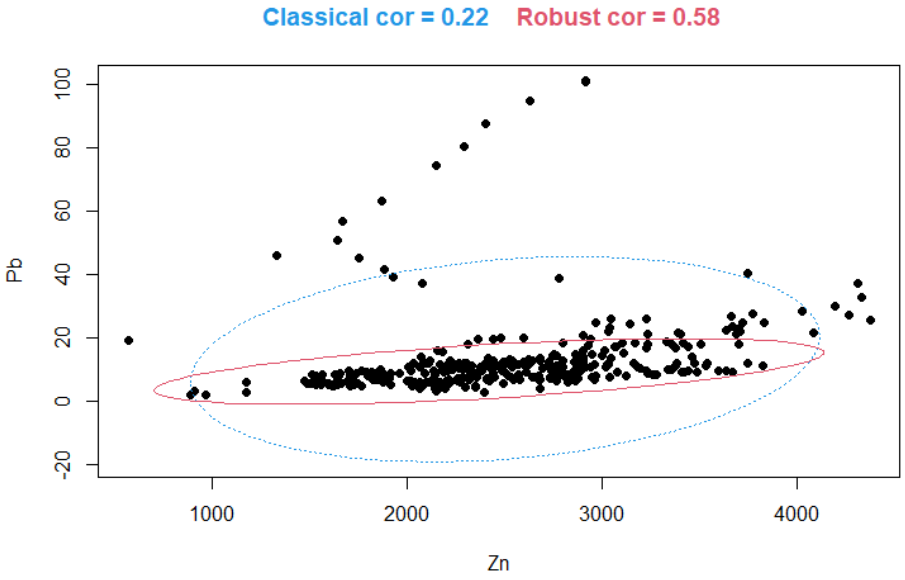
Classical test	Pearson's product-moment correlation data: Aa211C_CC$Zn and Aa211C_CC$Sr t = 20.166, df = 338, **p-value < 2.2e-16** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.6865859 0.7837428 sample estimates: **cor** **0.7389826**	Spearman's rank correlation rho data: Aa211C_CC$Zn and Aa211C_CC$Sr S = 1506568, **p-value < 2.2e-16** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.770011**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.7459763**	



- **Pb vs Zn**

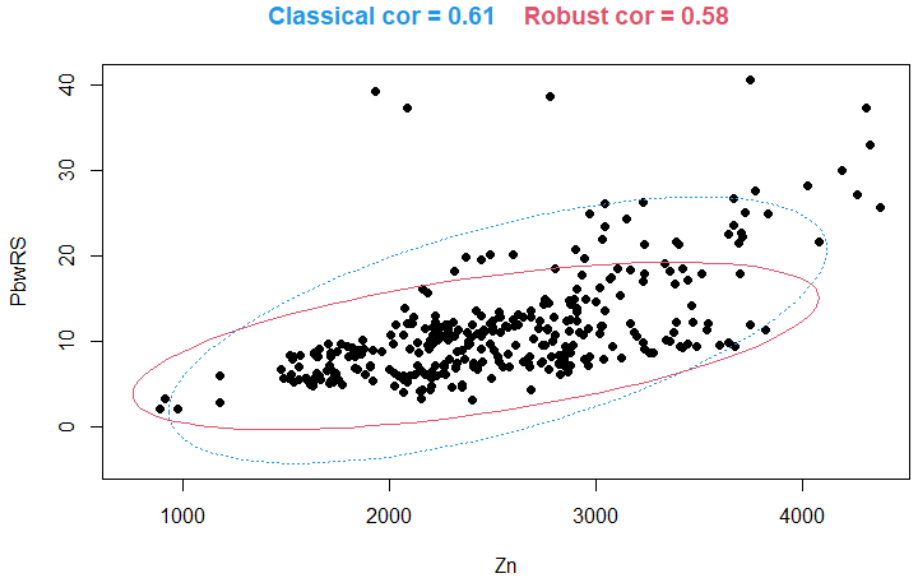
Whole cementum thickness:

Classical test	Pearson's product-moment correlation data: Aa211C_CC$Zn and Aa211C_CC$Pb t = 4.2406, df = 338, **p-value = 2.88e-05** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.1212964 0.3233902 sample estimates: **cor** **0.2247589**	Spearman's rank correlation rho data: Aa211C_CC$Zn and Aa211C_CC$Pb S = 3010790, **p-value < 2.2e-16** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.5403802**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.5789923**	



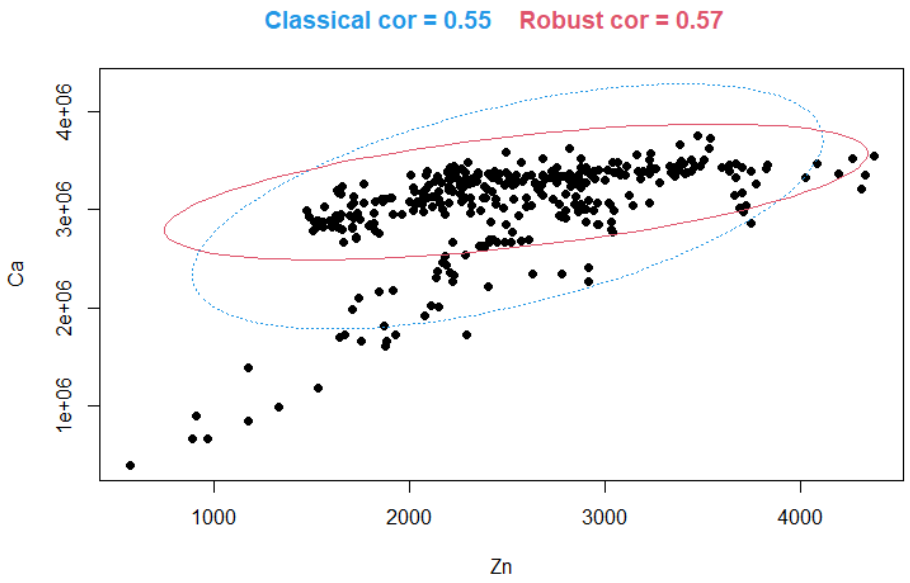
Removing 27 µm of Pb-enriched root surface:

Classical test	Pearson's product-moment correlation data: Aa211C_CC_wRS$Zn and Aa211C_CC_wRS$Pb t = 13.887, df = 325, **p-value < 2.2e-16** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.5373619 0.6740960 sample estimates: **cor** **0.610254**	Spearman's rank correlation rho data: Aa211C_CC_wRS$Zn and Aa211C_CC_wRS$Pb S = 2159708, **p-value < 2.2e-16** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.6293986**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.5752824**	



- **Zn vs Ca**

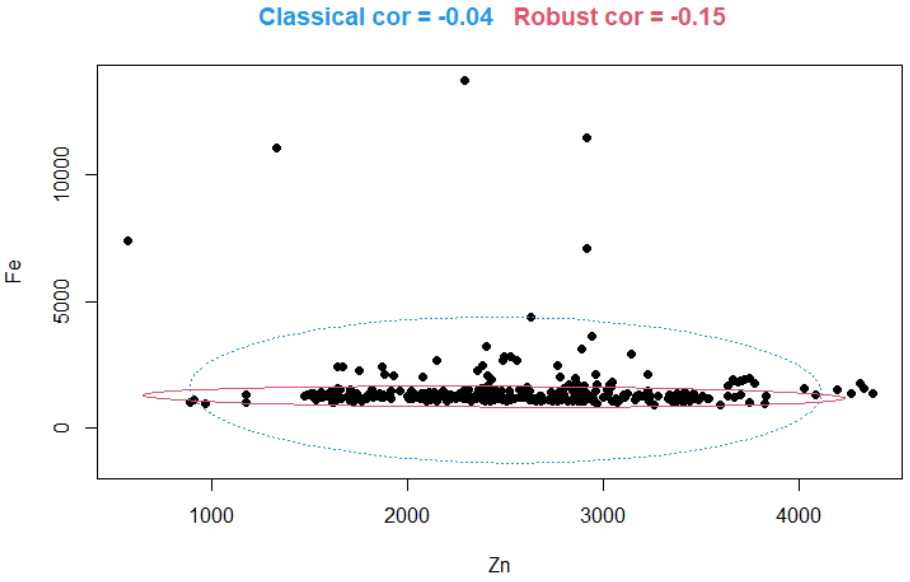
Classical test	Pearson's product-moment correlation data: Aa211C_CC$Zn and Aa211C_CC$Ca t = 12.248, df = 338, **p-value < 2.2e-16** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.4761334 0.6239848 sample estimates: **cor** **0.5544184**	Spearman's rank correlation rho data: Aa211C_CC$Zn and Aa211C_CC$Ca S = 2718964, **p-value < 2.2e-16** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.5849296**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.5666424**	



- **Zn vs Fe**

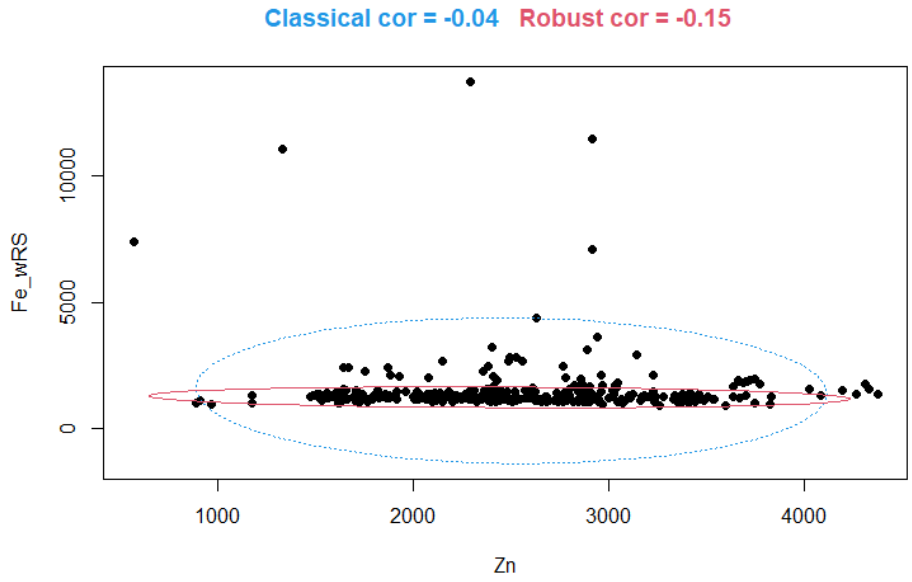
Whole cementum thickness:

Classical test	Pearson's product-moment correlation data: Aa211C_CC$Zn and Aa211C_CC$Fe t = -0.79887, df = 338, **p-value = 0.4249** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.14908558 0.06324246 sample estimates: **cor** **-0.04341176**	Spearman's rank correlation rho data: Aa211C_CC$Zn and Aa211C_CC$Fe S = 6501830, **p-value = 0.8911** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.007446635**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **-0.1496604**	



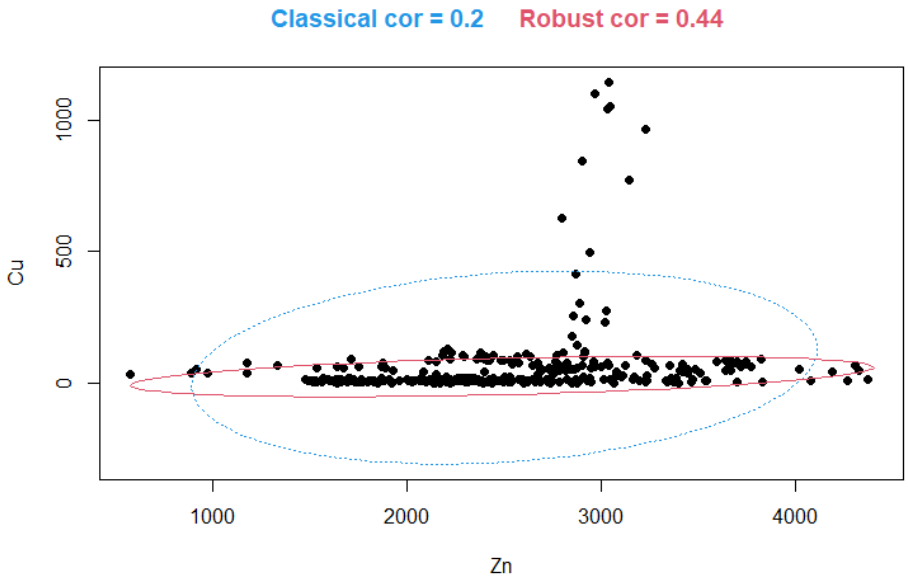
Removing 15 µm of Fe-enriched root surface:

Classical test	Pearson's product-moment correlation data: Aa211C_CC$Zn and Aa211C_CC$Fe t = -0.79887, df = 338, **p-value = 0.4249** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.14908558 0.06324246 sample estimates: **cor** **-0.04341176**	Spearman's rank correlation rho data: Aa211C_CC$Zn and Aa211C_CC$Fe S = 6501830, **p-value = 0.8911** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.007446635**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **-0.1496604**	



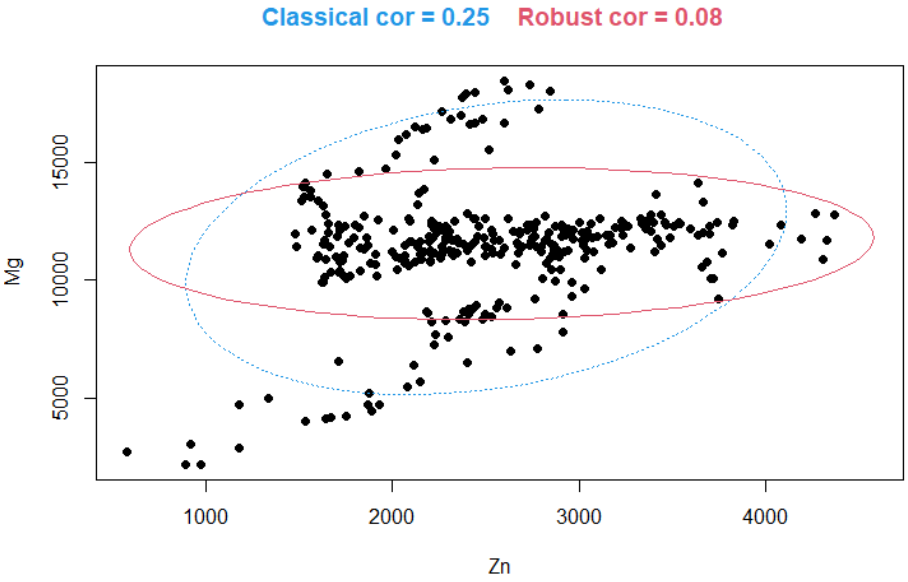
- **Zn vs Cu**

Classical test	Pearson's product-moment correlation data: Aa211C_CC$Zn and Aa211C_CC$Cu t = 3.6814, df = 338, **p-value = 0.0002699** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.09190018 0.29651317 sample estimates: **cor** **0.1963432**	Spearman's rank correlation rho data: Aa211C_CC$Zn and Aa211C_CC$Cu S = 4278960, **p-value = 6.446e-11** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.3467845**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.4401857**	



- **Zn vs Mg**

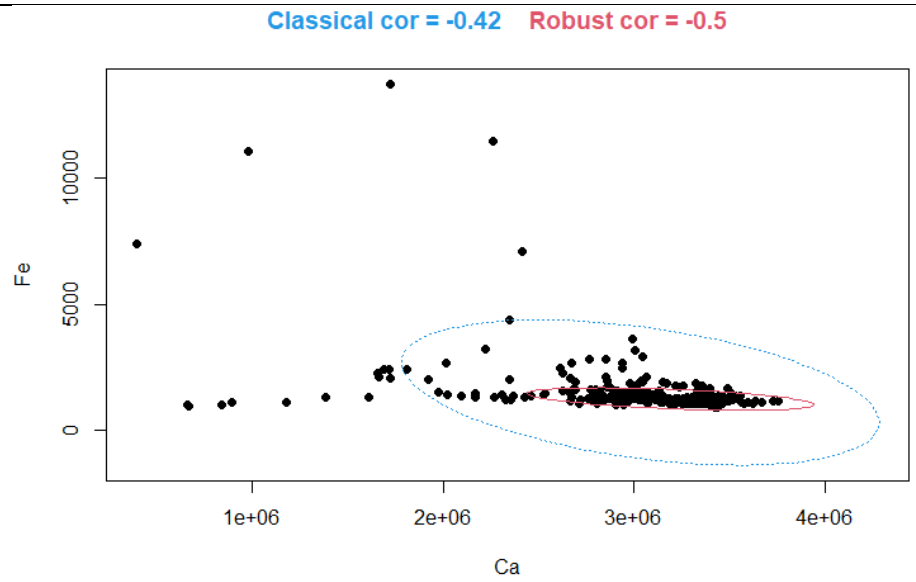
Classical test	Pearson's product-moment correlation data: Aa211C_CC$Zn and Aa211C_CC$Mg t = 4.7487, df = 338, **p-value = 3.03e-06** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.1476523 0.3472134 sample estimates: **cor** **0.250087**	Spearman's rank correlation rho data: Aa211C_CC$Zn and Aa211C_CC$Mg S = 5277330, **p-value = 0.0003195** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.1943758**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.08211205**	



- **Ca vs Fe**

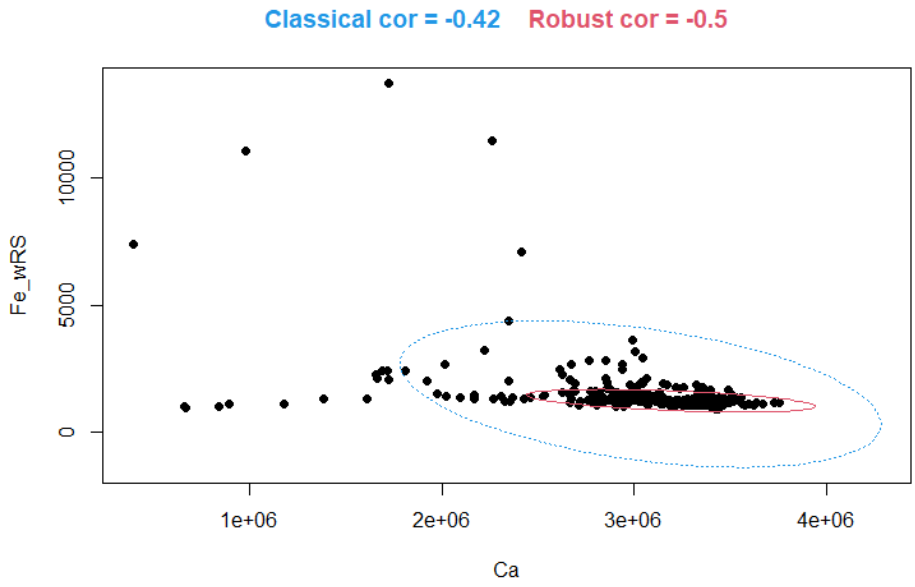
Whole cementum thickness:

Classical test	Pearson's product-moment correlation data: Aa211C_CC$Ca and Aa211C_CC$Fe t = -8.4272, df = 338, **p-value = 1.033e-15** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.5008532 -0.3247181 sample estimates: **cor** **-0.4166888**	Spearman's rank correlation rho data: Aa211C_CC$Ca and Aa211C_CC$Fe S = 9906092, **p-value < 2.2e-16** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **-0.5122396**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **-0.4999543**	



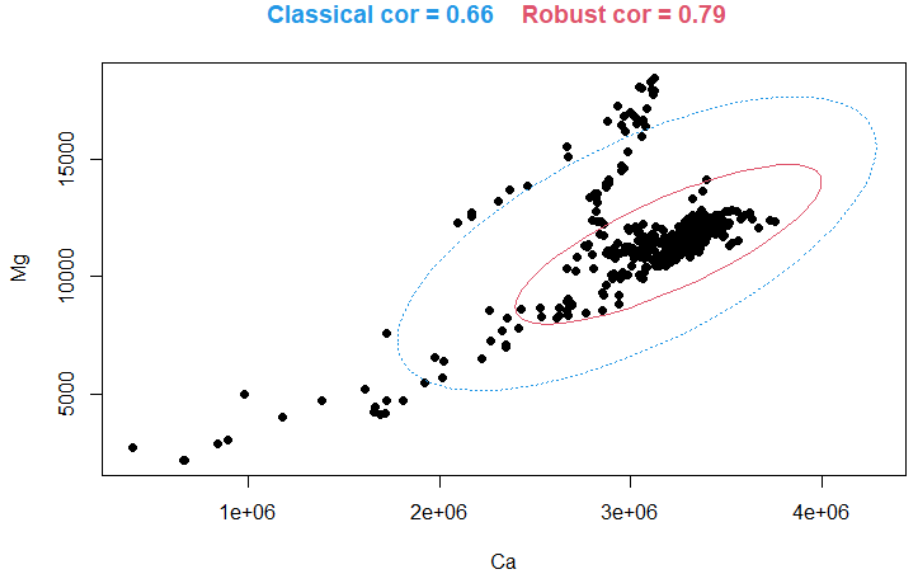
Removing 15 µm of Fe-enriched root surface:

Classical test	Pearson's product-moment correlation data: Aa211C_CC$Ca and Aa211C_CC$Fe t = -8.4272, df = 338, **p-value = 1.033e-15** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.5008532 -0.3247181 sample estimates: **cor** **-0.4166888**	Spearman's rank correlation rho data: Aa211C_CC$Ca and Aa211C_CC$Fe S = 9906092, **p-value < 2.2e-16** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **-0.5122396**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **-0.4999543**	



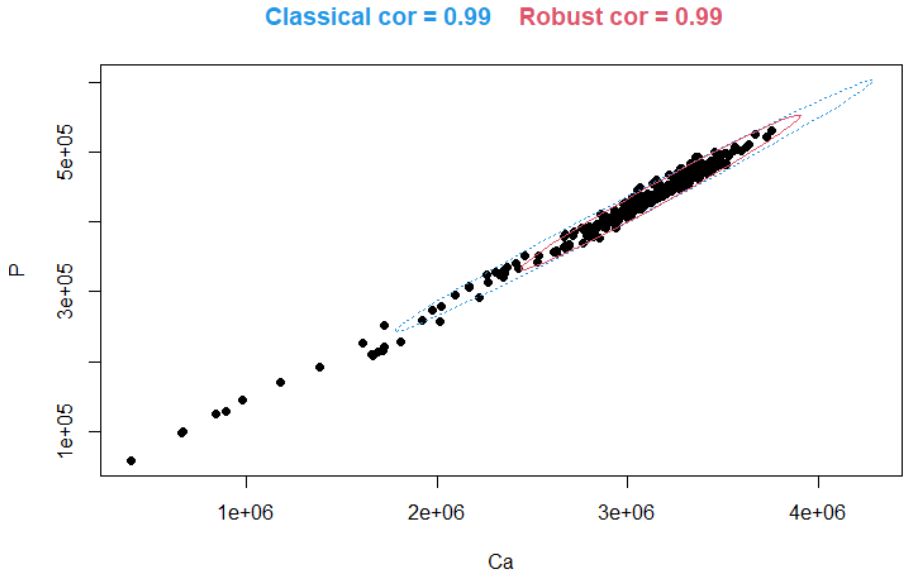
- **Ca vs Mg**

Classical test	Pearson's product-moment correlation data: Aa211C_CC$Ca and Aa211C_CC$Mg t = 16.104, df = 338, **p-value < 2.2e-16** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.5941831 0.7151465 sample estimates: **cor** **0.6589035**	Spearman's rank correlation rho data: Aa211C_CC$Ca and Aa211C_CC$Mg S = 3592892, **p-value < 2.2e-16** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.451518**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.7879131**	



- **Ca vs P**

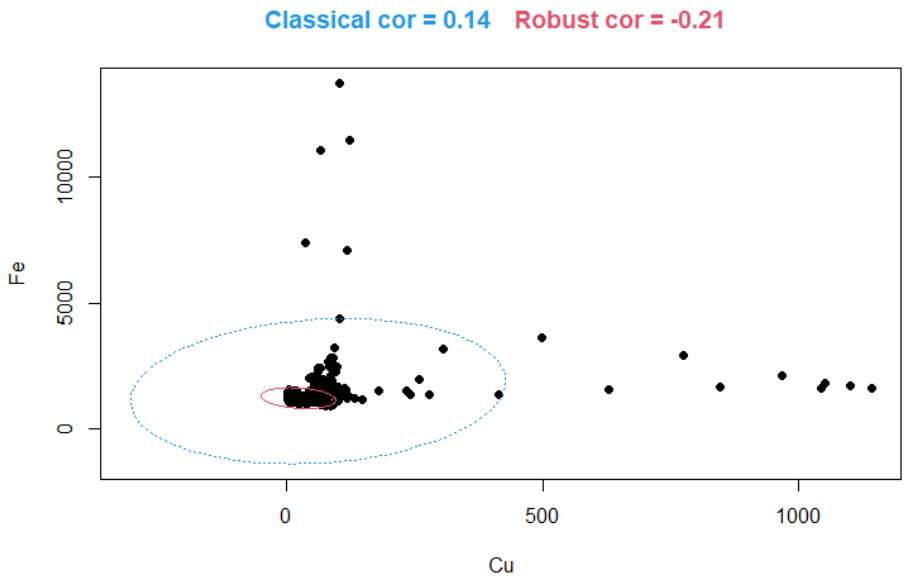
Classical test	Pearson's product-moment correlation data: Aa211C_CC$Ca and Aa211C_CC$P t = 175.03, df = 338, **p-value < 2.2e-16** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.9932310 0.9955785 sample estimates: **cor** **0.9945289**	Spearman's rank correlation rho data: Aa211C_CC$Ca and Aa211C_CC$P S = 112302, **p-value < 2.2e-16** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.9828563**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.9880191**	



- **Cu vs Fe**

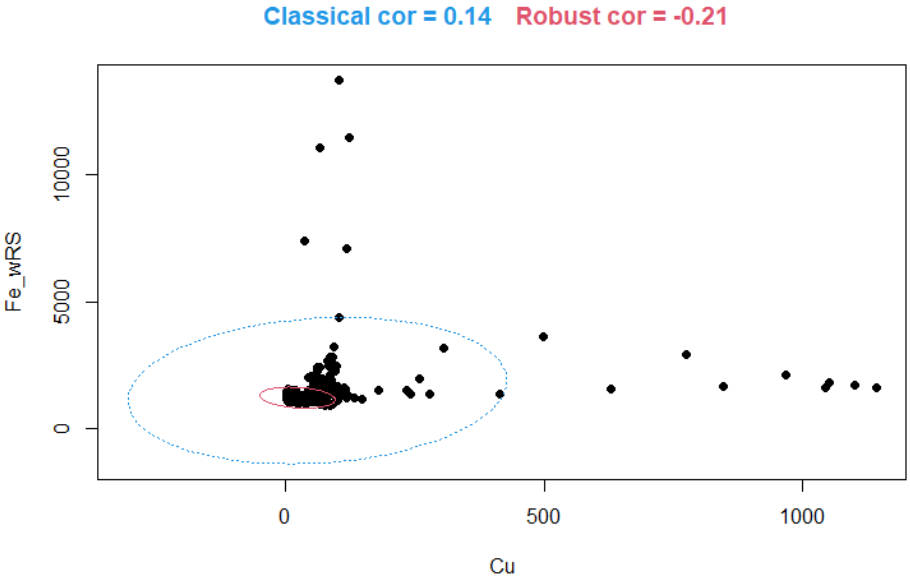
Whole cementum thickness:

Classical test	Pearson's product-moment correlation data: Aa211C_CC$Cu and Aa211C_CC$Fe t = 2.5683, df = 338, **p-value = 0.01065** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.03246759 0.24116538 sample estimates: **cor** **0.138352**	Spearman's rank correlation rho data: Aa211C_CC$Cu and Aa211C_CC$Fe S = 4806092, **p-value = 6.913e-07** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.2663138**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **-0.2079025**	



Removing 15 µm of Fe-enriched root surface:

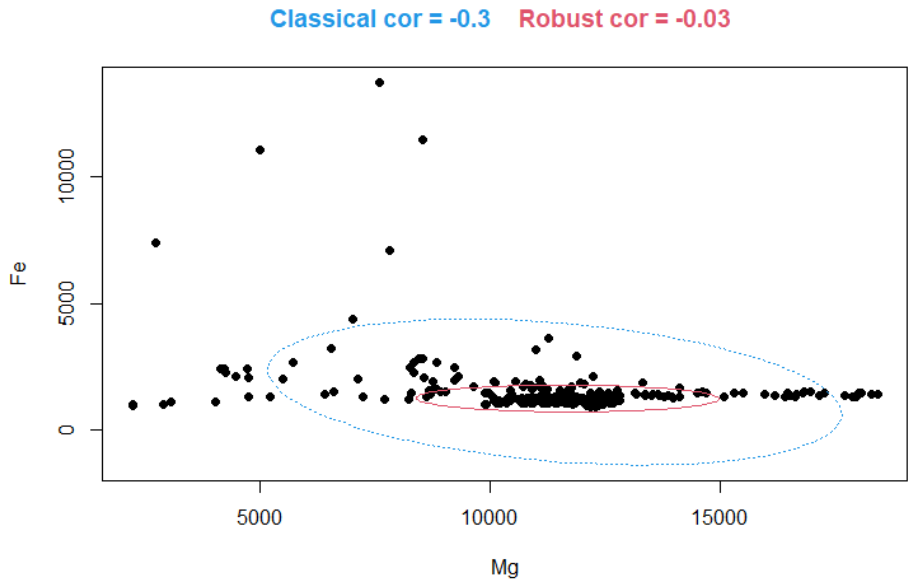
Classical test	Pearson's product-moment correlation data: Aa211C_CC$Cu and Aa211C_CC$Fe t = 2.5683, df = 338, **p-value = 0.01065** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.03246759 0.24116538 sample estimates: **cor** **0.138352**	Spearman's rank correlation rho data: Aa211C_CC$Cu and Aa211C_CC$Fe S = 4806092, **p-value = 6.913e-07** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.2663138**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **-0.2079025**	



- **Mg vs Fe**

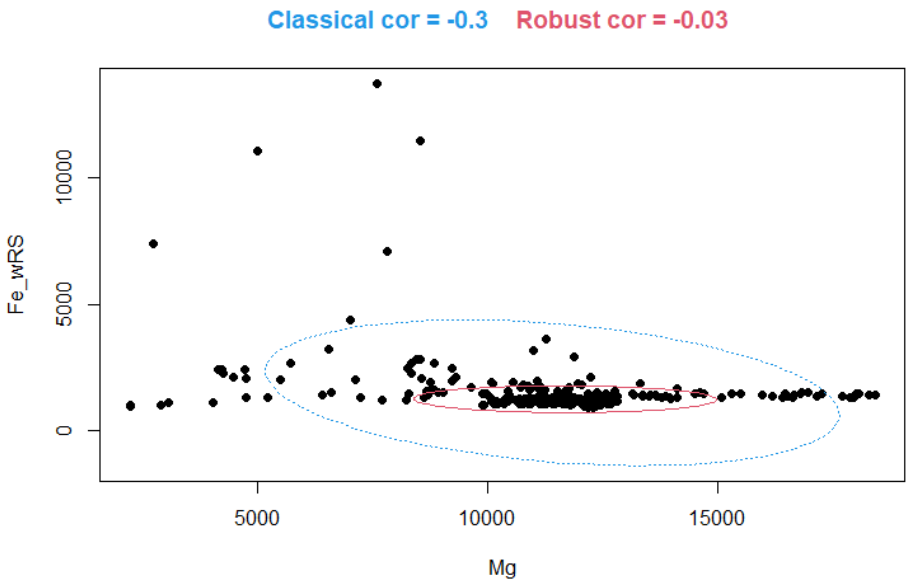
Whole cementum thickness:

Classical test	Pearson's product-moment correlation data: Aa211C_CC$Mg and Aa211C_CC$Fe t = -5.8506, df = 338, **p-value = 1.157e-08** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.3968103 -0.2034466 sample estimates: **cor** **-0.3032469**	Spearman's rank correlation rho data: Aa211C_CC$Mg and Aa211C_CC$Fe S = 7273132, **p-value = 0.04214** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **-0.1102984**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **-0.02840057**	



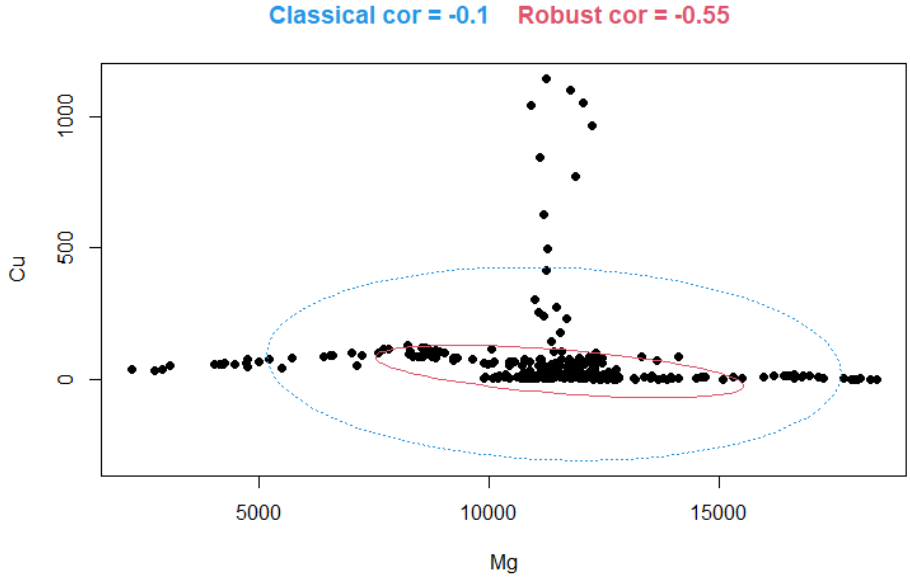
Removing 15 µm of Fe-enriched root surface:

Classical test	Pearson's product-moment correlation data: Aa211C_CC$Mg and Aa211C_CC$Fe t = -5.8506, df = 338, **p-value = 1.157e-08** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.3968103 -0.2034466 sample estimates: **cor** **-0.3032469**	Spearman's rank correlation rho data: Aa211C_CC$Mg and Aa211C_CC$Fe S = 7273132, **p-value = 0.04214** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **-0.1102984**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **-0.02840057**	



- **Cu vs Mg**

Classical test	Pearson's product-moment correlation data: Aa211C_CC$Mg and Aa211C_CC$Cu t = -1.8016, df = 338, **p-value = 0.0725** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.201796969 0.008926746 sample estimates: **cor** **-0.09752806**	Spearman's rank correlation rho data: Aa211C_CC$Mg and Aa211C_CC$Cu S = 9576908, **p-value < 2.2e-16** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **-0.4619872**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **-0.5469069**	

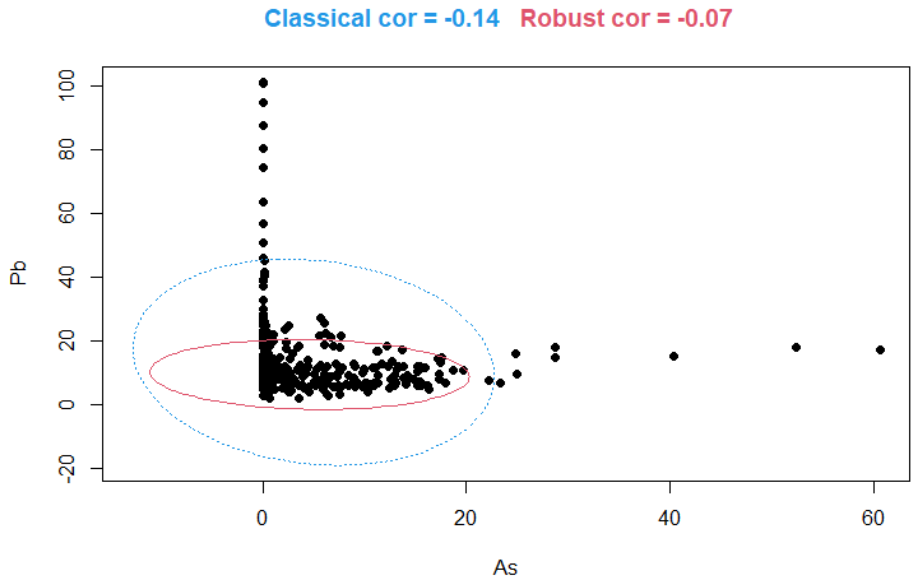


- **As vs Hg, Pb vs Hg (no Hg at all). => Not Applicable.**

- **Pb vs As**

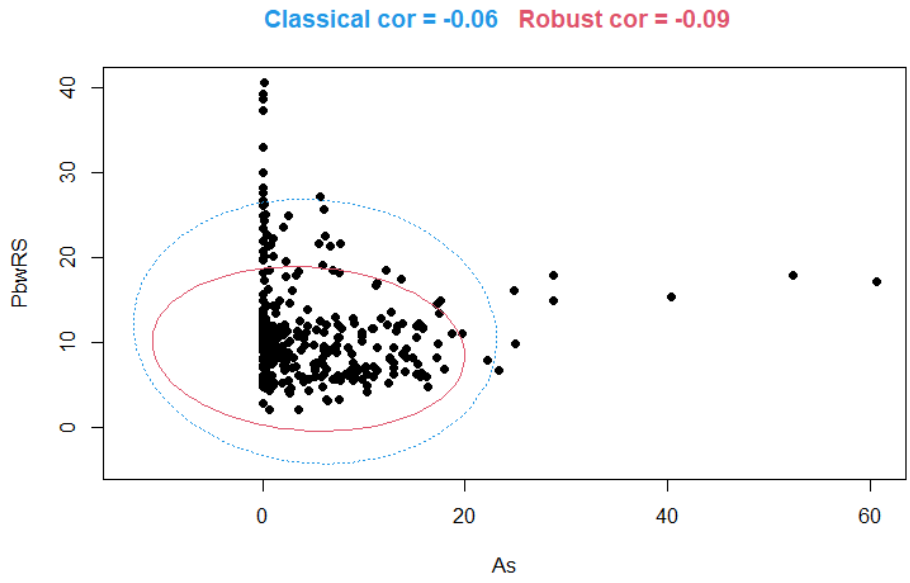
Whole cementum thickness:

Classical test	Pearson's product-moment correlation data: Aa211C_CC$As and Aa211C_CC$Pb t = -2.565, df = 338, **p-value = 0.01075** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.24099712 -0.03228913 sample estimates: **cor** **-0.1381768**	Spearman's rank correlation rho data: Aa211C_CC$As and Aa211C_CC$Pb S = 7893065, **p-value = 0.0001416** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **-0.2049359** *Impossible to calculate the exact p-value with ex-aequos*
MCD (α=0.05; quant=0.8)	$cor.rob [1] **-0.07379289**	



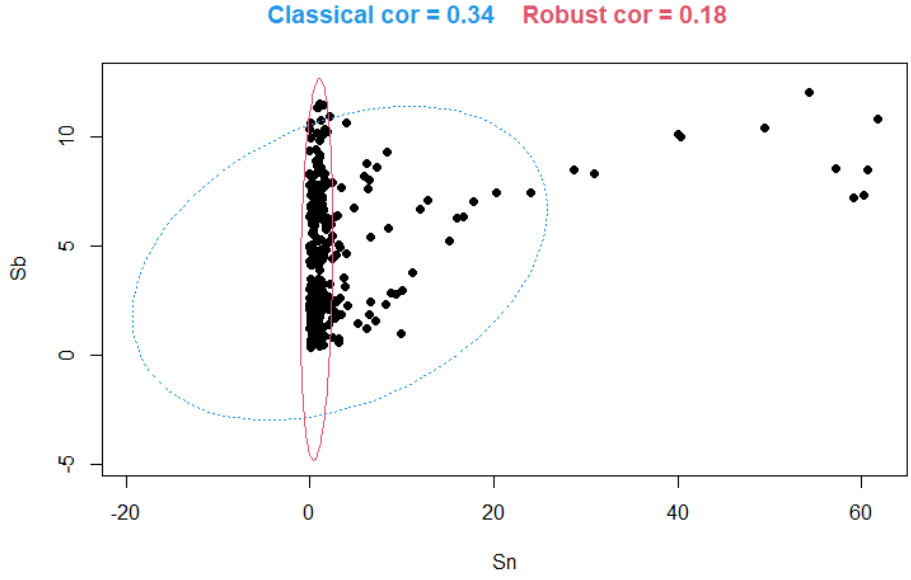
Removing 27 µm of Pb-enriched root surface:

Classical test	Pearson's product-moment correlation data: Aa211C_CC_wRS$As and Aa211C_CC_wRS$Pb t = -1.1211, df = 325, **p-value = 0.2631** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.16938326 0.04670812 sample estimates: **cor** **-0.06206488**	Spearman's rank correlation rho data: Aa211C_CC_wRS$As and Aa211C_CC_wRS$Pb S = 6591902, **p-value = 0.01765** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **-0.1311567** *Impossible to calculate the exact p-value with ex-aequos*
MCD (α=0.05; quant=0.8)	$cor.rob [1] **-0.08793329**	



- **Sb vs Sn**

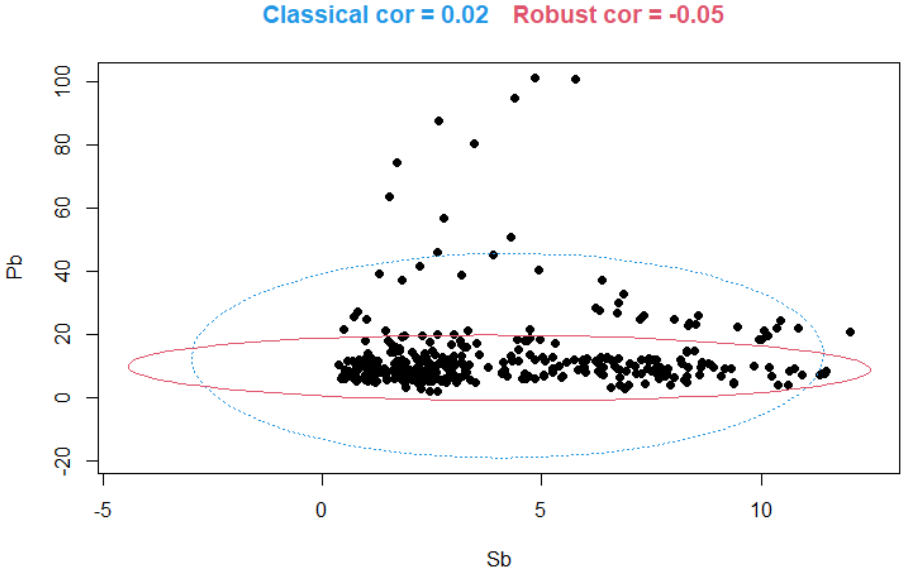
Classical test	Pearson's product-moment correlation data: Aa211C_CC$Sn and Aa211C_CC$Sb t = 6.6484, df = 338, **p-value = 1.191e-10** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.2424784 0.4308482 sample estimates: **cor** **0.34007**	Spearman's rank correlation rho data: Aa211C_CC$Sn and Aa211C_CC$Sb S = 4952632, **p-value = 5.724e-06** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.2439434**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.1804737**	



- **Pb vs Sb**

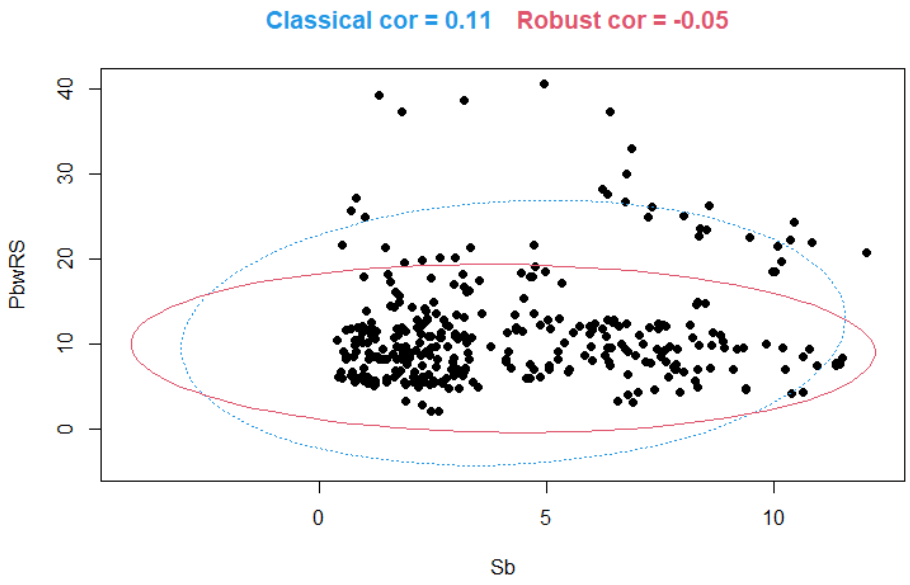
Whole cementum thickness:

Classical test	Pearson's product-moment correlation data: Aa211C_CC$Sb and Aa211C_CC$Pb t = 0.31289, df = 338, **p-value = 0.7546** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.08950772 0.12315580 sample estimates: **cor** **0.01701649**	Spearman's rank correlation rho data: Aa211C_CC$Sb and Aa211C_CC$Pb S = 5975776, **p-value = 0.1062** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.08775274**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **-0.05452402**	



Removing 27 µm of Pb-enriched root surface:

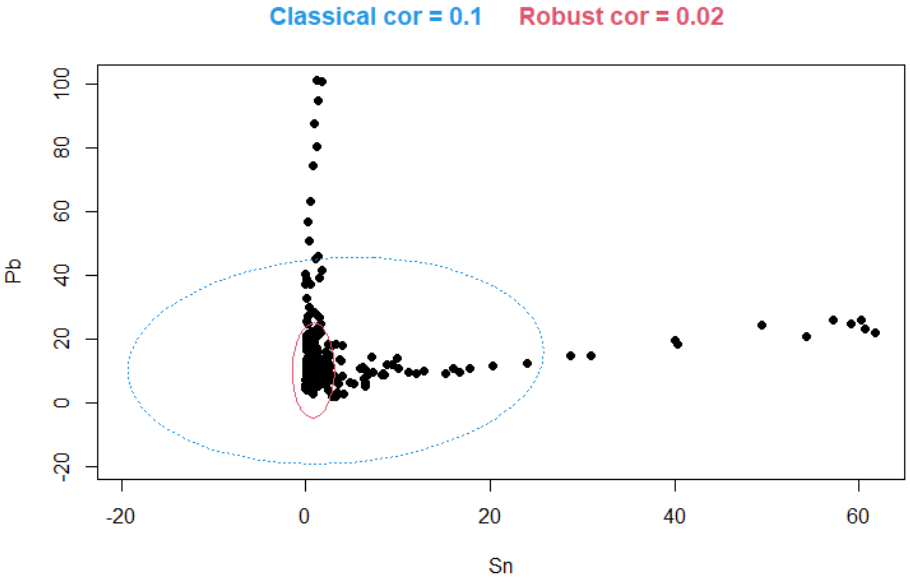
Classical test	Pearson's product-moment correlation data: Aa211C_CC_wRS$Sb and Aa211C_CC_wRS$Pb t = 2.0427, df = 325, **p-value = 0.04189** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.004181806 0.218381198 sample estimates: **cor** **0.1125893**	Spearman's rank correlation rho data: Aa211C_CC_wRS$Sb and Aa211C_CC_wRS$Pb S = 5227674, **p-value = 0.063** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.1029419**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **-0.04749927**	



- **Pb vs Sn**

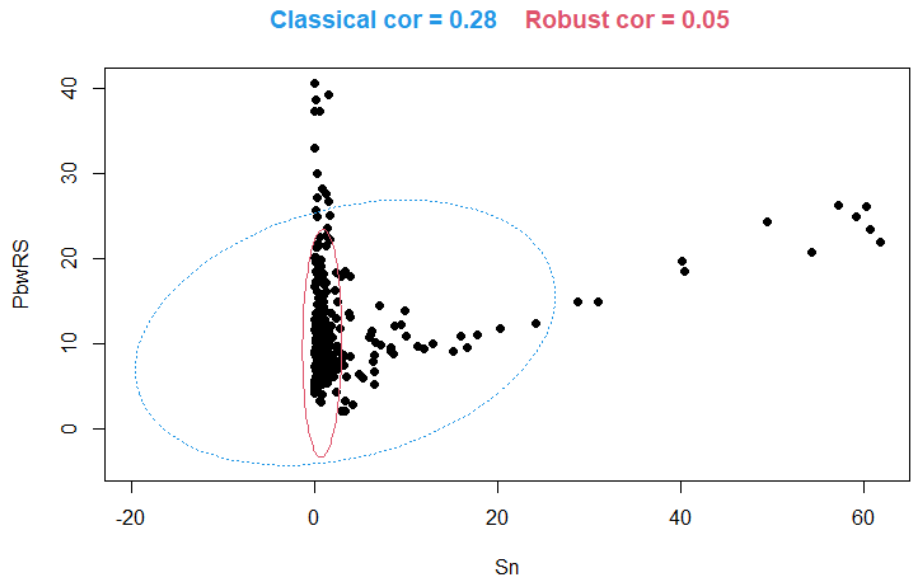
Whole cementum thickness:

Classical test	Pearson's product-moment correlation data: Aa211C_CC$Sn and Aa211C_CC$Pb t = 1.7675, df = 338, **p-value = 0.07805** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.01077634 0.20002186 sample estimates: **cor** **0.09569555**	Spearman's rank correlation rho data: Aa211C_CC$Sn and Aa211C_CC$Pb S = 5741980, **p-value = 0.02287** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.1234435**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.02039293**	



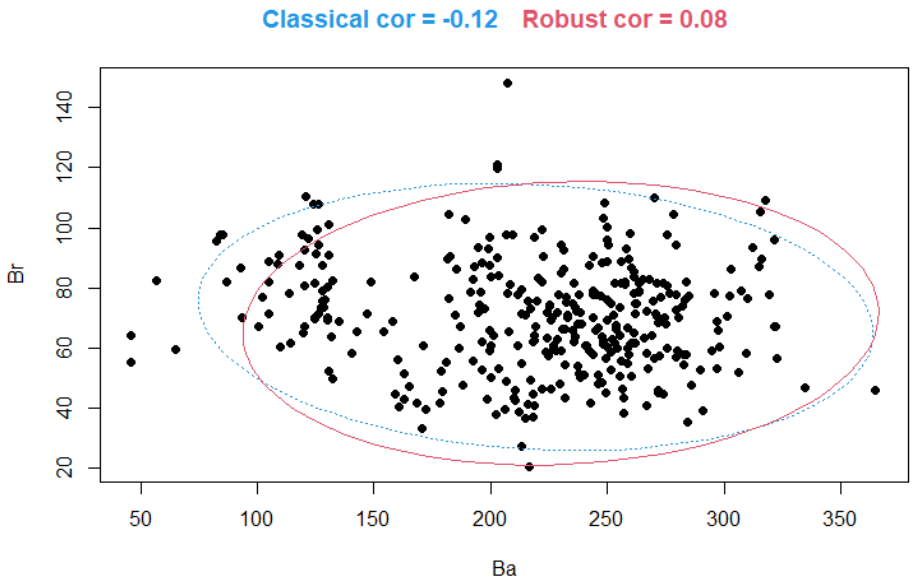
Removing 27 µm of Pb-enriched root surface:

Classical test	Pearson's product-moment correlation data: Aa211C_CC_wRS$Sn and Aa211C_CC_wRS$Pb t = 5.3054, df = 325, **p-value = 2.084e-07** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.1793539 0.3791690 sample estimates: **cor** **0.2823206**	Spearman's rank correlation rho data: Aa211C_CC_wRS$Sn and Aa211C_CC_wRS$Pb S = 5124926, **p-value = 0.02931** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.1205733**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.05272294**	



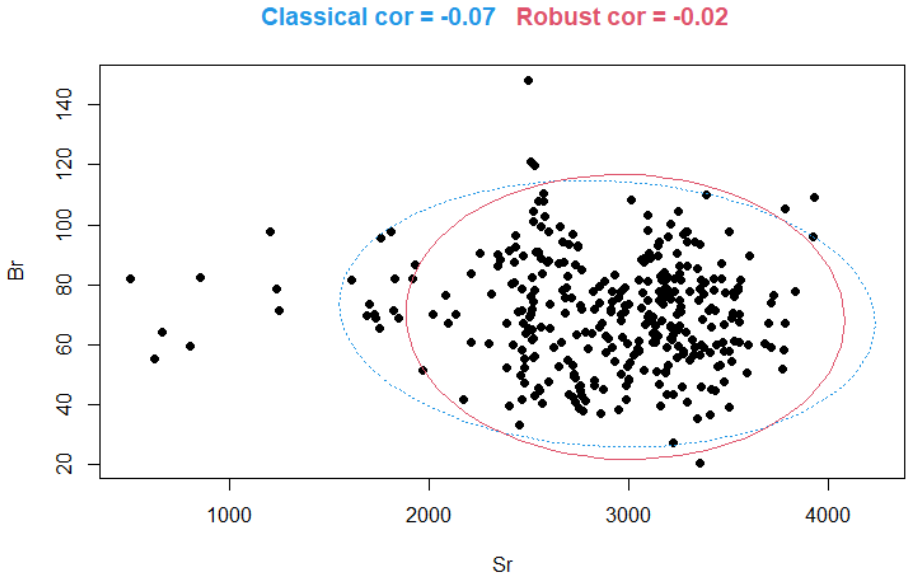
- **Br vs Ba**

Classical test	Pearson's product-moment correlation data: Aa211C_CC$Ba and Aa211C_CC$Br t = -2.2626, df = 338, **p-value = 0.0243** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.22557786 -0.01599186 sample estimates: **cor** **-0.1221463**	Spearman's rank correlation rho data: Aa211C_CC$Ba and Aa211C_CC$Br S = 7161164, **p-value = 0.08615** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **-0.09320567**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.0757424**	



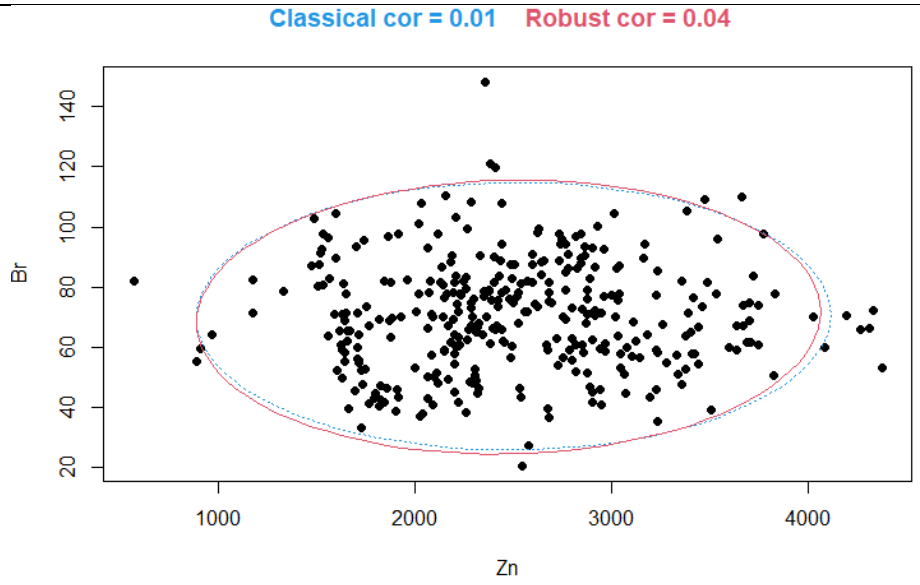
- **Br vs Sr**

Classical test	Pearson's product-moment correlation data: Aa211C_CC$Sr and Aa211C_CC$Br t = -1.3668, df = 338, **p-value = 0.1726** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.17908762 0.03248073 sample estimates: **cor** **-0.0741376**	Spearman's rank correlation rho data: Aa211C_CC$Sr and Aa211C_CC$Br S = 7018806, **p-value = 0.1885** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **-0.07147365**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **-0.02307787**	



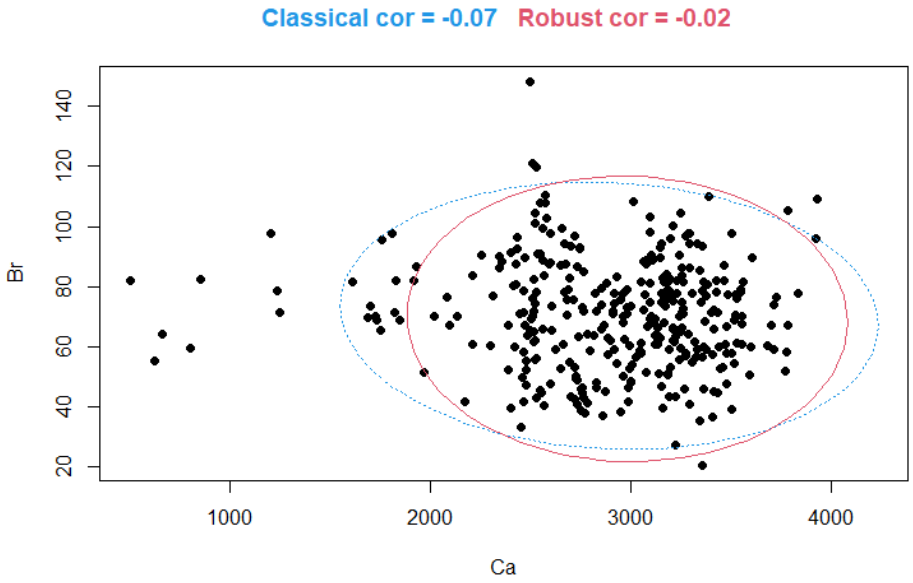
- **Br vs Zn**

Classical test	Pearson's product-moment correlation data: Aa211C_CC$Zn and Aa211C_CC$Br t = 0.19553, df = 338, **p-value = 0.8451** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.09583573 0.11686490 sample estimates: **cor** **0.01063488**	Spearman's rank correlation rho data: Aa211C_CC$Zn and Aa211C_CC$Br S = 6435608, **p-value = 0.7469** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.01755592**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.03940319**	



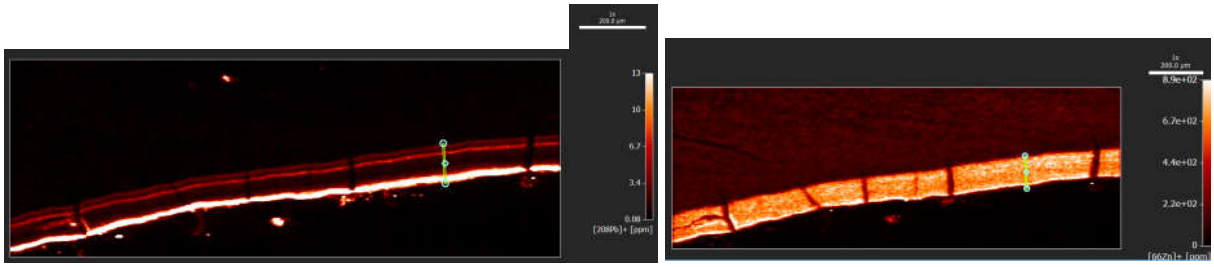
- **Br vs Ca**

Classical test	Pearson's product-moment correlation data: Aa211C_CC$Ca and Aa211C_CC$Br t = -1.3833, df = 338, **p-value = 0.1675** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.17995719 0.03158313 sample estimates: **cor** **-0.07503112**	Spearman's rank correlation rho data: Aa211C_CC$Ca and Aa211C_CC$Br S = 6896554, **p-value = 0.3314** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **-0.05281096**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **-0.02307787**	


Classical cor = -0.07
Robust cor = -0.02
Br
Ca
20
40
60
80
100
120
140
1000
2000
3000
4000

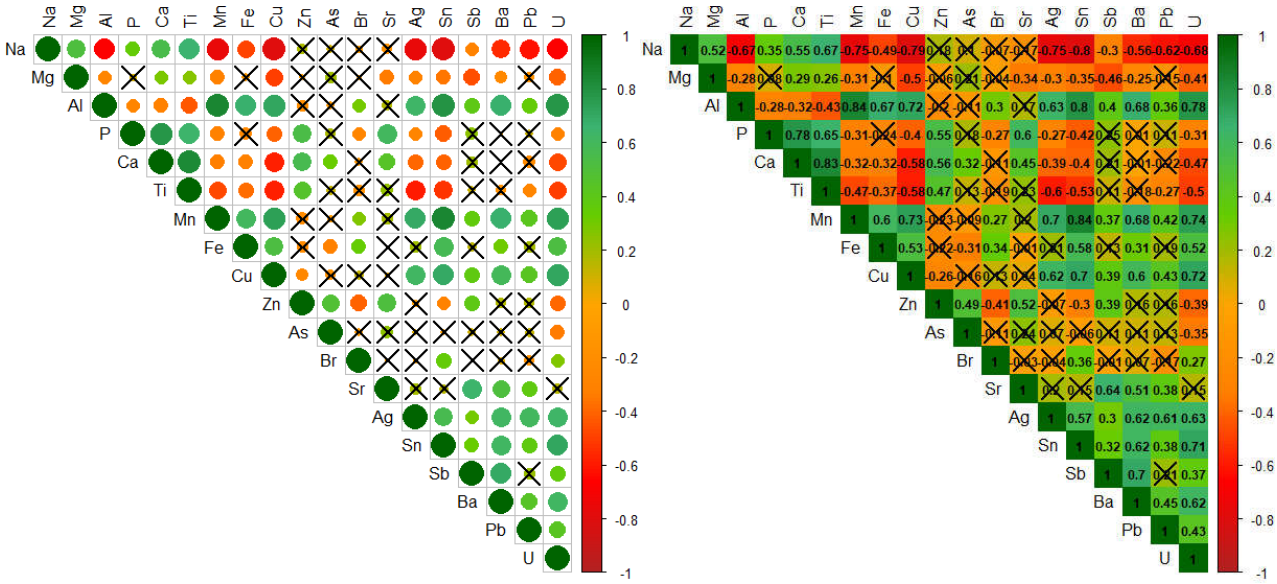
Odense 533M1 – Acellular Cementum (total thickness=122 µm)

Correlations between pairs of elements

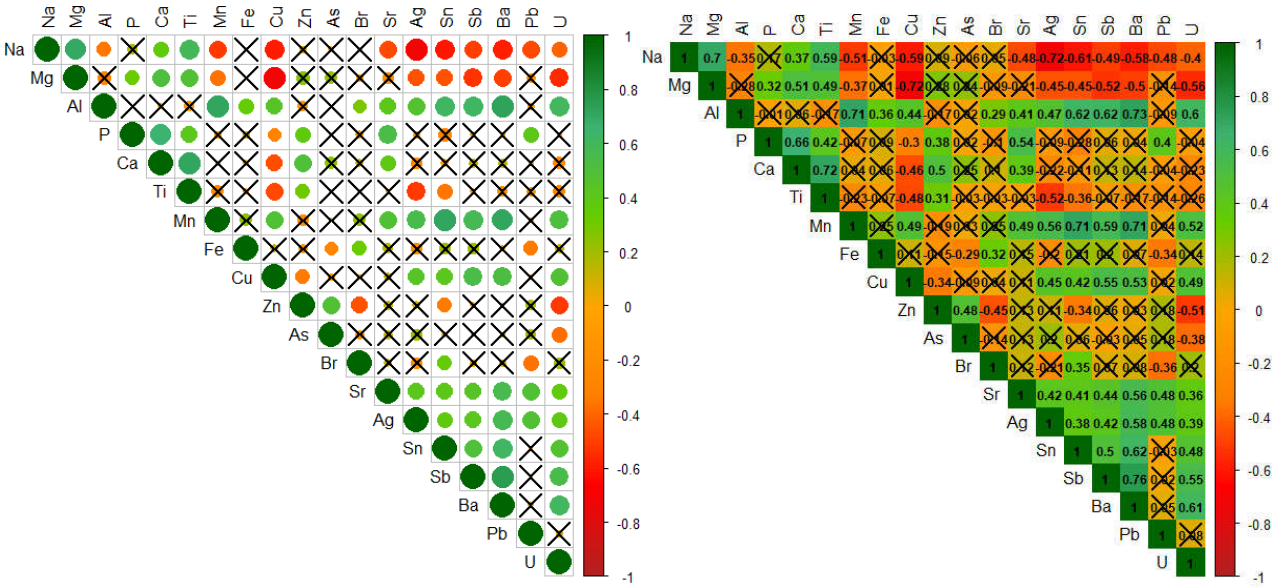


Pb (left) and Zn (right) maps (green path indicates where the measurements are taken)

Summary: whole cementum thickness, Spearman correlations.



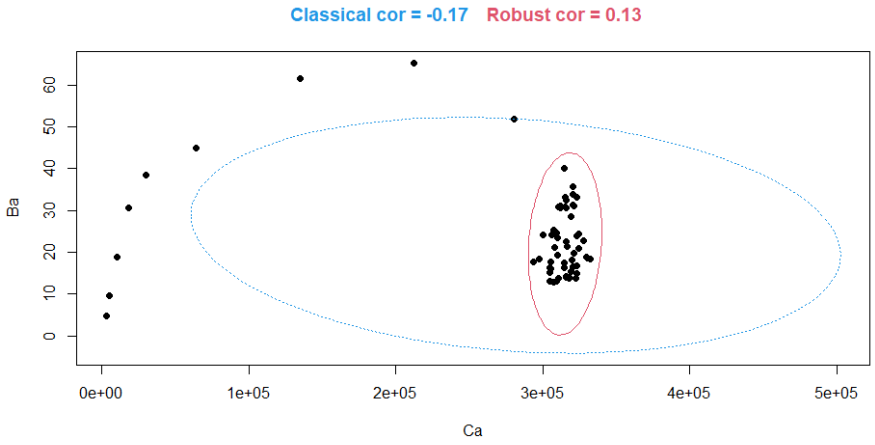
Summary: removing the first 25 µm of root surface, Spearman correlations.



wRS: without Root surface [Pb = ~25 µm; Fe = ~20 µm; Mn = ~25 µm; Al = ~18 µm]

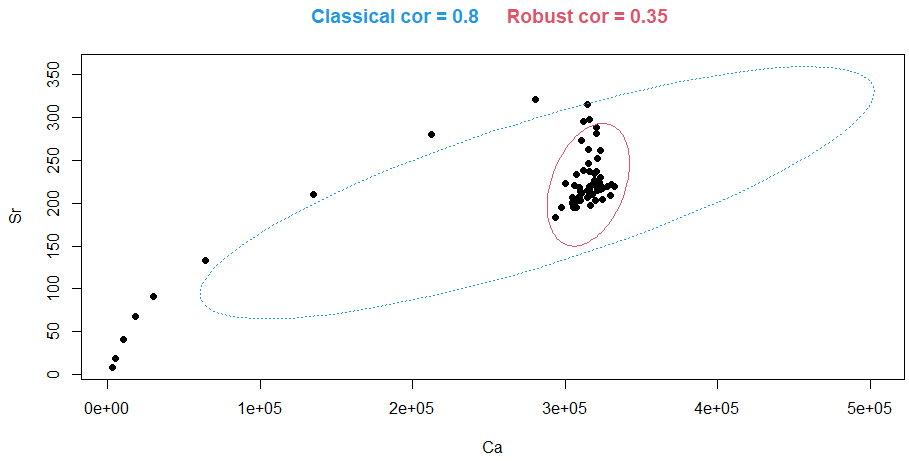
- **Ca vs Ba**

Classical test	Pearson's product-moment correlation data: Od533M_AC$Ca and Od533M_AC$Ba t = -1.3231, df = 60, **p-value = 0.1908** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.40126689 0.08496775 sample estimates: **cor** **-0.1683737**	Spearman's rank correlation rho data: Od533M_AC$Ca and Od533M_AC$Ba S = 40122, **p-value = 0.9363** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **-0.01034978**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.1322351**	



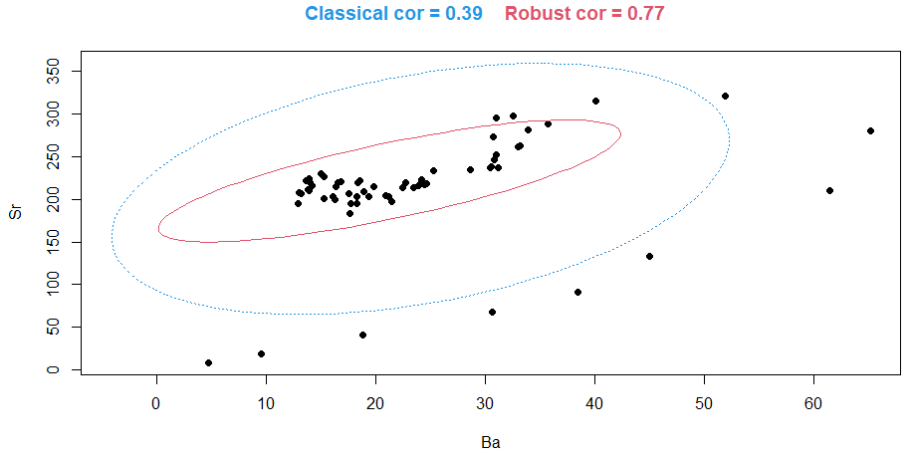
- **Ca vs Sr**

Classical test	Pearson's product-moment correlation data: Od533M_AC$Ca and Od533M_AC$Sr t = 10.43, df = 60, **p-value = 4.231e-15** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.6917803 0.8767852 sample estimates: **cor** **0.8028315**	Spearman's rank correlation rho data: Od533M_AC$Ca and Od533M_AC$Sr S = 21722, **p-value = 0.0002536** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.4529979**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.3525441**	



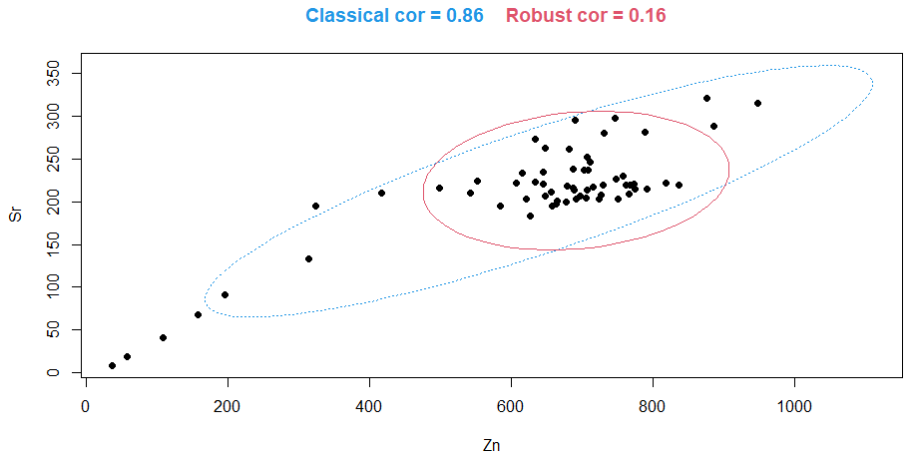
- **Ba vs Sr**

Classical test	Pearson's product-moment correlation data: Od533M_AC$Ba and Od533M_AC$Sr t = 3.2487, df = 60, **p-value = 0.001901** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.1516530 0.5804646 sample estimates: **cor** **0.3867711**	Spearman's rank correlation rho data: Od533M_AC$Ba and Od533M_AC$Sr S = 19484, **p-value = 3.066e-05** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.5093551**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.773796**	



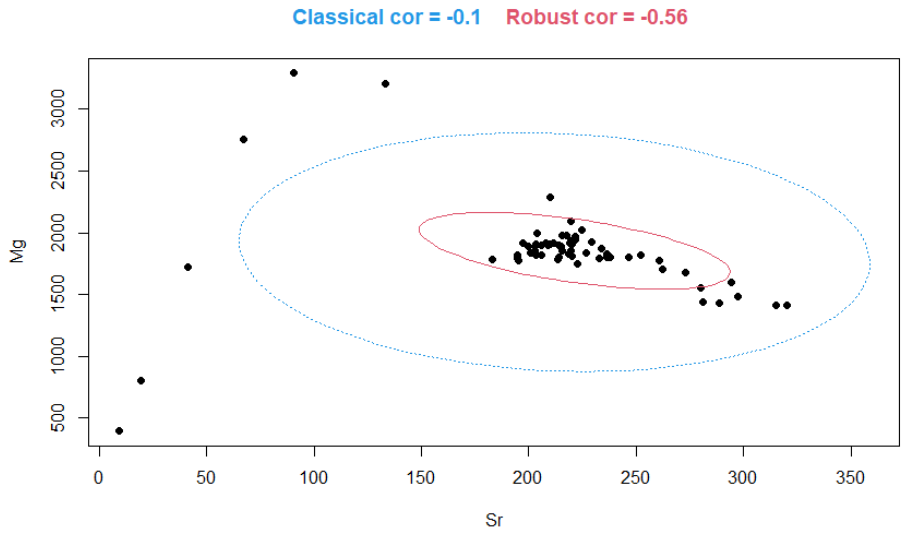
- **Zn vs Sr**

Classical test	Pearson's product-moment correlation data: Od533M_AC$Zn and Od533M_AC$Sr t = 12.962, df = 60, **p-value < 2.2e-16** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.7747542 0.9125301 sample estimates: **cor** **0.858412**	Spearman's rank correlation rho data: Od533M_AC$Zn and Od533M_AC$Sr S = 19190, **p-value = 2.263e-05** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.5167586**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.1622059**	



- **Mg vs Sr**

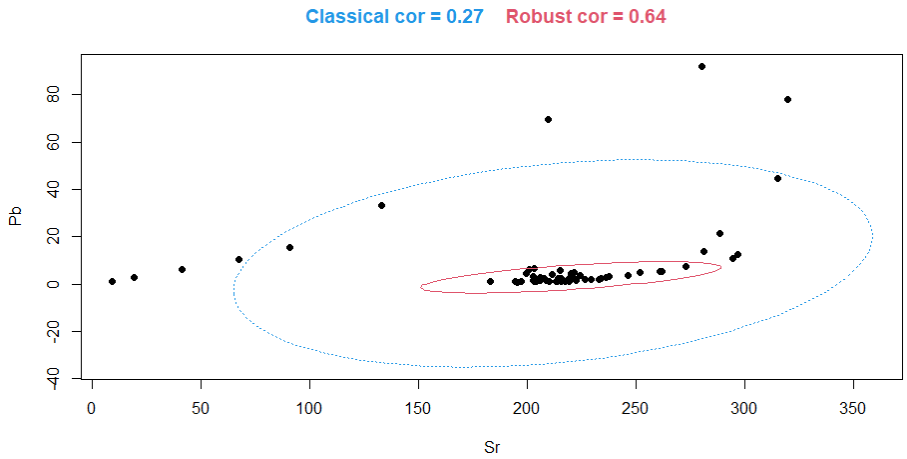
Classical test	Pearson's product-moment correlation data: Od533M_AC$Sr and Od533M_AC$Mg t = -0.74167, df = 60, **p-value = 0.4612** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.3370577 0.1582213 sample estimates: **cor** **-0.09531356**	Spearman's rank correlation rho data: Od533M_AC$Sr and Od533M_AC$Mg S = 53034, **p-value = 0.00795** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **-0.5588916**	



- **Pb vs Sr**

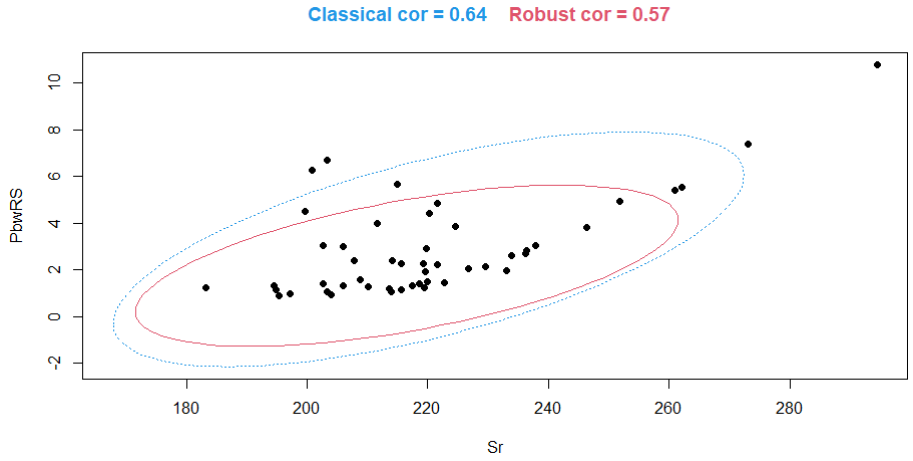
Whole cementum thickness:

Classical test	Pearson's product-moment correlation data: Od533M_AC$Sr and Od533M_AC$Pb t = 2.1467, df = 60, **p-value = 0.03587** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.0185453 0.4845234 sample estimates: **cor** **0.2670764**	Spearman's rank correlation rho data: Od533M_AC$Sr and Od533M_AC$Pb S = 24506, **p-value = 0.002278** alternative hypothesis: true rho is not equal to 0 sample estimates: rho 0.3828914
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.6354589**	



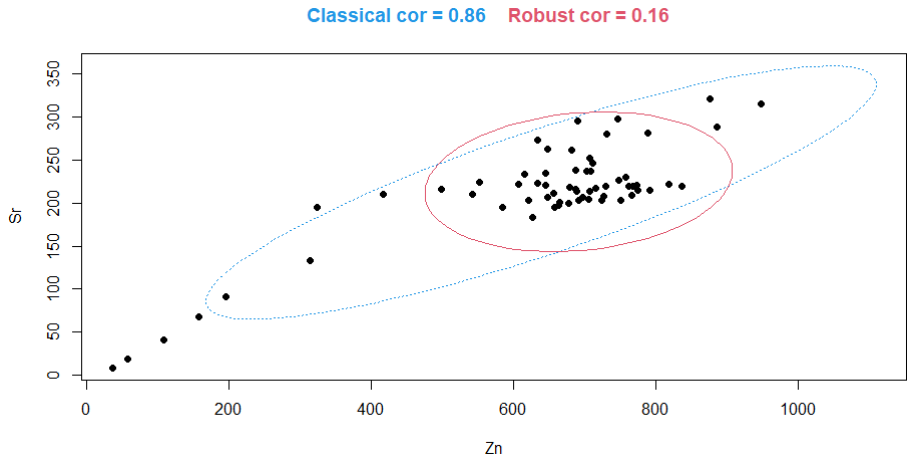
Removing 25 µm of Pb-enriched root surface:

Classical test	Pearson's product-moment correlation data: Od533M_AC_wRS$Sr and Od533M_AC_wRS$Pb t = 5.6421, df = 47, **p-value = 9.329e-07** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.4313376 0.7776908 sample estimates: **cor** **0.6354589**	Spearman's rank correlation rho data: Od533M_AC_wRS$Zn and Od533M_AC_wRS$Pb S = 16154, **p-value = 0.2262** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.1758163**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.5718473**	



- **Sr vs Zn**

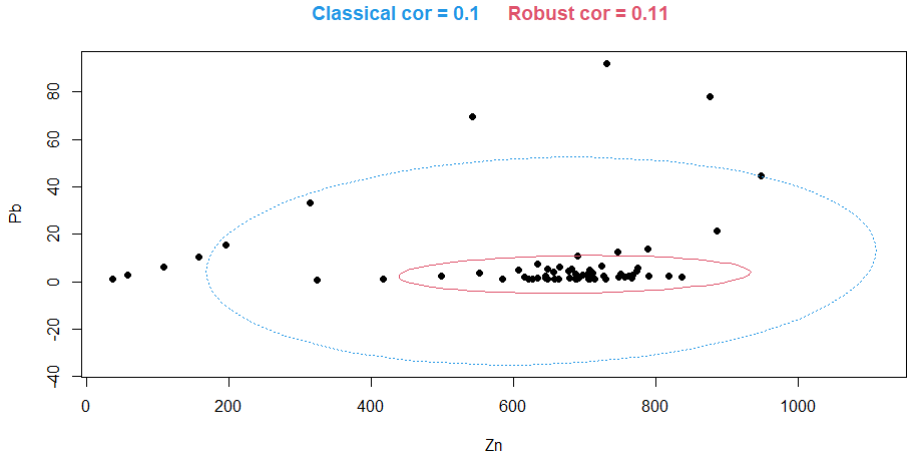
Classical test	Pearson's product-moment correlation data: Od533M_AC$Zn and Od533M_AC$Sr t = 12.962, df = 60, **p-value < 2.2e-16** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.7747542 0.9125301 sample estimates: **cor** **0.858412**	Spearman's rank correlation rho data: Od533M_AC$Zn and Od533M_AC$Sr S = 19190, **p-value = 2.263e-05** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.5167586**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.1622059**	



- **Pb vs Zn**

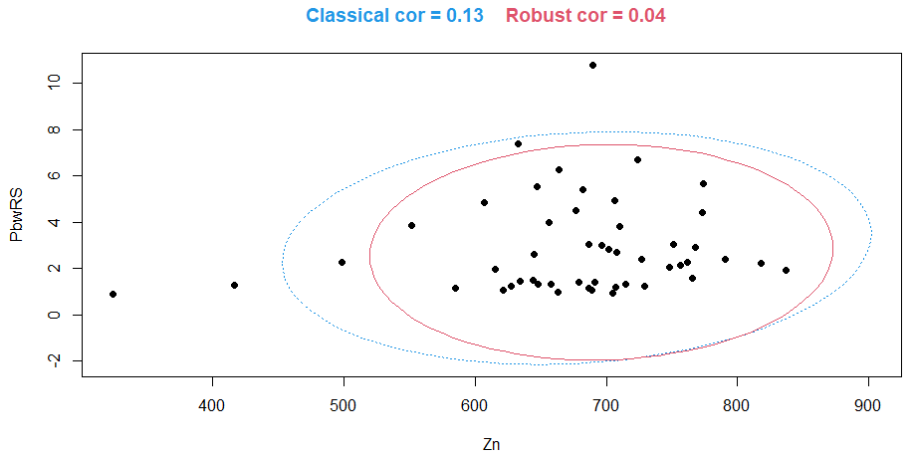
Whole cementum thickness:

	Pearson's product-moment correlation	Spearman's rank correlation rho
Classical test	data: Od533M_AC$Zn and Od533M_AC$Pb t = 0.78748, df = 60, **p-value = 0.4341** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.1524783 0.3422638 sample estimates: **cor** **0.1011418**	data: Od533M_AC$Zn and Od533M_AC$Pb S = 33264, **p-value = 0.2069** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.162348**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.1101698**	



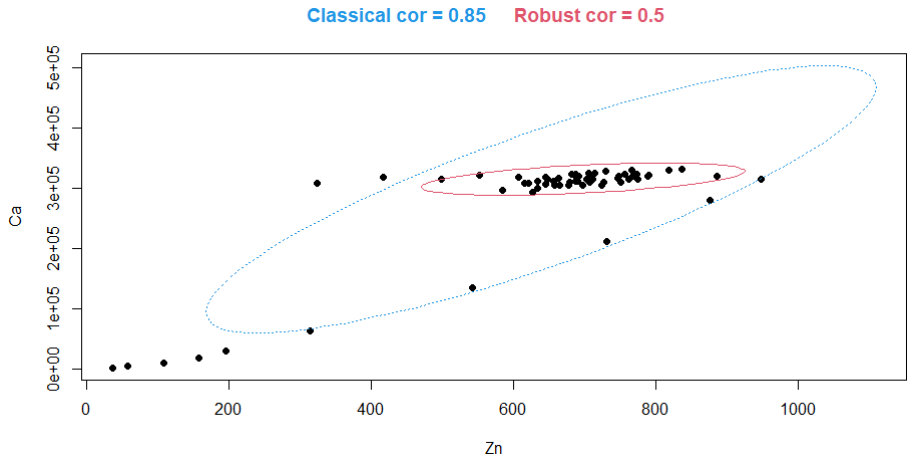
Removing 25 µm of Pb-enriched root surface:

	Pearson's product-moment correlation	Spearman's rank correlation rho
Classical test	data: Od533M_AC_wRS$Zn and Od533M_AC_wRS$Pb t = 0.8646, df = 47, **p-value = 0.3916** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.1617640 0.3925105 sample estimates: **cor** **0.1251242**	data: Od533M_AC_wRS$Zn and Od533M_AC_wRS$Pb S = 16154, **p-value = 0.2262** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.1758163**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.03672209**	



- **Zn vs Ca**

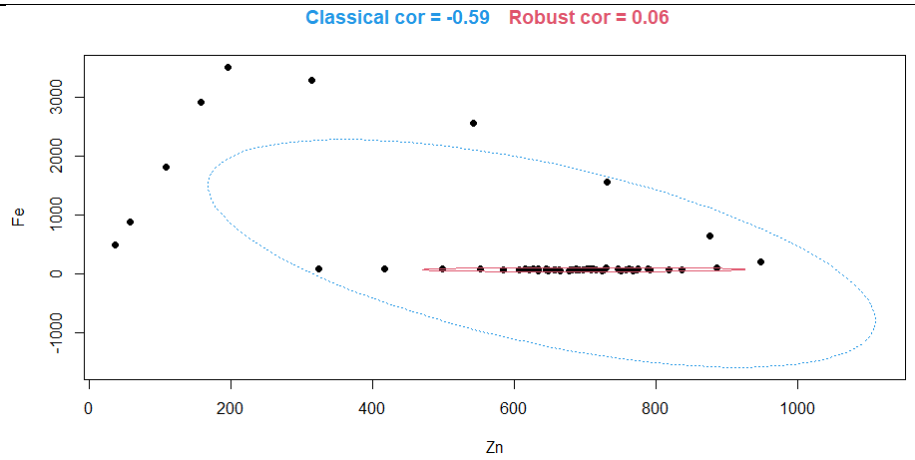
	Pearson's product-moment correlation	Spearman's rank correlation rho
Classical test	data: Od533M_AC$Zn and Od533M_AC$Ca t = 12.292, df = 60, **p-value < 2.2e-16** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.7560046 0.9046328 sample estimates: **cor** **0.846022**	data: Od533M_AC$Zn and Od533M_AC$Ca S = 17394, **p-value = 3.074e-06** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.5619853**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.495149**	



- **Zn vs Fe**

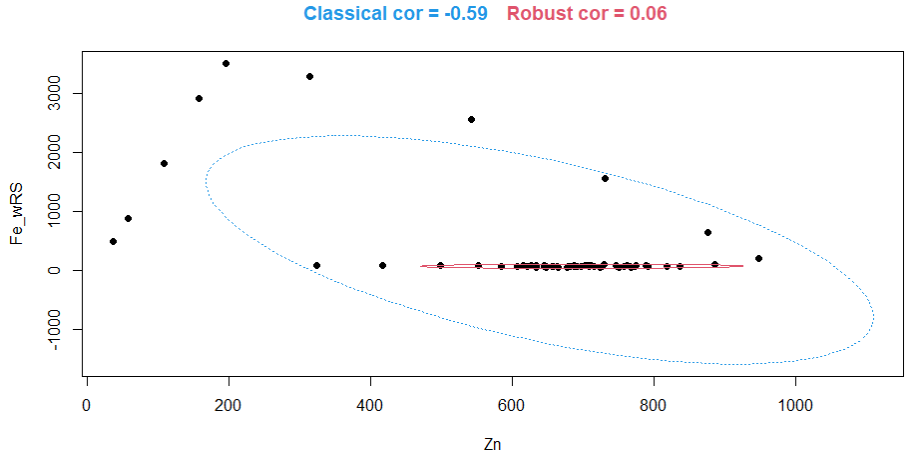
Whole cementum thickness:

Classical test	Pearson's product-moment correlation data: Od533M_AC$Zn and Od533M_AC$Fe t = -5.7009, df = 60, **p-value = 3.858e-07** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.7338670 -0.4025811 sample estimates: **cor** **-0.5927474**	Spearman's rank correlation rho data: Od533M_AC$Zn and Od533M_AC$Fe S = 48500, **p-value = 0.08392** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **-0.2213241**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.05539145**	



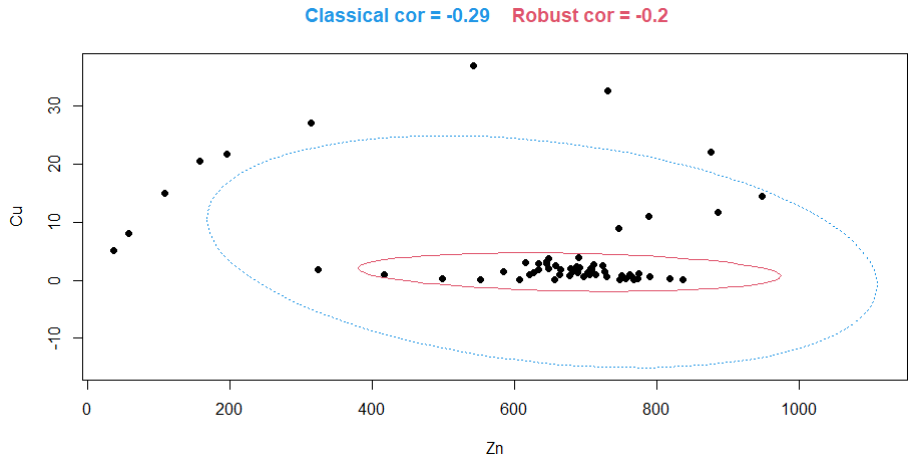
Removing 20 µm of Fe-enriched root surface:

Classical test	Pearson's product-moment correlation data: Od533M_AC$Zn and Od533M_AC$Fe t = -5.7009, df = 60, **p-value = 3.858e-07** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.7338670 -0.4025811 sample estimates: **cor** **-0.5927474**	Spearman's rank correlation rho data: Od533M_AC$Zn and Od533M_AC$Fe S = 48500, **p-value = 0.08392** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **-0.2213241**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.05539145**	



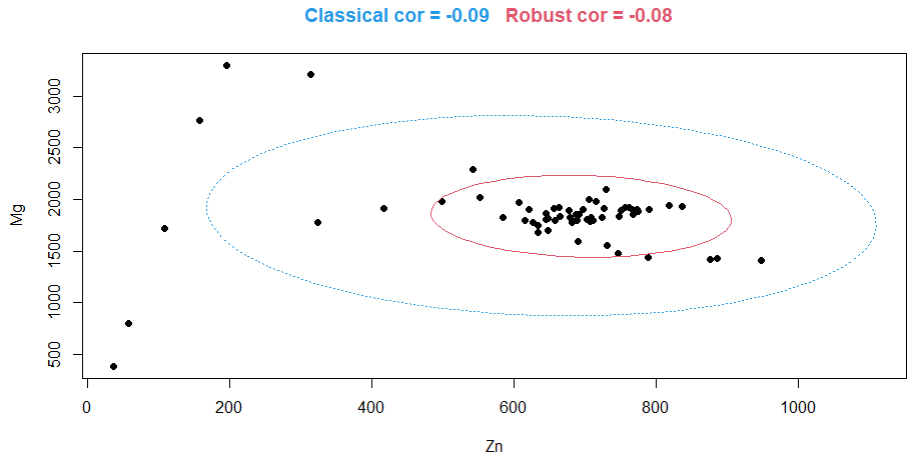
- **Zn vs Cu**

Classical test	Pearson's product-moment correlation data: Od533M_AC$Zn and Od533M_AC$Cu t = -2.3242, df = 60, **p-value = 0.02352** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.5011898 -0.0405404 sample estimates: **cor** **-0.2873985**	Spearman's rank correlation rho data: Od533M_AC$Zn and Od533M_AC$Cu S = 50118, **p-value = 0.03992** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **-0.2620684**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **-0.199509**	



- **Zn vs Mg**

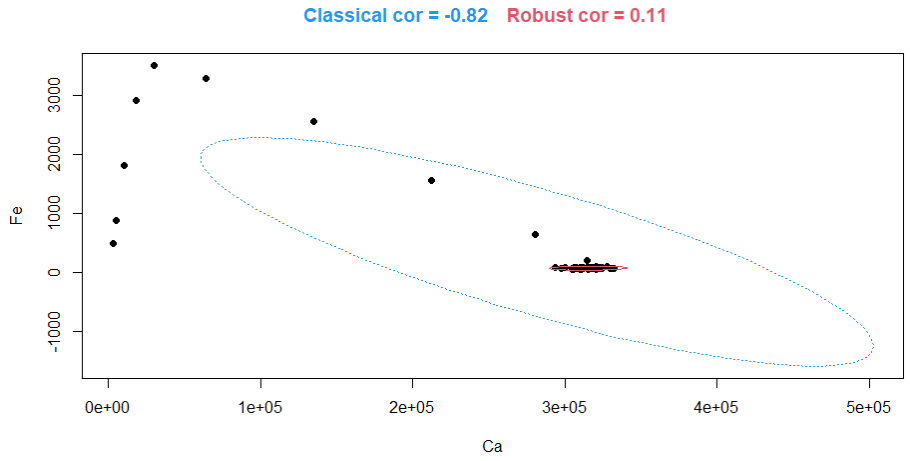
Classical test	Pearson's product-moment correlation data: Od533M_AC$Zn and Od533M_AC$Mg t = -0.67332, df = 60, **p-value = 0.5033** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.3292453 0.1667769 sample estimates: **cor** **-0.08659857**	Spearman's rank correlation rho data: Od533M_AC$Zn and Od533M_AC$Mg S = 42232, **p-value = 0.6232** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **-0.06348367**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **-0.08098037**	



- **Ca vs Fe**

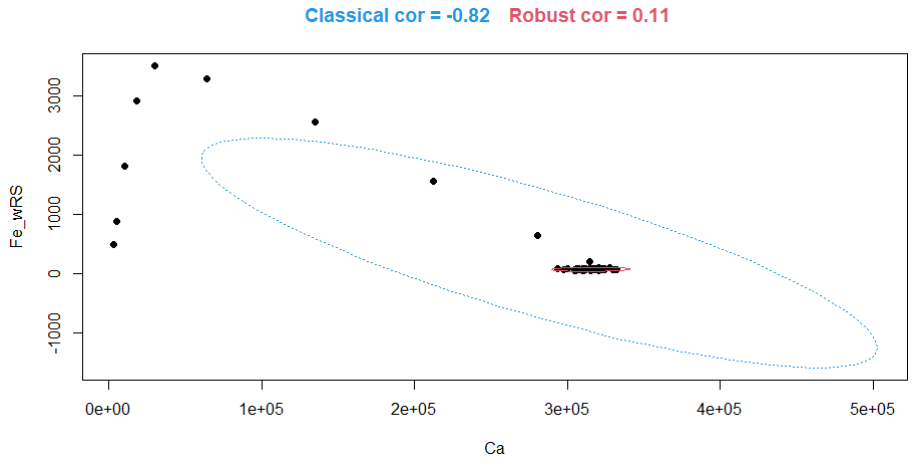
Whole cementum thickness:

Classical test	Pearson's product-moment correlation data: Od533M_AC$Ca and Od533M_AC$Fe t = -11.254, df = 60, **p-value < 2.2e-16** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.8903300 -0.7226572 sample estimates: **cor** **-0.8237425**	Spearman's rank correlation rho data: Od533M_AC$Ca and Od533M_AC$Fe S = 52262, **p-value = 0.01264** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **-0.3160585**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.1122484**	



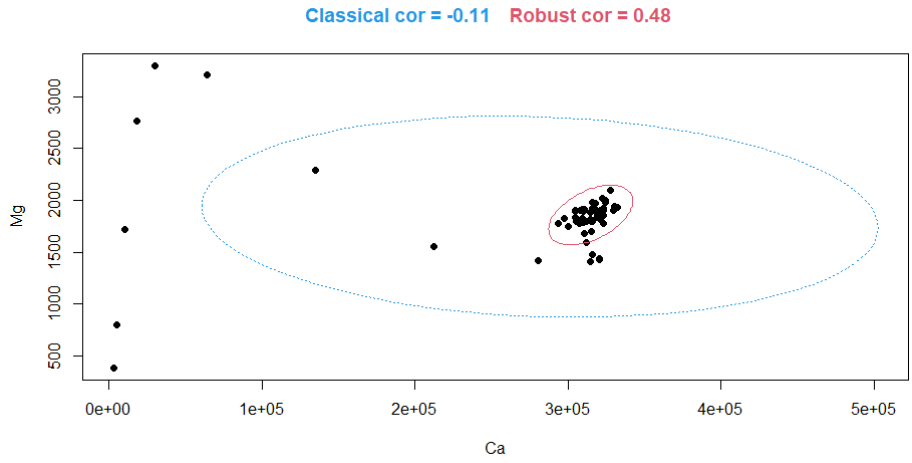
Removing 20 µm of Fe-enriched root surface:

Classical test	Pearson's product-moment correlation data: Od533M_AC$Ca and Od533M_AC$Fe t = -11.254, df = 60, **p-value < 2.2e-16** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.8903300 -0.7226572 sample estimates: **cor** **-0.8237425**	Spearman's rank correlation rho data: Od533M_AC$Ca and Od533M_AC$Fe S = 52262**, p-value = 0.01264** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **-0.3160585**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.1122484**	



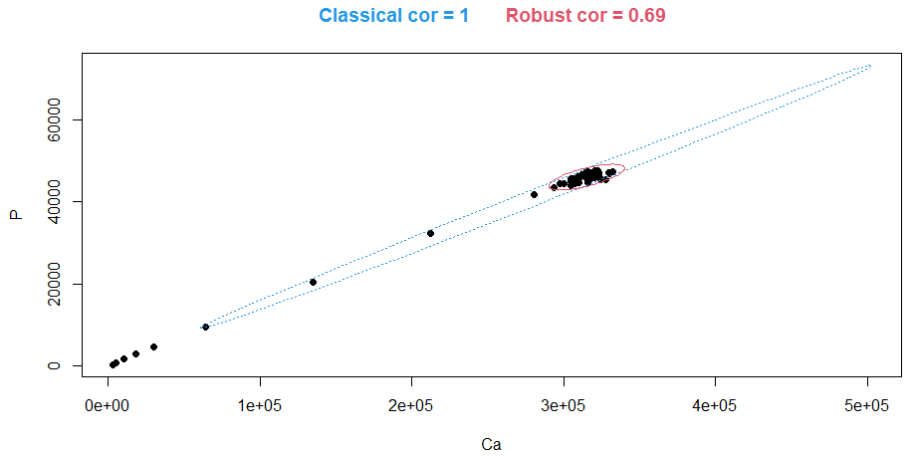
- **Ca vs Mg**

Classical test	Pearson's product-moment correlation data: Od533M_AC$Ca and Od533M_AC$Mg t = -0.84899, df = 60, **p-value = 0.3993** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.3492168 0.1447556 sample estimates: **cor** **-0.1089518**	Spearman's rank correlation rho data: Od533M_AC$Ca and Od533M_AC$Mg S = 28360**, p-value = 0.02465** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.2858402**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.4769753**	



- **Ca vs P**

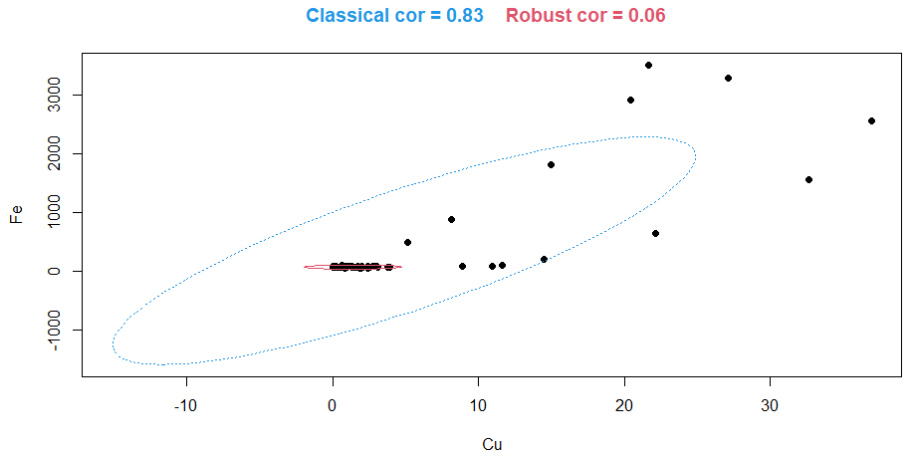
Classical test	Pearson's product-moment correlation data: Od533M_AC$Ca and Od533M_AC$P t = 119.66, df = 60, **p-value < 2.2e-16** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.9965231 0.9987457 sample estimates: **cor** **0.9979114**	Spearman's rank correlation rho data: Od533M_AC$Ca and Od533M_AC$P S = 8874, **p-value < 2.2e-16** alternative hypothesis: true rho is not equal to 0 sample estimates: rho **0.7765355**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.6936723**	



- **Cu vs Fe**

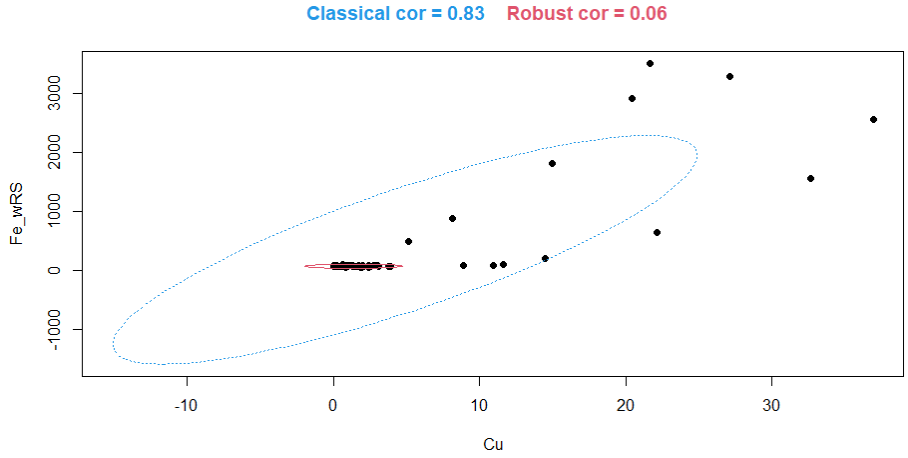
Whole cementum thickness:

Classical test	Pearson's product-moment correlation data: Od533M_AC$Cu and Od533M_AC$Fe t = 11.496, df = 60, **p-value < 2.2e-16** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.7309596 0.8939221 sample estimates: **cor** **0.8293187**	Spearman's rank correlation rho data: Od533M_AC$Cu and Od533M_AC$Fe S = 18542, **p-value = 1.133e-05** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.5330765**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.05517098**	



Removing 15 µm of Fe-enriched root surface:

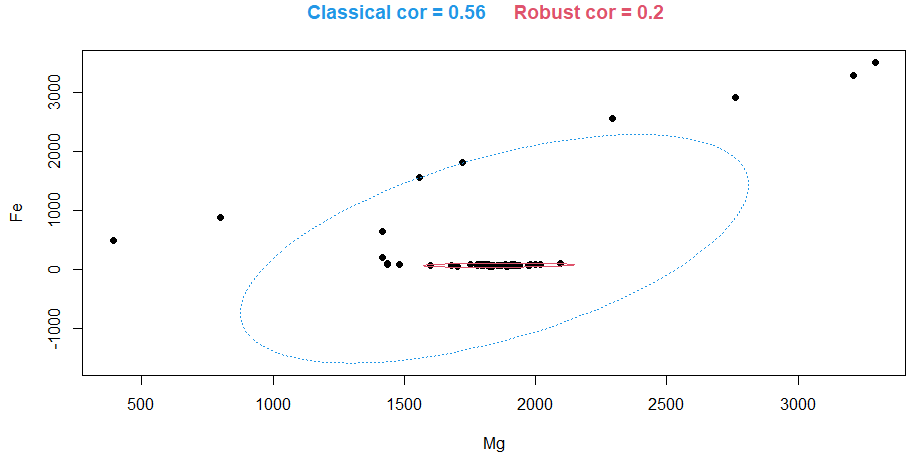
Classical test	Pearson's product-moment correlation data: Od533M_AC$Cu and Od533M_AC$Fe t = 11.496, df = 60, **p-value < 2.2e-16** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.7309596 0.8939221 sample estimates: **cor** **0.8293187**	Spearman's rank correlation rho data: Od533M_AC$Cu and Od533M_AC$Fe S = 18542, **p-value = 1.133e-05** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.5330765**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.05517098**	



- **Mg vs Fe**

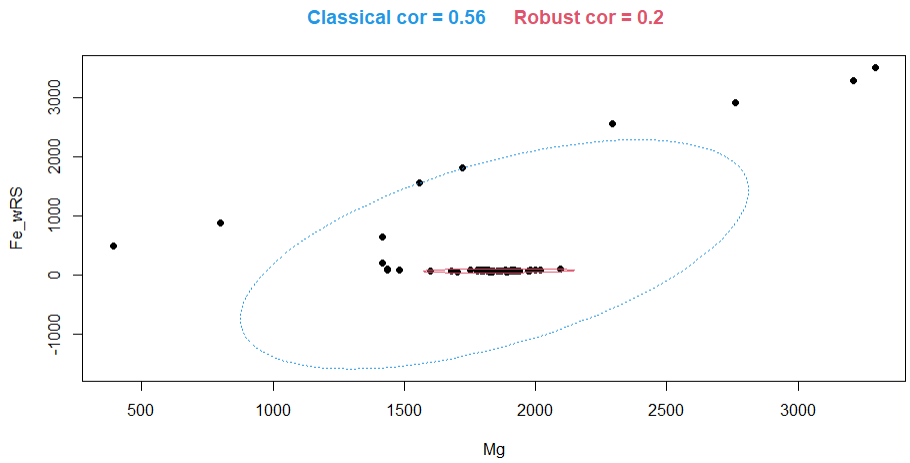
Whole cementum thickness:

Classical test	Pearson's product-moment correlation data: Od533M_AC$Mg and Od533M_AC$Fe t = 5.2596, df = 60, **p-value = 2.03e-06** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.3628988 0.7116660 sample estimates: **cor** **0.5617497**	Spearman's rank correlation rho data: Od533M_AC$Mg and Od533M_AC$Fe S = 43784, **p-value = 0.4266** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **-0.102566**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.1951158**	



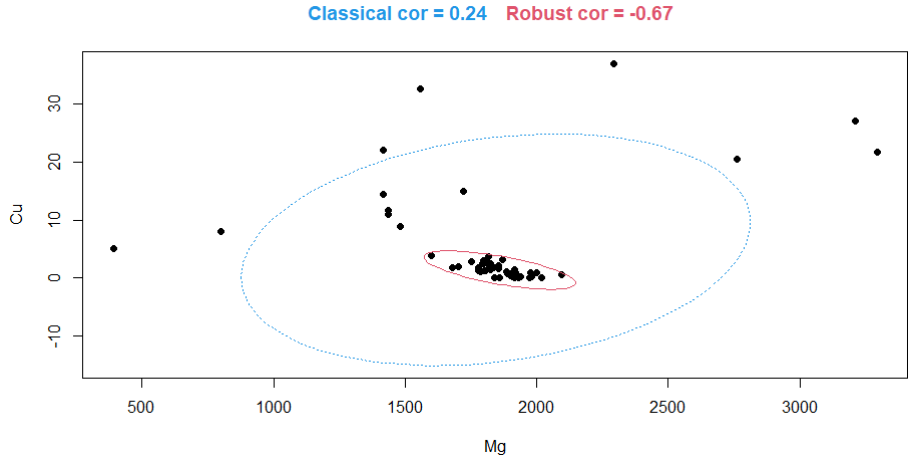
Removing 20 µm of Fe-enriched root surface:

Classical test	Pearson's product-moment correlation data: Od533M_AC$Mg and Od533M_AC$Fe t = 5.2596, df = 60, **p-value = 2.03e-06** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.3628988 0.7116660 sample estimates: **cor** **0.5617497**	Spearman's rank correlation rho data: Od533M_AC$Mg and Od533M_AC$Fe S = 43784, **p-value = 0.4266** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **-0.102566**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.1951158**	



- **Cu vs Mg**

Classical test	Pearson's product-moment correlation data: Od533M_AC$Mg and Od533M_AC$Cu t = 1.8879, df = 60, **p-value = 0.06388** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.01379117 0.45939099 sample estimates: **cor** **0.2367927**	Spearman's rank correlation rho data: Od533M_AC$Mg and Od533M_AC$Cu S = 59714, **p-value = 3.847e-05** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **-0.5037143**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **-0.6742311**	

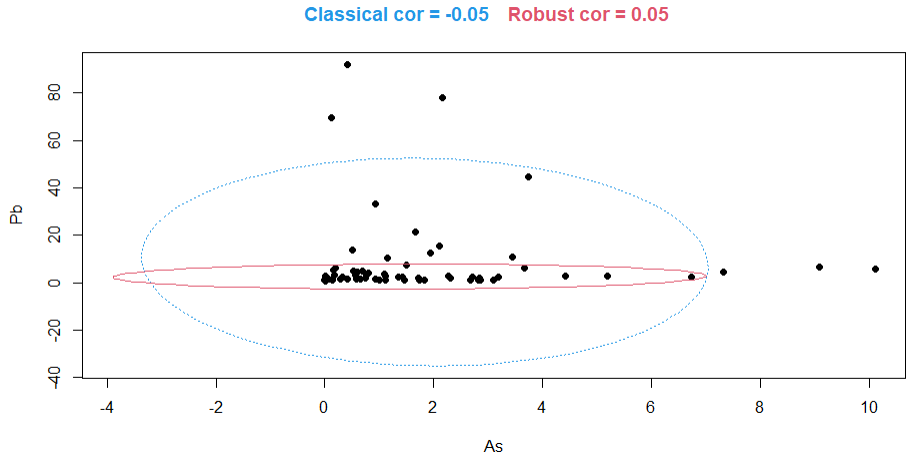


- **As vs Hg, Pb vs Hg (no Hg at all). => Not Applicable.**

- **Pb vs As**

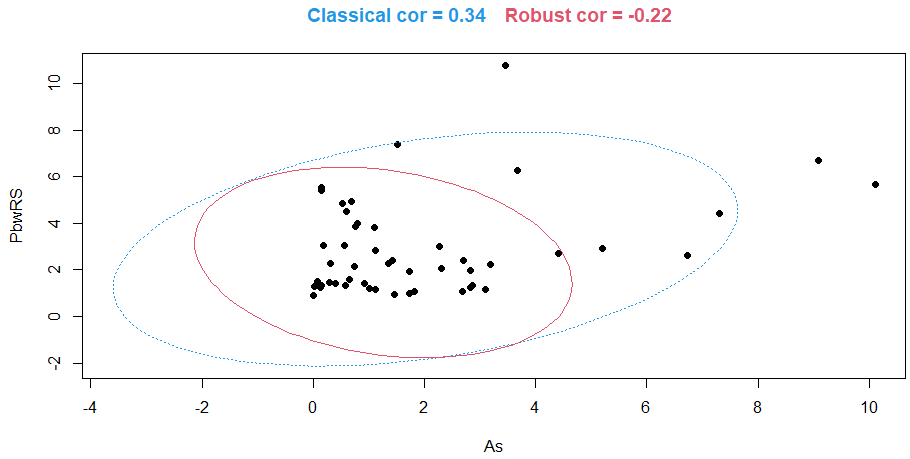
Whole cementum thickness:

Classical test	Pearson's product-moment correlation data: Od533M_AC$As and Od533M_AC$Pb t = -0.36151, df = 60, **p-value = 0.719** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.2929768 0.2055414 sample estimates: **cor** **-0.04662013**	Spearman's rank correlation rho data: Od533M_AC$As and Od533M_AC$Pb S = 34662, **p-value = 0.3239** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.1271436**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.05151116**	



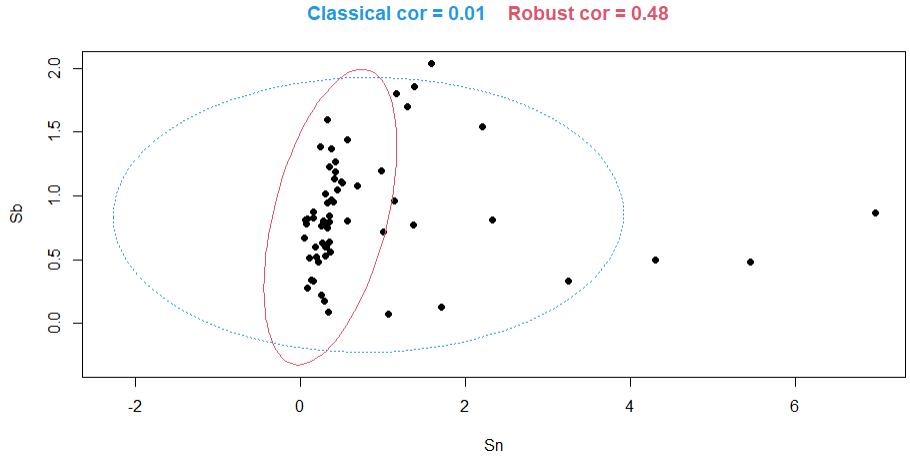
Removing 25 µm of Pb-enriched root surface:

Classical test	Pearson's product-moment correlation data: Od533M_AC_wRS$As and Od533M_AC_wRS$Pb t = 2.4433, df = 47, **p-value = 0.01836** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.06020137 0.56369734 sample estimates: **cor** **0.3357148**	Spearman's rank correlation rho data: Od533M_AC_wRS$As and Od533M_AC_wRS$Pb S = 15974, **p-value = 0.2025** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.185**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **-0.2204023**	



- **Sb vs Sn**

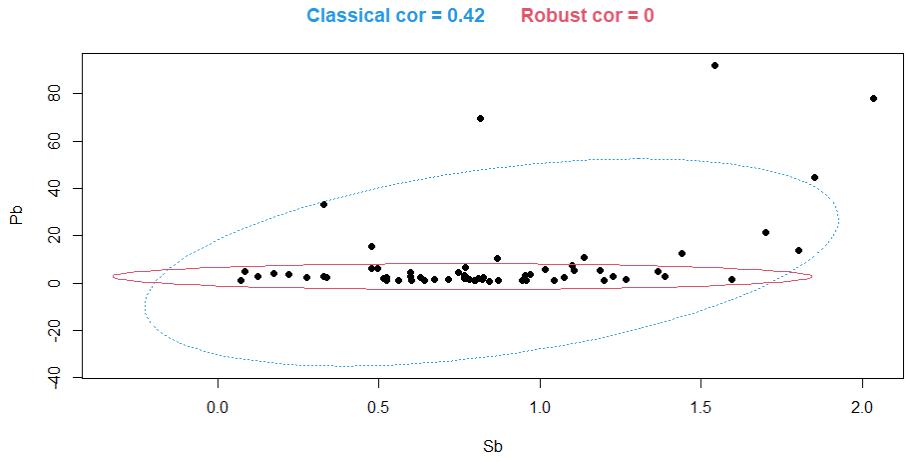
Classical test	Pearson's product-moment correlation data: Od533M_AC$Sn and Od533M_AC$Sb t = 0.082198, df = 60, **p-value = 0.9348** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.2397926 0.2596911 sample estimates: **cor** **0.01061118**	Spearman's rank correlation rho data: Od533M_AC$Sn and Od533M_AC$Sb S = 26930, **p-value = 0.01104** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.3218504**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.4795098**	



- **Pb vs Sb**

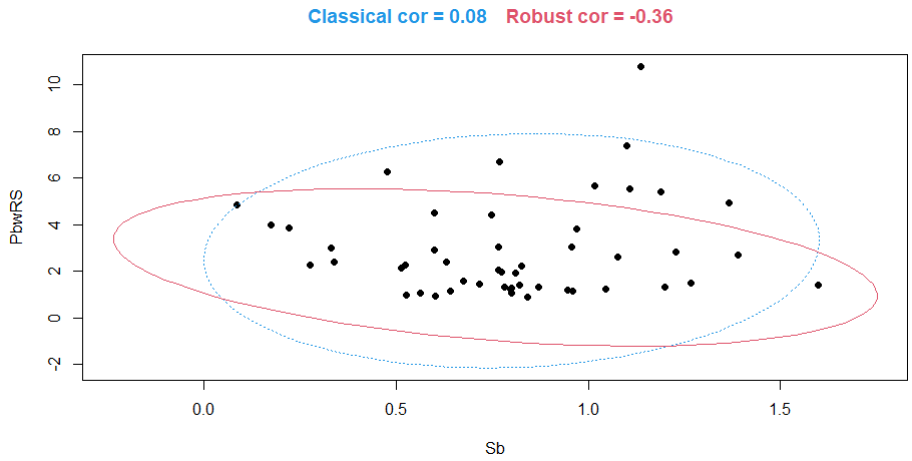
Whole cementum thickness:

Classical test	Pearson's product-moment correlation data: Od533M_AC$Sb and Od533M_AC$Pb t = 3.6301, df = 60, **p-value = 0.0005873** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.1952898 0.6095230 sample estimates: **cor** **0.424359**	Spearman's rank correlation rho data: Od533M_AC$Sb and Od533M_AC$Pb S = 31236, **p-value = 0.09582** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.2134169**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **-0.002296206**	



Removing 25 µm of Pb-enriched root surface:

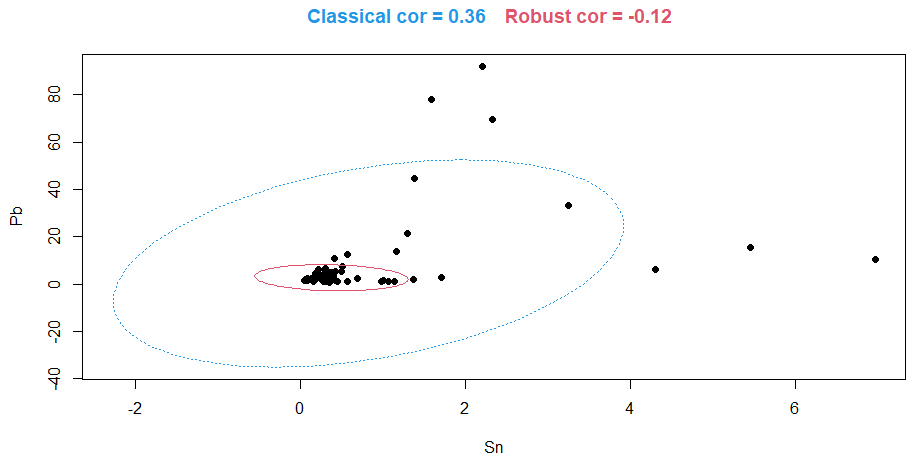
Classical test	Pearson's product-moment correlation data: Od533M_AC_wRS$Sb and Od533M_AC_wRS$Pb t = 0.5351, df = 47, **p-value = 0.5951** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.2079310 0.3513245 sample estimates: **cor** **0.07781542**	Spearman's rank correlation rho data: Od533M_AC_wRS$Sb and Od533M_AC_wRS$Pb S = 19266, **p-value = 0.9074** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.01704082**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **-0.3605865**	



- **Pb vs Sn**

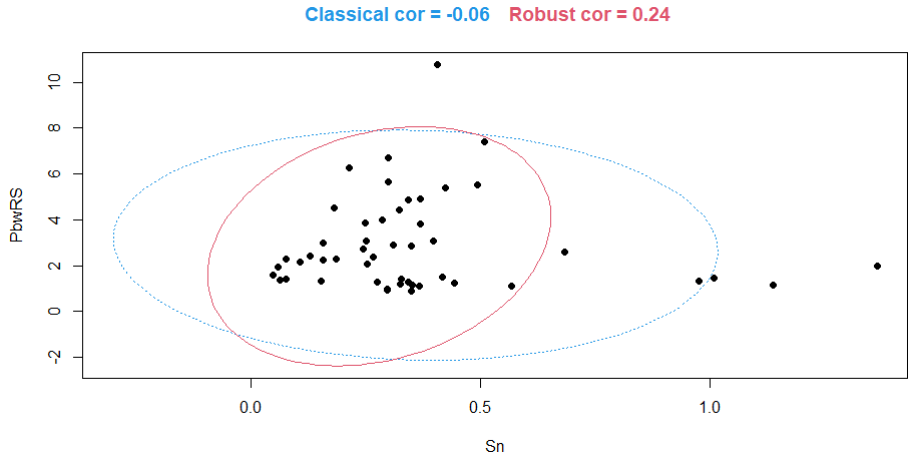
Whole cementum thickness:

Classical test	Pearson's product-moment correlation data: Od533M_AC$Sn and Od533M_AC$Pb t = 3.0305, df = 60, **p-value = 0.0036** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.1260418 0.5628855 sample estimates: **cor** **0.3643402**	Spearman's rank correlation rho data: Od533M_AC$Sn and Od533M_AC$Pb S = 24746, **p-value = 0.002698** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.3768477**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **-0.1243023**	



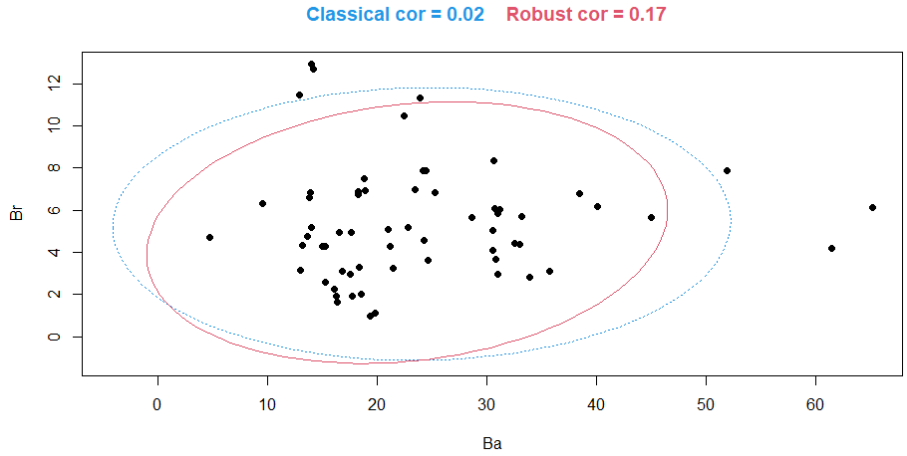
Removing 25 µm of Pb-enriched root surface:

Classical test	Pearson's product-moment correlation data: Od533M_AC_wRS$Sn and Od533M_AC_wRS$Pb t = -0.3783, df = 47, **p-value = 0.7069** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.3311624 0.2296582 sample estimates: **cor** **-0.05509644**	Spearman's rank correlation rho data: Od533M_AC_wRS$Sn and Od533M_AC_wRS$Pb S = 20154, **p-value = 0.8468** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **-0.02826531**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.2403129**	



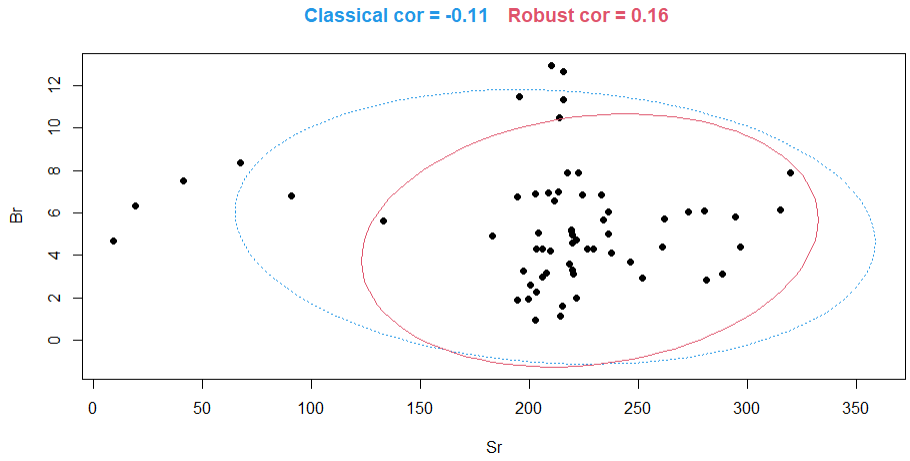
- **Br vs Ba**

Classical test	Pearson's product-moment correlation data: Od533M_AC$Ba and Od533M_AC$Br t = 0.18099, df = 60, **p-value = 0.857** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.2277374 0.2715435 sample estimates: **cor** **0.02335957**	Spearman's rank correlation rho data: Od533M_AC$Ba and Od533M_AC$Br S = 36878, **p-value = 0.5807** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.07134043**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.1710217**	



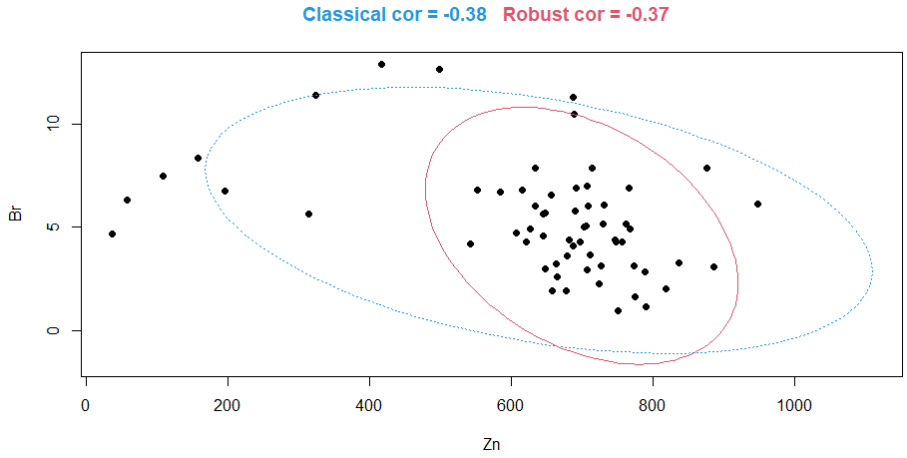
- **Br vs Sr**

Classical test	Pearson's product-moment correlation data: Od533M_AC$Sr and Od533M_AC$Br t = -0.85807, df = 60, **p-value = 0.3943** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.3502397 0.1436145 sample estimates: **cor** **-0.1101032**	Spearman's rank correlation rho data: Od533M_AC$Sr and Od533M_AC$Br S = 41026, **p-value = 0.7979** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **-0.03311425**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.1626547**	



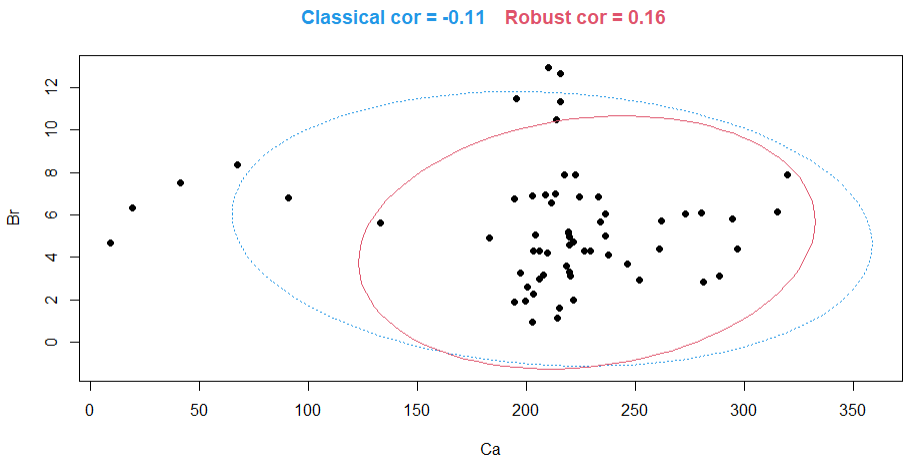
- **Br vs Zn**

Classical test	Pearson's product-moment correlation data: Od533M_AC$Zn and Od533M_AC$Br t = -3.1715, df = 60, **p-value = 0.00239** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.5743247 -0.1426418 sample estimates: **cor** **-0.3789104**	Spearman's rank correlation rho data: Od533M_AC$Zn and Od533M_AC$Br S = 55904, **p-value = 0.001099** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **-0.4077711**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **-0.3694156**	



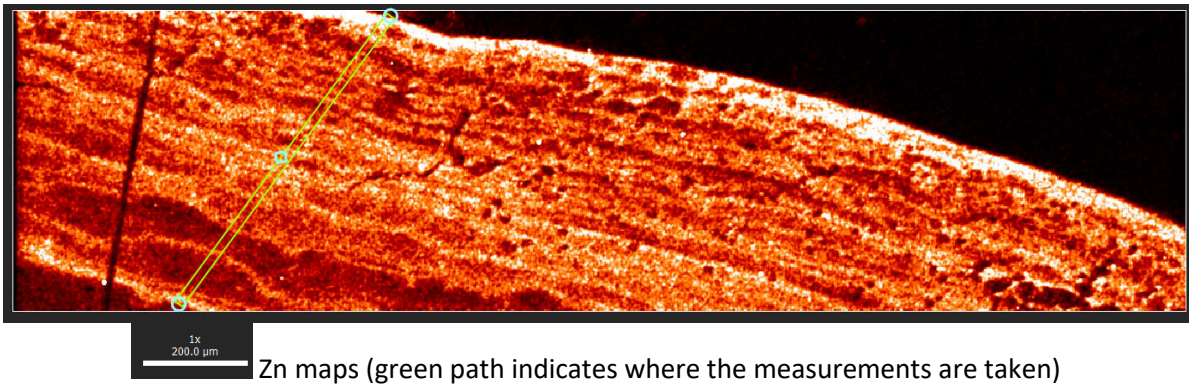
- **Br vs Ca**

Classical test	Pearson's product-moment correlation data: Od533M_AC$Ca and Od533M_AC$Br t = -1.1183, df = 60, **p-value = 0.2679** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.3791260 0.1108354 sample estimates: **cor** **-0.1428884**	Spearman's rank correlation rho data: Od533M_AC$Ca and Od533M_AC$Br S = 44066, **p-value = 0.3952** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **-0.1096673**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.1626547**	


Classical cor = -0.11
Robust cor = 0.16
Br
Ca
0
2
4
6
8
10
12
0
50
100
150
200
250
300
350

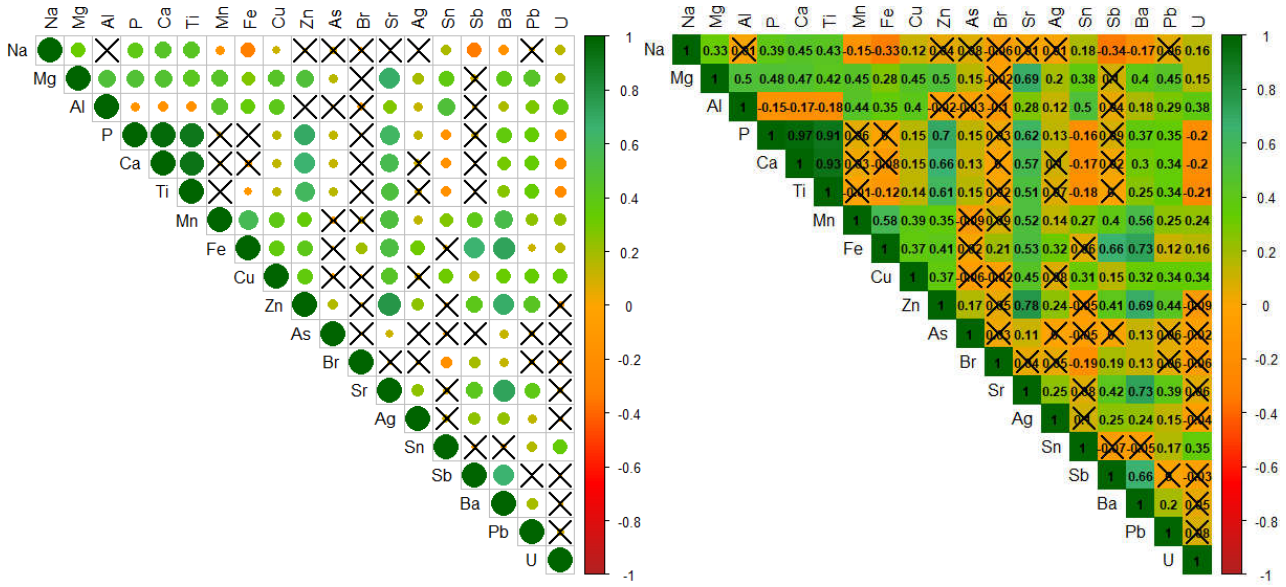
Odense 533M1 – Cellular Cementum (total thickness=694 µm)

Correlations between pairs of elements

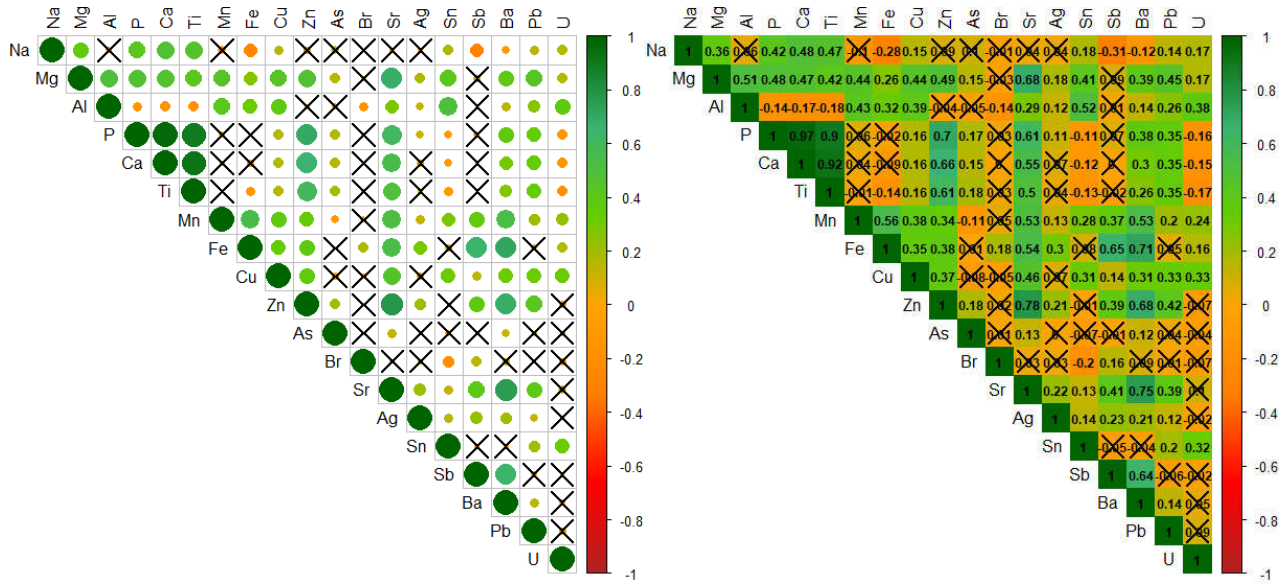


Zn maps (green path indicates where the measurements are taken)

Summary : <u>whole cementum</u> thickness, Spearman correlations.



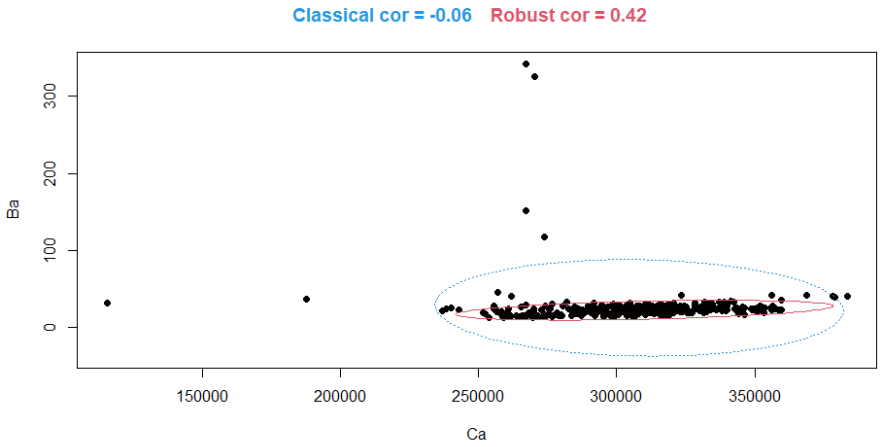
Summary : removing the first 15 µm of root surface, Spearman correlations.



wRS: without Root surface [Pb = ~15 µm; Fe, Mn, Al not included in the path]

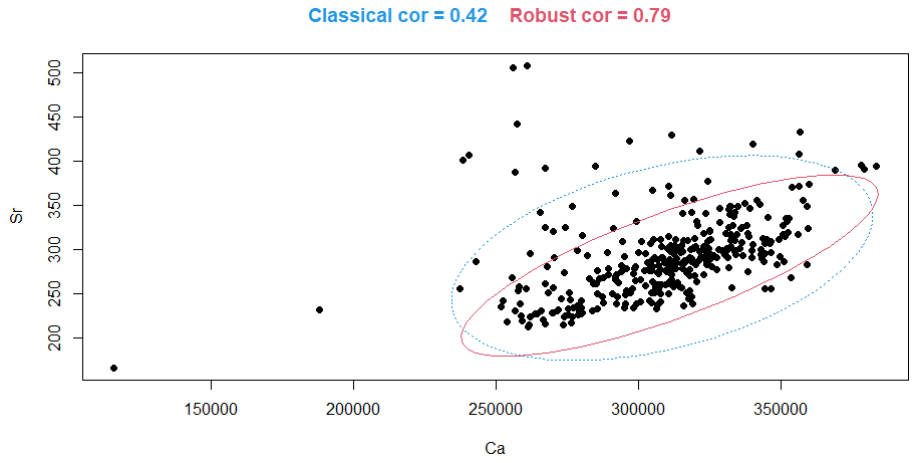
- **Ca vs Ba**

Classical test	Pearson's product-moment correlation data: Od533M_CC$Ca and Od533M_CC$Ba t = -1.192, df = 346, **p-value = 0.2341** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.16795239 0.04145918 sample estimates: **cor** **-0.06395056**	Spearman's rank correlation rho data: Od533M_CC$Ca and Od533M_CC$Ba S = 4937240, **p-value = 1.881e-08** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.2970874**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.4222214**	



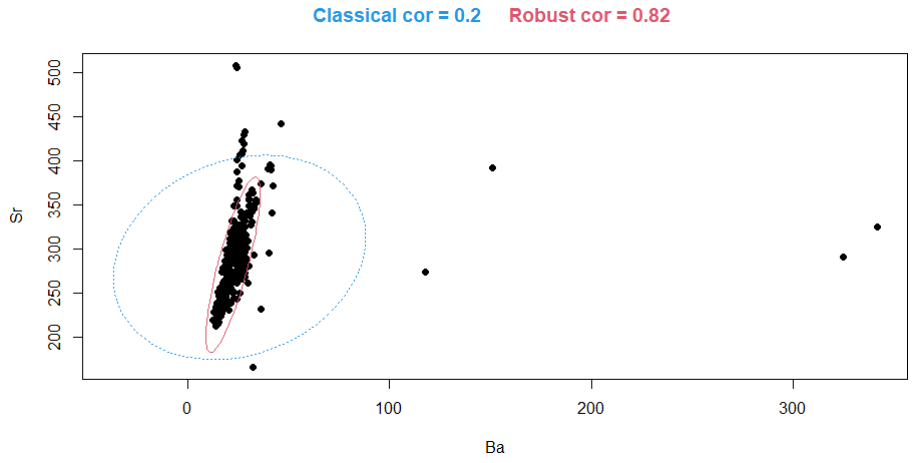
- **Ca vs Sr**

Classical test	Pearson's product-moment correlation data: Od533M_CC$Ca and Od533M_CC$Sr t = 8.5503, df = 346, **p-value = 4.012e-16** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.3268786 0.5007984 sample estimates: **cor** **0.4176568**	Spearman's rank correlation rho data: Od533M_CC$Ca and Od533M_CC$Sr S = 3051902, **p-value < 2.2e-16** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.5655021**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.7877556**	



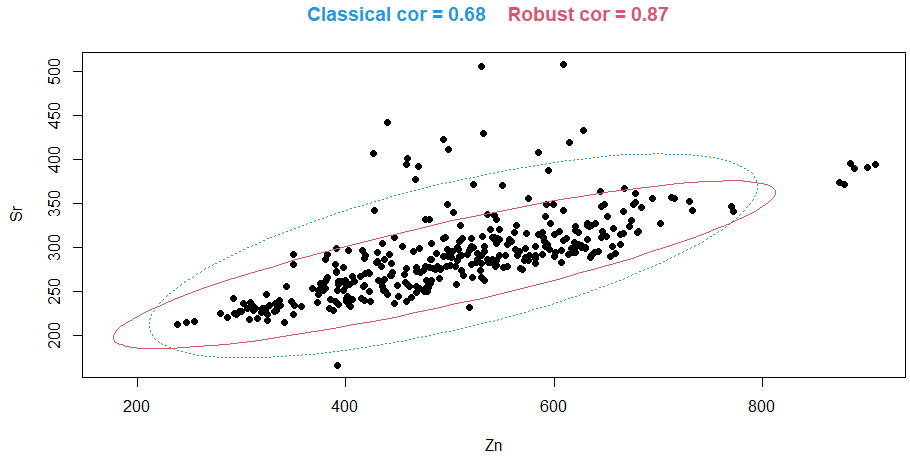
- **Ba vs Sr**

Classical test	Pearson's product-moment correlation data: Od533M_CC$Ba and Od533M_CC$Sr t = 3.768, df = 346, **p-value = 0.0001934** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.09539602 0.29745827 sample estimates: **cor** **0.1985359**	Spearman's rank correlation rho data: Od533M_CC$Ba and Od533M_CC$Sr S = 1899564, **p-value < 2.2e-16** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.7295599**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.8230075**	



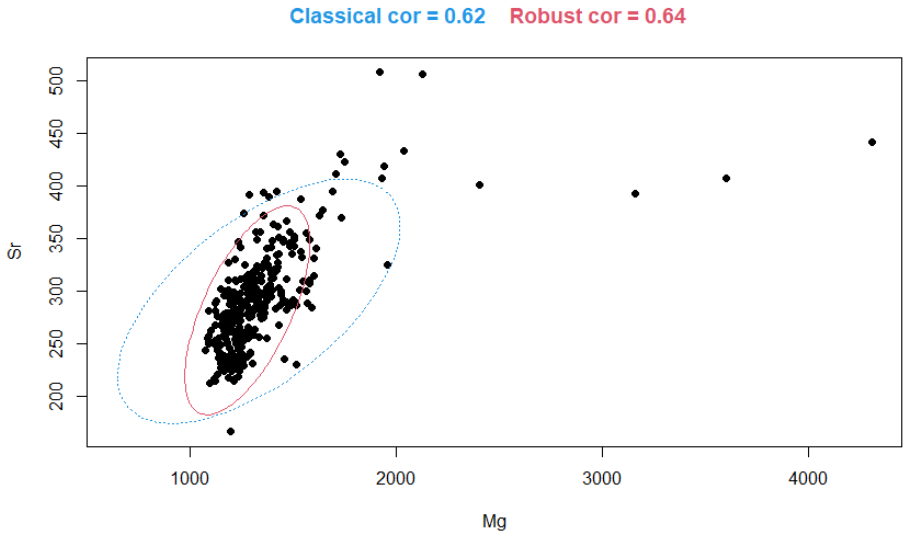
- **Zn vs Sr**

Classical test	Pearson's product-moment correlation data: Od533M_CC$Zn and Od533M_CC$Sr t = 17.291, df = 346, **p-value < 2.2e-16** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.6201049 0.7334794 sample estimates: **cor** **0.6808497**	Spearman's rank correlation rho data: Od533M_CC$Zn and Od533M_CC$Sr S = 1538210, **p-value < 2.2e-16** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.7810057**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.8659534**	



- **Mg vs Sr**

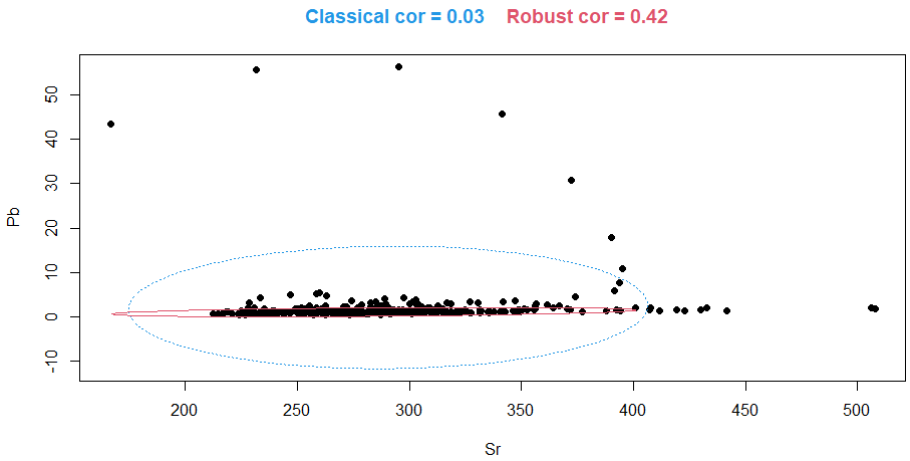
Classical test	Pearson's product-moment correlation data: Od533M_CC$Mg and Od533M_CC$Sr t = 14.517, df = 346, **p-value < 2.2e-16** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.5453866 0.6766088 sample estimates: **cor** **0.6152415**	Spearman's rank correlation rho data: Od533M_CC$Mg and Od533M_CC$Sr S = 2212532, **p-value < 2.2e-16** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.6850028**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.6402011**	



- **Pb vs Sr**

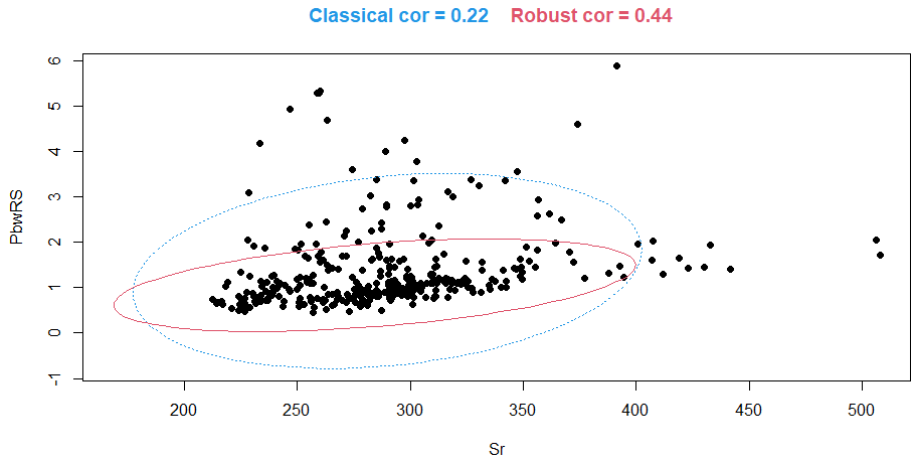
Whole cementum thickness:

Classical test	Pearson's product-moment correlation data: Od533M_CC$Sr and Od533M_CC$Pb t = 0.55828, df = 346, **p-value = 0.577** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.07536916 0.13470571 sample estimates: **cor** **0.02999955**	Spearman's rank correlation rho data: Od533M_CC$Sr and Od533M_CC$Pb S = 4282912, **p-value = 4.798e-14** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.3902438**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.4150683**	



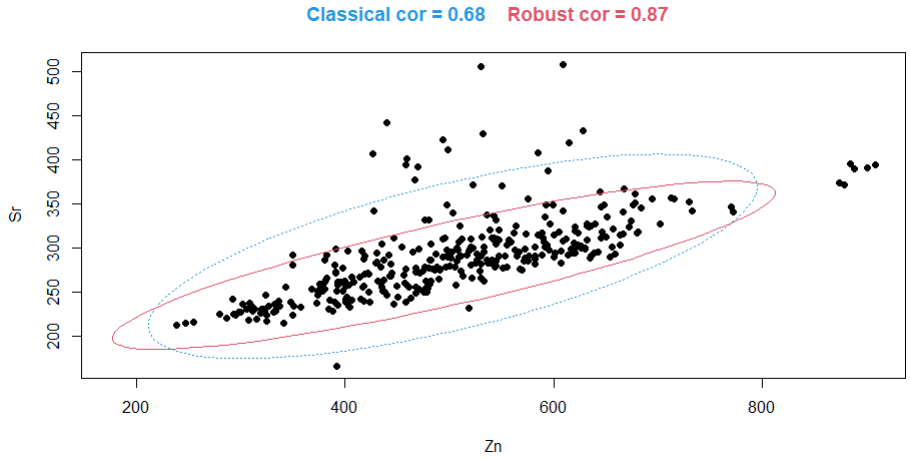
Removing 15 µm of Pb-enriched root surface:

Classical test	Pearson's product-moment correlation data: Od533M_CC_wRS$Sr and Od533M_CC_wRS$Pb t = 4.1906, df = 338, **p-value = 3.556e-05** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.1186810 0.3210121 sample estimates: **cor** **0.2222379**	Spearman's rank correlation rho data: Od533M_CC_wRS$Zn and Od533M_CC_wRS$Pb S = 3812334, **p-value < 2.2e-16** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.4180185**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.435669**	



- **Sr vs Zn**

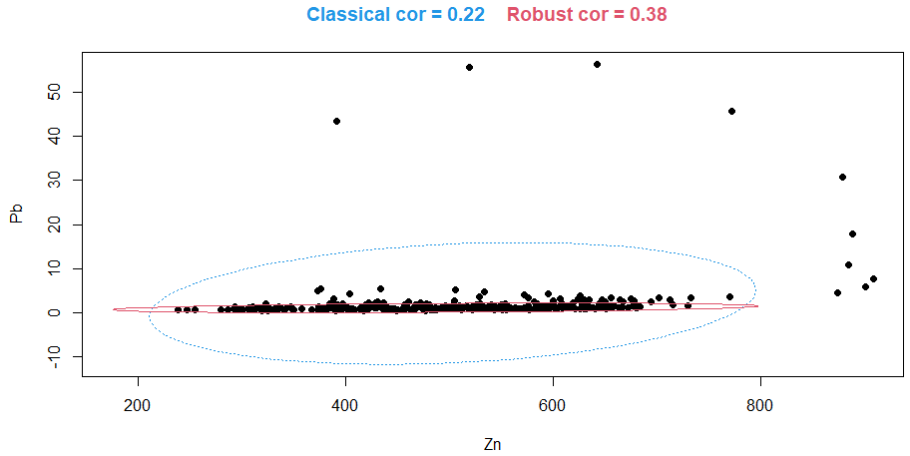
Classical test	Pearson's product-moment correlation data: Od533M_CC$Zn and Od533M_CC$Sr t = 17.291, df = 346, **p-value < 2.2e-16** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.6201049 0.7334794 sample estimates: **cor** **0.6808497**	Spearman's rank correlation rho data: Od533M_CC$Zn and Od533M_CC$Sr S = 1538210, **p-value < 2.2e-16** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.7810057**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.8659534**	



- **Pb vs Zn**

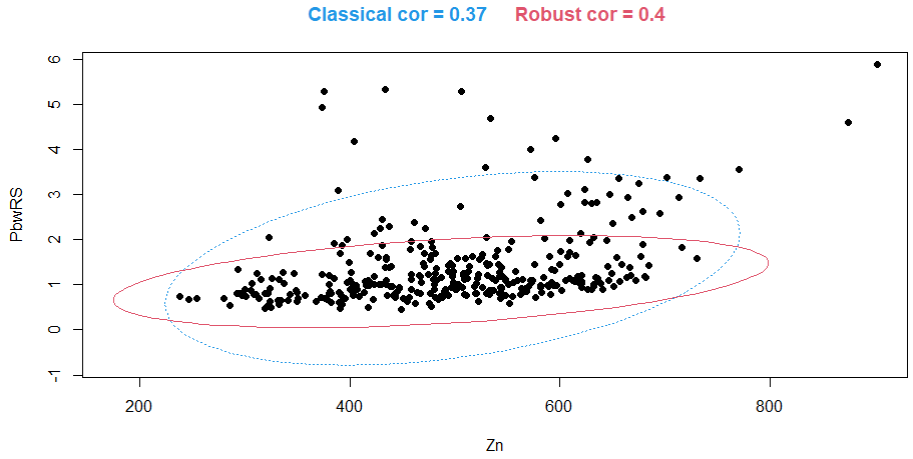
Whole cementum thickness:

Classical test	Pearson's product-moment correlation data: Od533M_CC$Zn and Od533M_CC$Pb t = 4.2036, df = 346, **p-value = 3.348e-05** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.1180325 0.3181857 sample estimates: **cor** **0.2204283**	Spearman's rank correlation rho data: Od533M_CC$Zn and Od533M_CC$Pb S = 3949120, **p-value < 2.2e-16** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.4377656**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.3801596**	



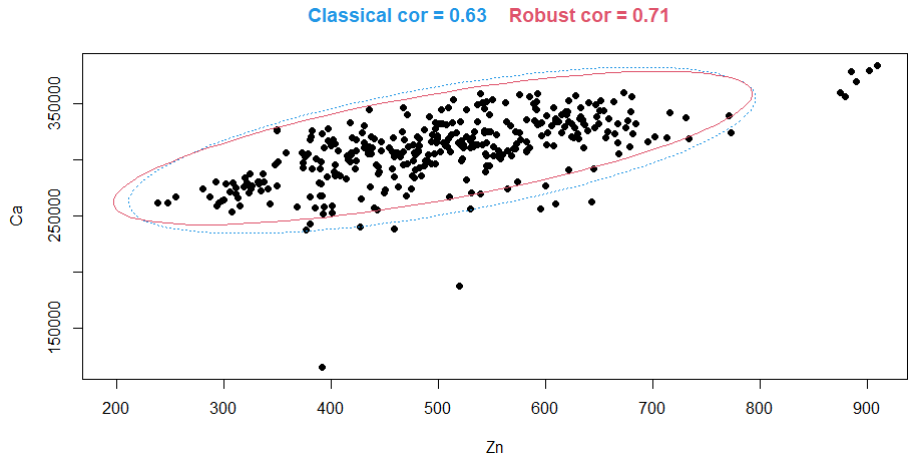
Removing 15 µm of Pb-enriched root surface:

Classical test	Pearson's product-moment correlation data: Od533M_CC_wRS$Zn and Od533M_CC_wRS$Pb t = 7.2751, df = 338, **p-value = 2.435e-12** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.2722422 0.4564486 sample estimates: **cor** **0.3679499**	Spearman's rank correlation rho data: Od533M_CC_wRS$Zn and Od533M_CC_wRS$Pb S = 3812334, **p-value < 2.2e-16** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.4180185**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.4035045**	



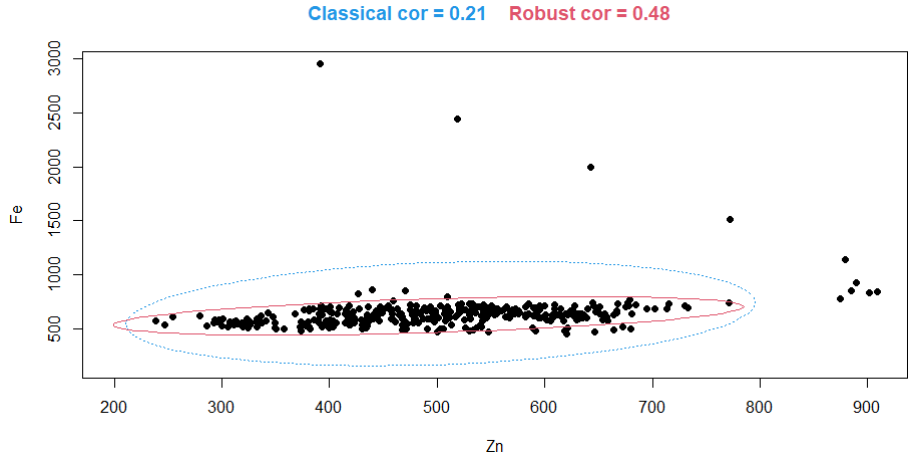
- **Zn vs Ca**

Classical test	Pearson's product-moment correlation data: Od533M_CC$Zn and Od533M_CC$Ca t = 15.055, df = 346, **p-value < 2.2e-16** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.5611166 0.6887129 sample estimates: **cor** **0.6291345**	Spearman's rank correlation rho data: Od533M_CC$Zn and Od533M_CC$Ca S = 2381548, **p-value < 2.2e-16** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.6609401**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.710546**	



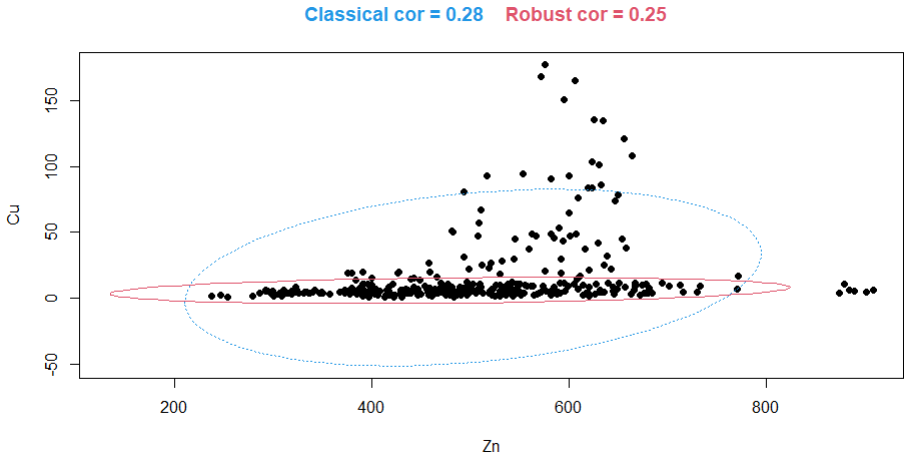
- **Zn vs Fe**

Classical test	Pearson's product-moment correlation data: Od533M_CC$Zn and Od533M_CC$Fe t = 4.0683, df = 346, **p-value = 5.869e-05** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.1110267 0.3117911 sample estimates: **cor** **0.2136638**	Spearman's rank correlation rho data: Od533M_CC$Zn and Od533M_CC$Fe S = 4179194, **p-value = 1.234e-15** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.40501**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.4823483**	



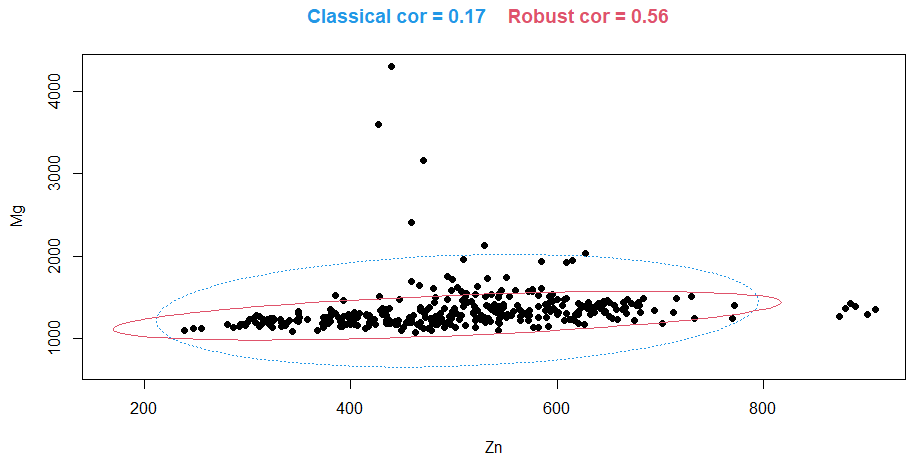
- **Zn vs Cu**

Classical test	Pearson's product-moment correlation data: Od533M_CC$Zn and Od533M_CC$Cu t = 5.3372, df = 346, **p-value = 1.712e-07** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.1757652 0.3701970 sample estimates: **cor** **0.2757999**	Spearman's rank correlation rho data: Od533M_CC$Zn and Od533M_CC$Cu S = 4437736, **p-value = 1.792e-12** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.3682015**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.2541785**	



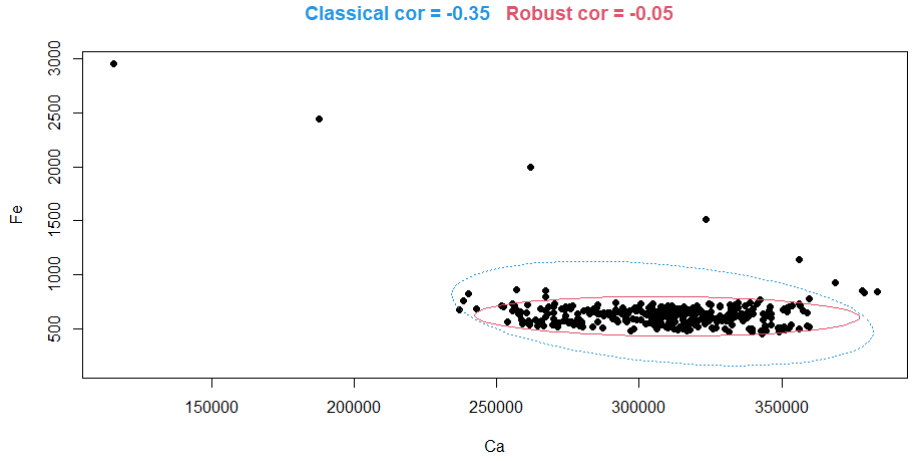
- **Zn vs Mg**

Classical test	Pearson's product-moment correlation data: Od533M_CC$Zn and Od533M_CC$Mg t = 3.2595, df = 346, **p-value = 0.001227** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.06871983 0.27278489 sample estimates: **cor** **0.1726038**	Spearman's rank correlation rho data: Od533M_CC$Zn and Od533M_CC$Mg S = 3506054, **p-value < 2.2e-16** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.5008447**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.5550434**	



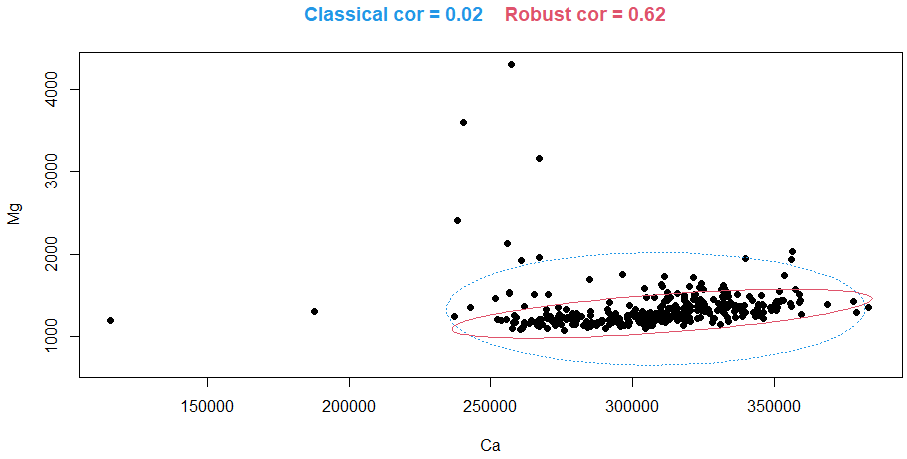
- **Ca vs Fe**

Classical test	Pearson's product-moment correlation data: Od533M_CC$Ca and Od533M_CC$Fe t = -6.9981, df = 346, **p-value = 1.352e-11** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.4409332 -0.2564893 sample estimates: **cor** **-0.3521252**	Spearman's rank correlation rho data: Od533M_CC$Ca and Od533M_CC$Fe S = 7553372, **p-value = 0.1606** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **-0.07537015**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **-0.04928535**	



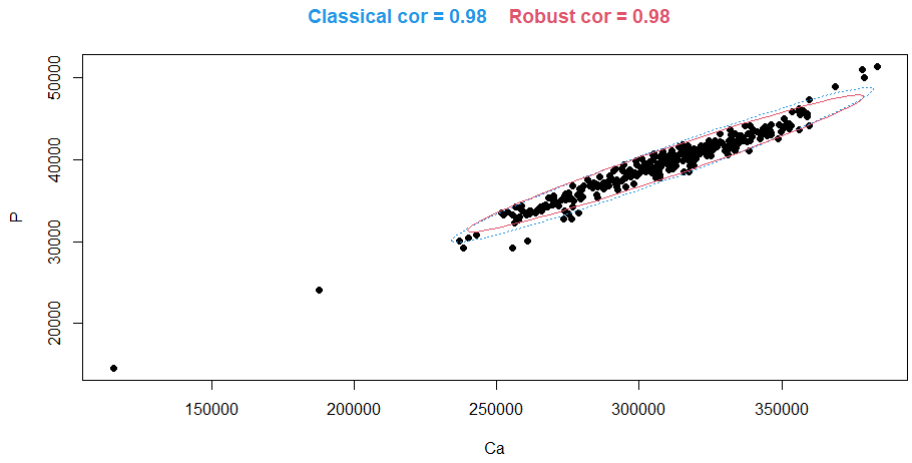
- **Ca vs Mg**

Classical test	Pearson's product-moment correlation data: Od533M_CC$Ca and Od533M_CC$Mg t = 0.28031, df = 346, **p-value = 0.7794** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.09020595 0.12000885 sample estimates: **cor** **0.01506795**	Spearman's rank correlation rho data: Od533M_CC$Ca and Od533M_CC$Mg S = 3704688, **p-value < 2.2e-16** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.4725652**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.6241344**	



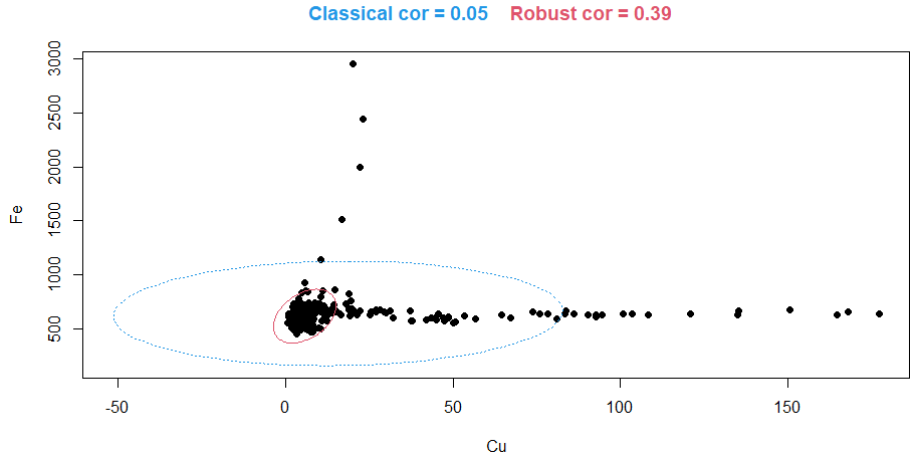
- **Ca vs P**

Classical test	Pearson's product-moment correlation data: Od533M_CC$Ca and Od533M_CC$P t = 83.901, df = 346, **p-value < 2.2e-16** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.9708054 0.9807610 sample estimates: **cor** **0.9762941**	Spearman's rank correlation rho data: Od533M_CC$Ca and Od533M_CC$P S = 200644, **p-value < 2.2e-16** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.9714344**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.9763796**	



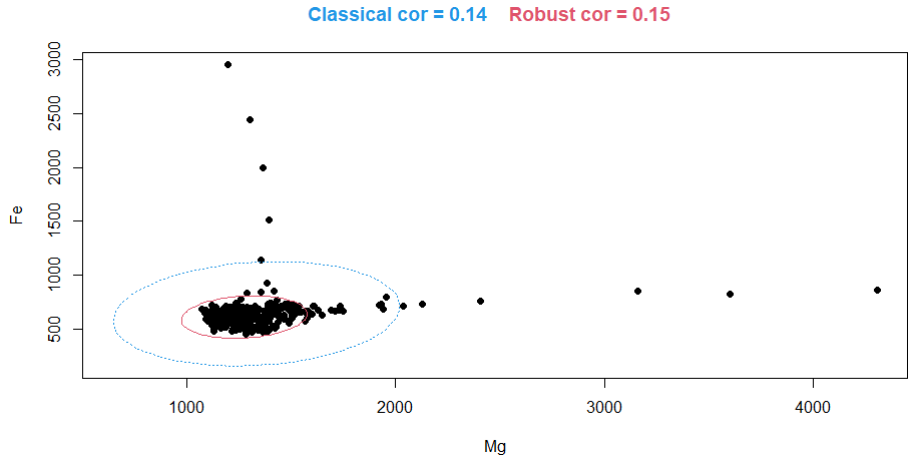
- **Cu vs Fe**

Classical test	Pearson's product-moment correlation data: Od533M_CC$Cu and Od533M_CC$Fe t = 0.9357, df = 346, **p-value = 0.3501** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.05518252 0.15455463 sample estimates: **cor** **0.05023995**	Spearman's rank correlation rho data: Od533M_CC$Cu and Od533M_CC$Fe S = 4457044, **p-value = 2.702e-12** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.3654527**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.3913524**	



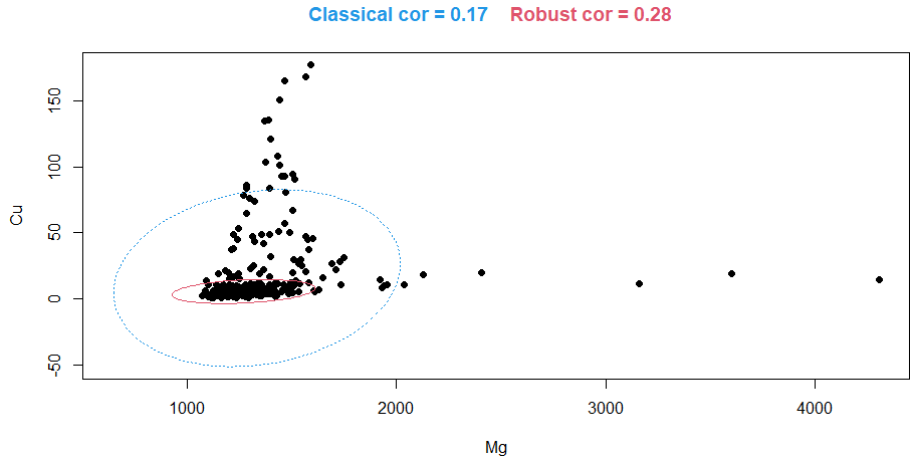
- **Mg vs Fe**

Classical test	Pearson's product-moment correlation data: Od533M_CC$Mg and Od533M_CC$Fe t = 2.6355, df = 346, **p-value = 0.00878** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.03567788 0.24184694 sample estimates: **cor** **0.1402827**	Spearman's rank correlation rho data: Od533M_CC$Mg and Od533M_CC$Fe S = 5072070, **p-value = 1.543e-07** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.2778917**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.1465132**	



- **Cu vs Mg**

Classical test	Pearson's product-moment correlation data: Od533M_CC$Mg and Od533M_CC$Cu t = 3.1556, df = 346, **p-value = 0.001742** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.06323774 0.26768091 sample estimates: **cor** **0.1672568**	Spearman's rank correlation rho data: Od533M_CC$Mg and Od533M_CC$Cu S = 3894676, **p-value < 2.2e-16** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.4455167**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.2762911**	

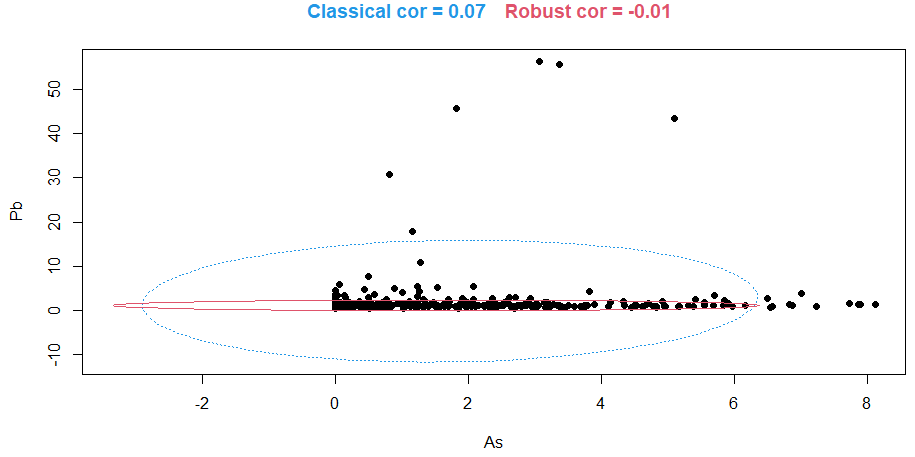


- **As vs Hg, Pb vs Hg (no Hg at all). => Not Applicable.**

- **Pb vs As**

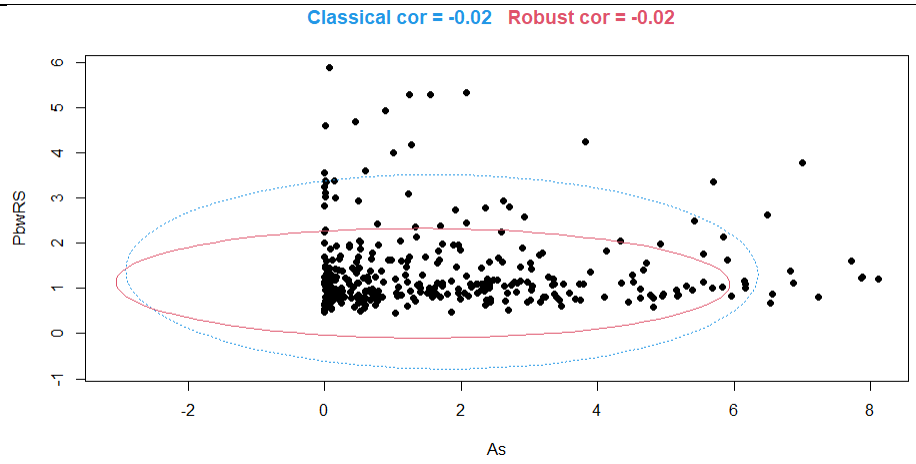
Whole cementum thickness:

Classical test	Pearson's product-moment correlation data: Od533M_CC$As and Od533M_CC$Pb t = 1.2663, df = 346, **p-value = 0.2063** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.03747891 0.17182381 sample estimates: **cor** **0.06791971**	Spearman's rank correlation rho data: Od533M_CC$As and Od533M_CC$Pb S = 6636242, **p-value = 0.3045** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.05520125** *Impossible to calculate the exact p-value with ex-aequos*
MCD (α=0.05; quant=0.8)	$cor.rob [1] **-0.01183972**	



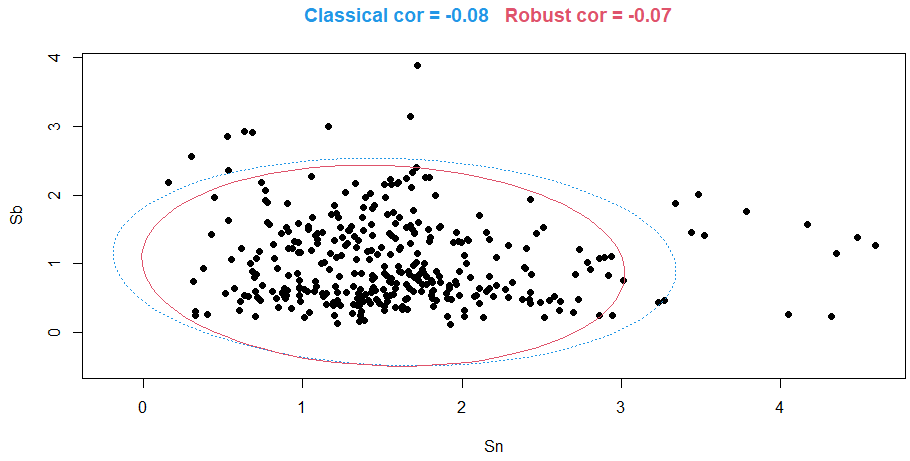
Removing 15 µm of Pb-enriched root surface:

Classical test	Pearson's product-moment correlation data: Od533M_CC_wRS$As and Od533M_CC_wRS$Pb t = -0.33905, df = 338, **p-value = 0.7348** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.12455677 0.08809614 sample estimates: **cor** **-0.01843885**	Spearman's rank correlation rho data: Od533M_CC_wRS$As and Od533M_CC_wRS$Pb S = 6300312, **p-value = 0.4825** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.03820989** *Impossible to calculate the exact p-value with ex-aequos*
MCD (α=0.05; quant=0.8)	$cor.rob [1] **-0.01645062**	



- **Sb vs Sn**

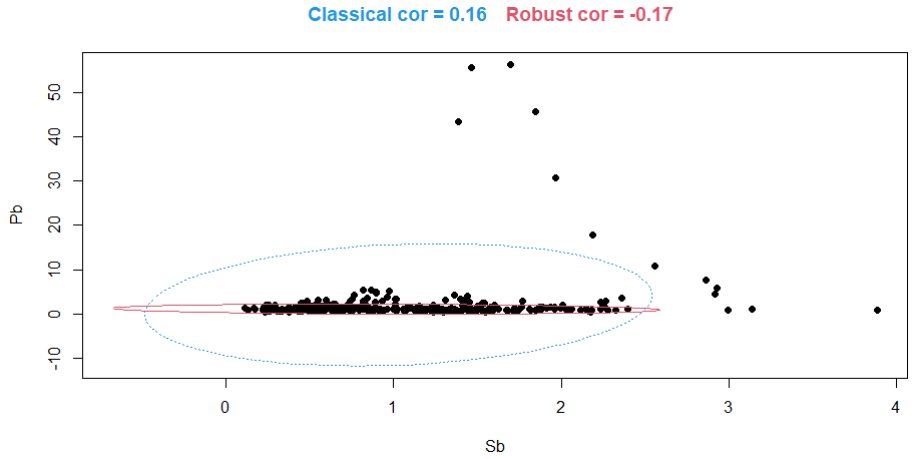
Classical test	Pearson's product-moment correlation data: Od533M_CC$Sn and Od533M_CC$Sb t = -1.5008, df = 346, **p-value = 0.1343** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.18399834 0.02491866 sample estimates: **cor** **-0.08042303**	Spearman's rank correlation rho data: Od533M_CC$Sn and Od533M_CC$Sb S = 7514274, **p-value = 0.1938** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **-0.06980379**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **-0.07359742**	



- **Pb vs Sb**

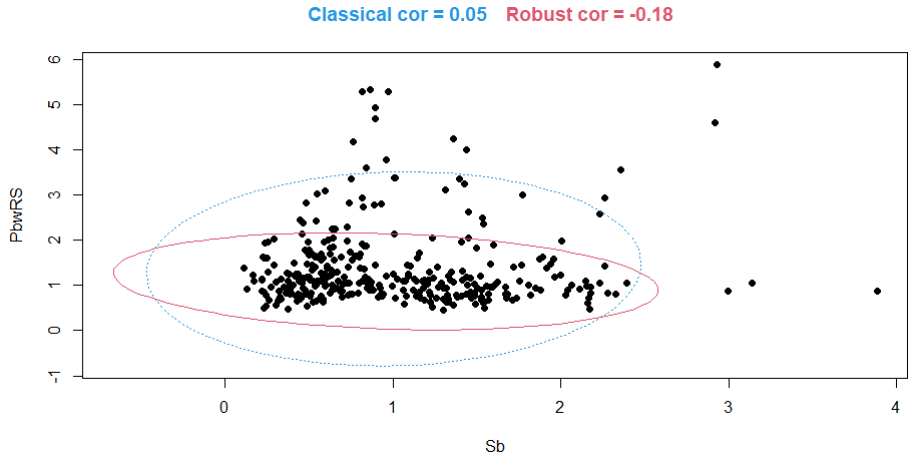
Whole cementum thickness:

Classical test	Pearson's product-moment correlation data: Od533M_CC$Sb and Od533M_CC$Pb t = 3.0237, df = 346, **p-value = 0.002684** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.05626567 0.26117312 sample estimates: **cor** **0.1604476**	Spearman's rank correlation rho data: Od533M_CC$Sb and Od533M_CC$Pb S = 7033012, **p-value = 0.9809** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **-0.001286736**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **-0.1667674**	



Removing 15 µm of Pb-enriched root surface:

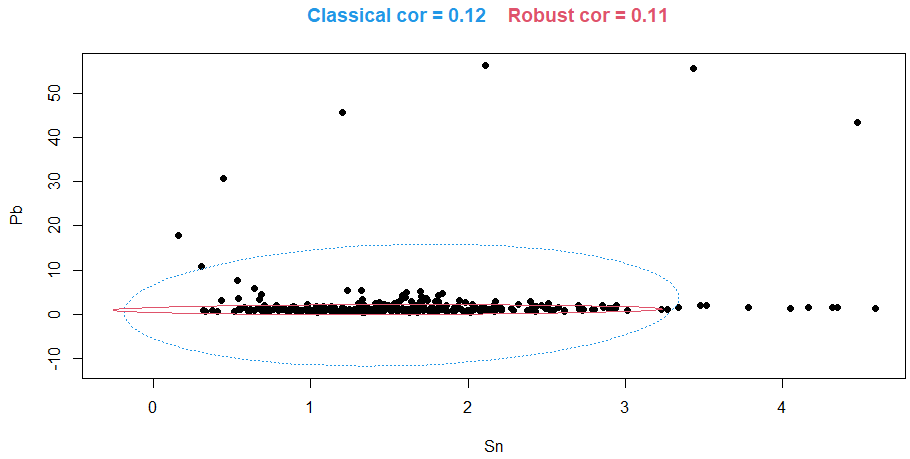
Classical test	Pearson's product-moment correlation data: Od533M_CC_wRS$Sb and Od533M_CC_wRS$Pb t = 0.99995, df = 338, **p-value = 0.3181** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.05235506 0.15974899 sample estimates: **cor** **0.05430957**	Spearman's rank correlation rho data: Od533M_CC_wRS$Sb and Od533M_CC_wRS$Pb S = 6929224, **p-value = 0.2878** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **-0.05779828**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **-0.1805594**	



- **Pb vs Sn**

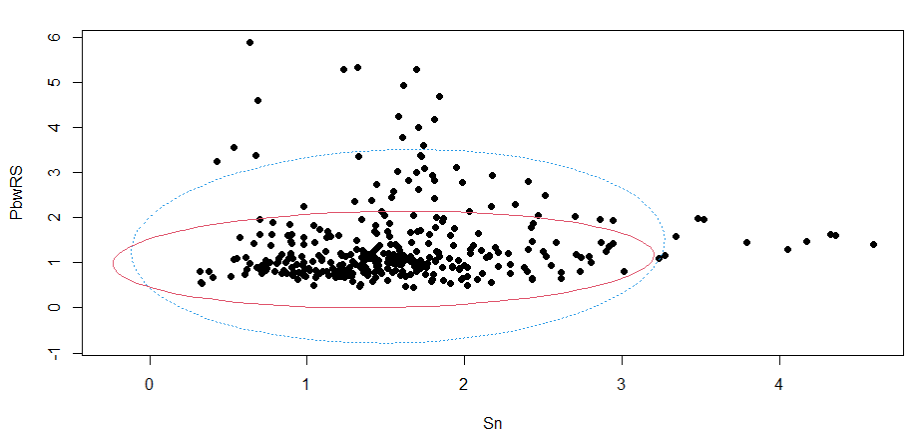
Whole cementum thickness:

Classical test	Pearson's product-moment correlation data: Od533M_CC$Sn and Od533M_CC$Pb t = 2.3224, df = 346, **p-value = 0.02079** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.01900917 0.22607892 sample estimates: **cor** **0.1238926**	Spearman's rank correlation rho data: Od533M_CC$Sn and Od533M_CC$Pb S = 5821180, **p-value = 0.001362** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.1712412**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.1078794**	



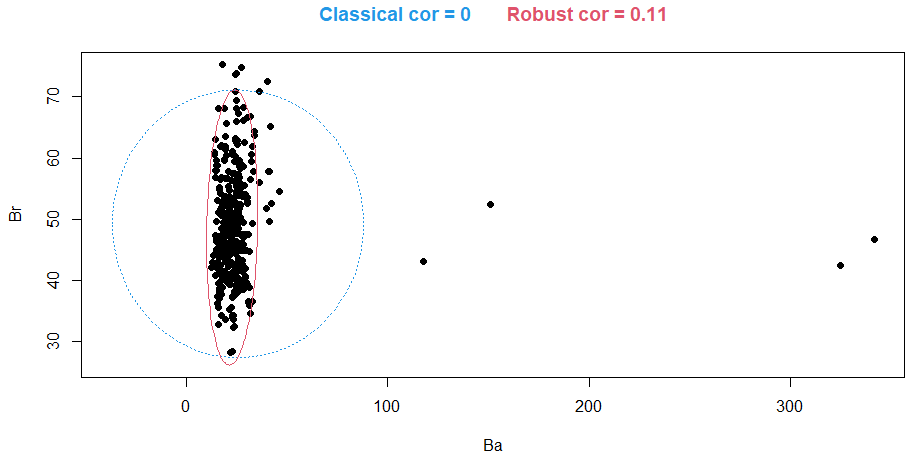
Removing 15 µm of Pb-enriched root surface:

Classical test	Pearson's product-moment correlation data: Od533M_CC_wRS$Sn and Od533M_CC_wRS$Pb t = 1.2308, df = 338, **p-value = 0.2192** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.03984622 0.17193969 sample estimates: **cor** **0.0667991**	Spearman's rank correlation rho data: Od533M_CC_wRS$Sn and Od533M_CC_wRS$Pb S = 5262186, **p-value = 0.0002701** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.1966876**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.08510237**	



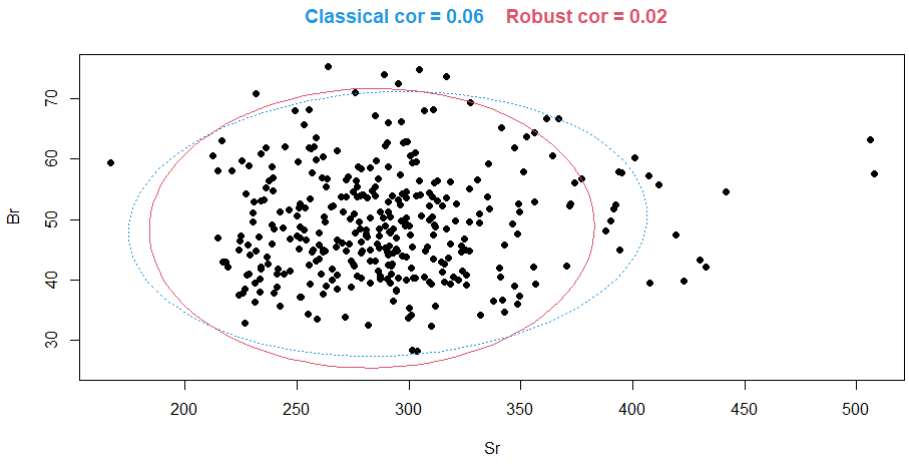
- **Br vs Ba**

Classical test	Pearson's product-moment correlation data: Od533M_CC$Ba and Od533M_CC$Br t = -0.030879, df = 346, **p-value = 0.9754** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.1067725 0.1034890 sample estimates: **cor** **-0.001660083**	Spearman's rank correlation rho data: Od533M_CC$Ba and Od533M_CC$Br S = 6124820, **p-value = 0.01693** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.1280121**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.107534**	



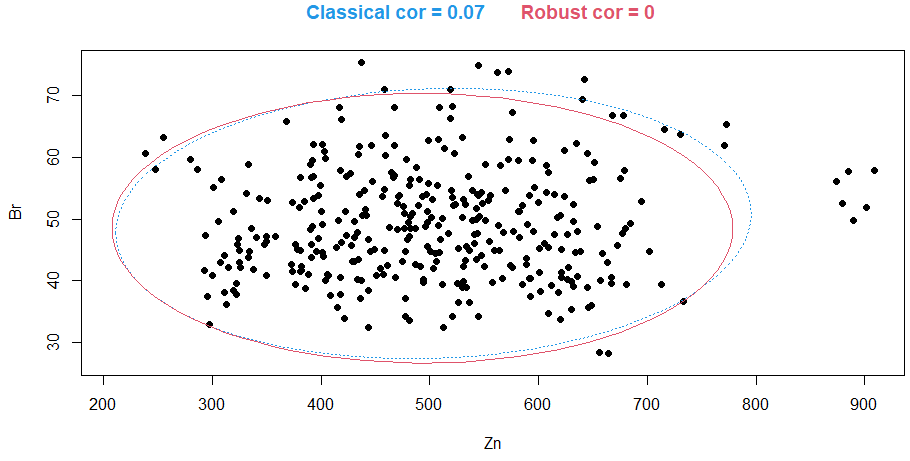
- **Br vs Sr**

Classical test	Pearson's product-moment correlation data: Od533M_CC$Sr and Od533M_CC$Br t = 1.1968, df = 346, **p-value = 0.2322** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.04120406 0.16820073 sample estimates: **cor** **0.06420507**	Spearman's rank correlation rho data: Od533M_CC$Sr and Od533M_CC$Br S = 6739054, **p-value = 0.4505** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.04056393**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.01599081**	



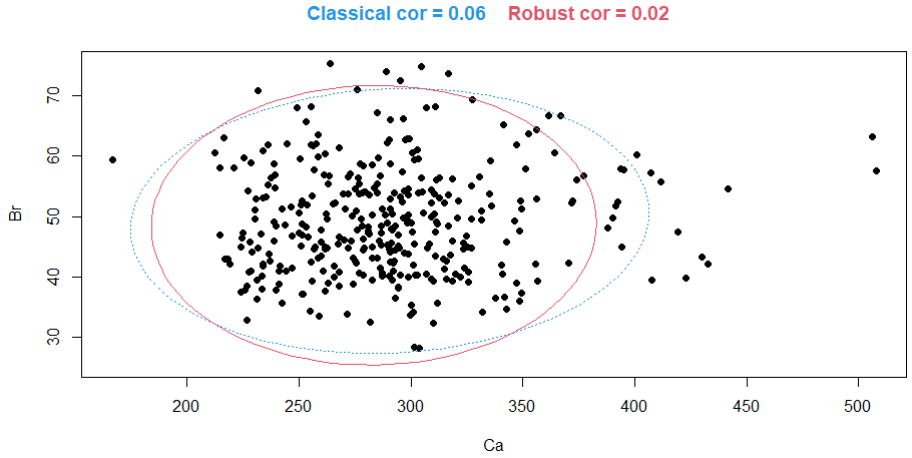
- **Br vs Zn**

Classical test	Pearson's product-moment correlation data: Od533M_CC$Zn and Od533M_CC$Br t = 1.2881, df = 346, **p-value = 0.1986** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.03631413 0.17295552 sample estimates: **cor** **0.06908061**	Spearman's rank correlation rho data: Od533M_CC$Zn and Od533M_CC$Br S = 6704876, **p-value = 0.398** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.04542984**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **-0.001427677**	



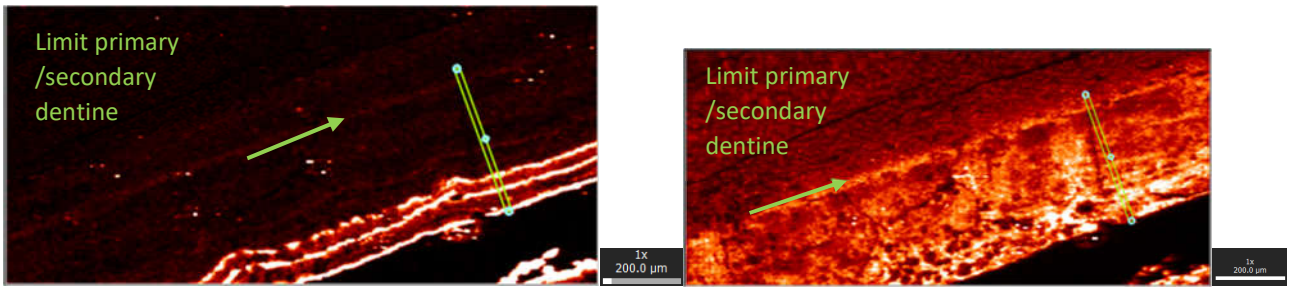
- **Br vs Ca**

Classical test	Pearson's product-moment correlation data: Od533M_CC$Ca and Od533M_CC$Br t = -0.45575, df = 346, **p-value = 0.6489** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.12929178 0.08084547 sample estimates: **cor** **-0.02449371**	Spearman's rank correlation rho data: Od533M_CC$Ca and Od533M_CC$Br S = 7026418, **p-value = 0.9948** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **-0.0003479512**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.01599081**	



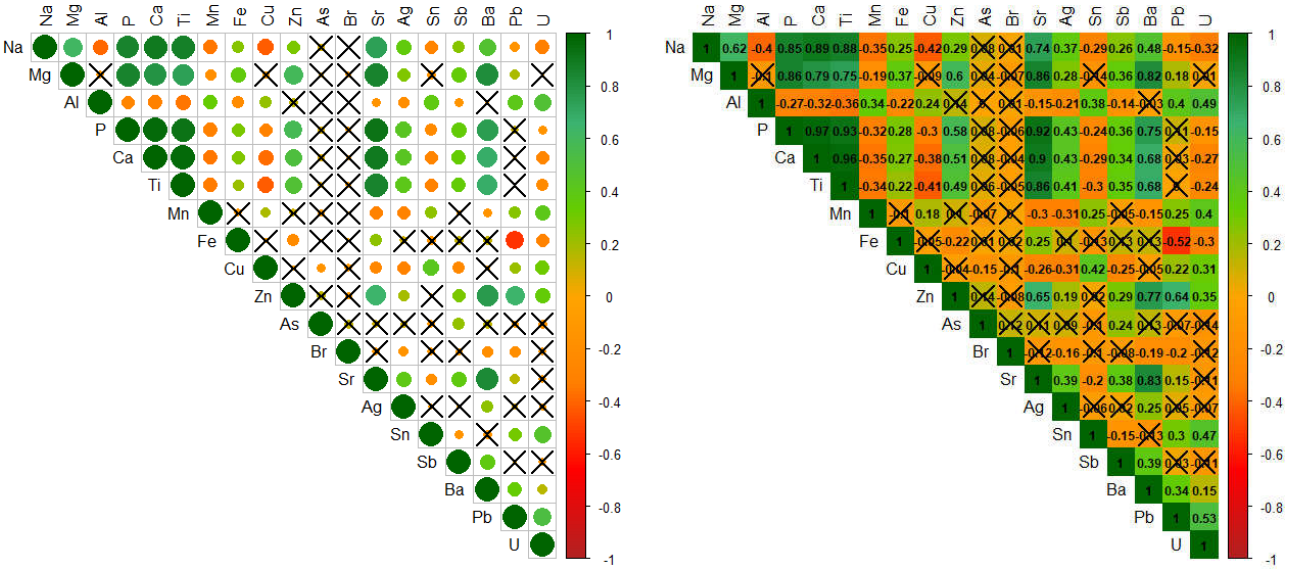
Odense 533M1 – Secondary Dentine (total thickness=396 µm)

Correlations between pairs of elements

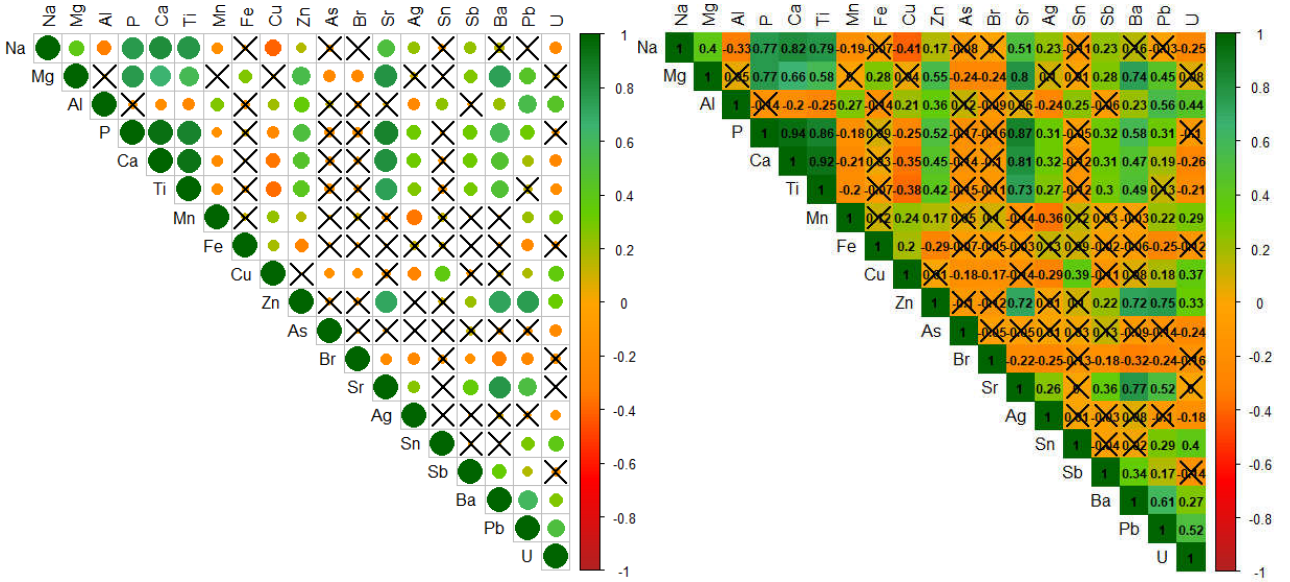


Pb (left) and Zn (right) maps (green path indicates where the measurements are taken)

Summary: whole secondary dentinee thickness, Spearman correlations.



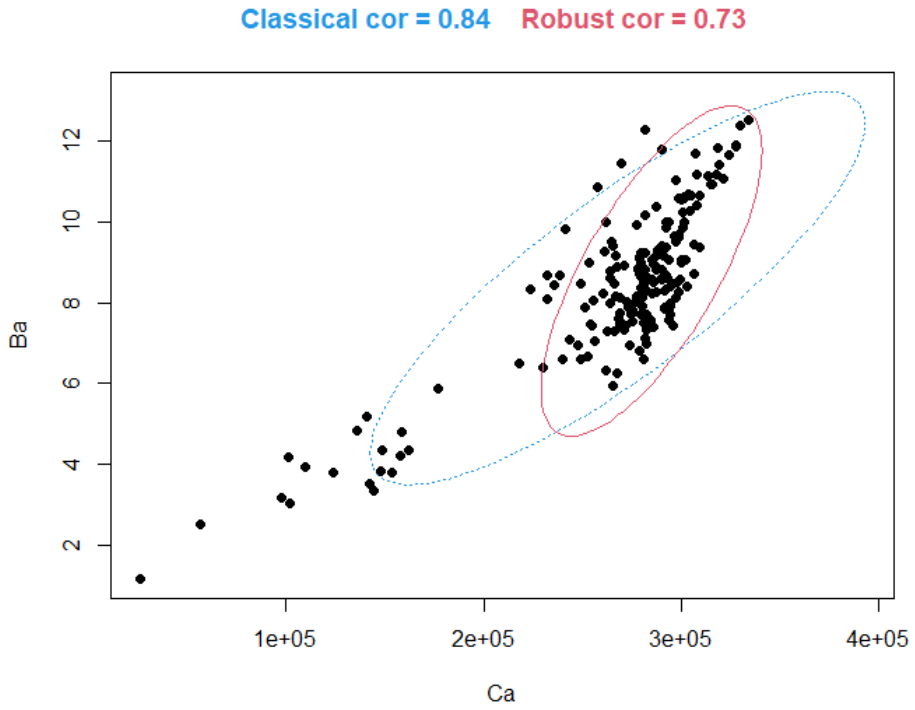
Summary: removing the first 110 µm of secondary dentinee surface, Spearman correlations.



wSDS: without Secondary Dentinee surface [Pb = ~109 µm containing 3 strong (biological) accentuated lines; no significant surface enrichment for Fe, Mn, Cu, Al]

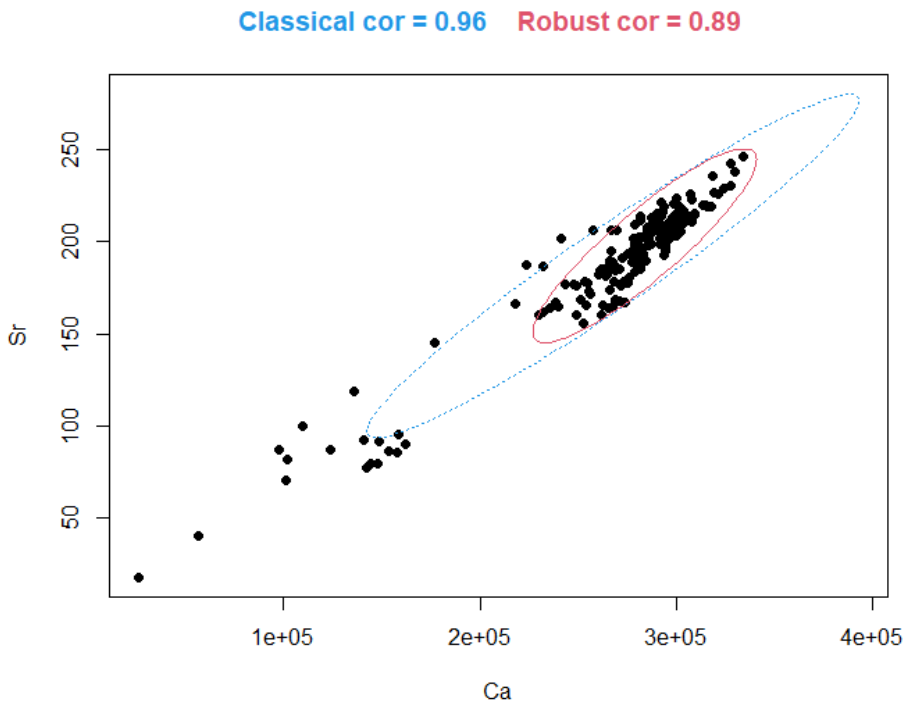
- **Ca vs Ba**

Classical test	Pearson's product-moment correlation data: Od533M_SD$Ca and Od533M_SD$Ba t = 21.276, df = 188, **p-value < 2.2e-16** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.7931194 0.8778780 sample estimates: **cor** **0.8405697**	Spearman's rank correlation rho data: Od533M_SD$Ca and Od533M_SD$Ba S = 361716, **p-value < 2.2e-16** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.6835754**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.7271962**	



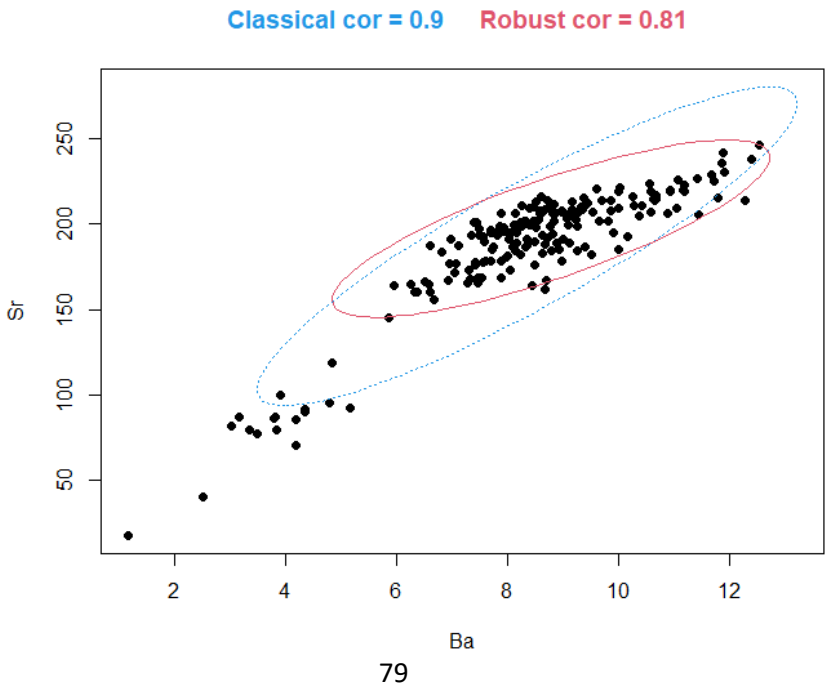
- **Ca vs Sr**

Classical test	Pearson's product-moment correlation data: Od533M_SD$Ca and Od533M_SD$Sr t = 47.692, df = 188, **p-value < 2.2e-16** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.9484792 0.9706298 sample estimates: **cor** **0.9610697**	Spearman's rank correlation rho data: Od533M_SD$Ca and Od533M_SD$Sr S = 111092, **p-value < 2.2e-16** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.9028181**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.8939784**	



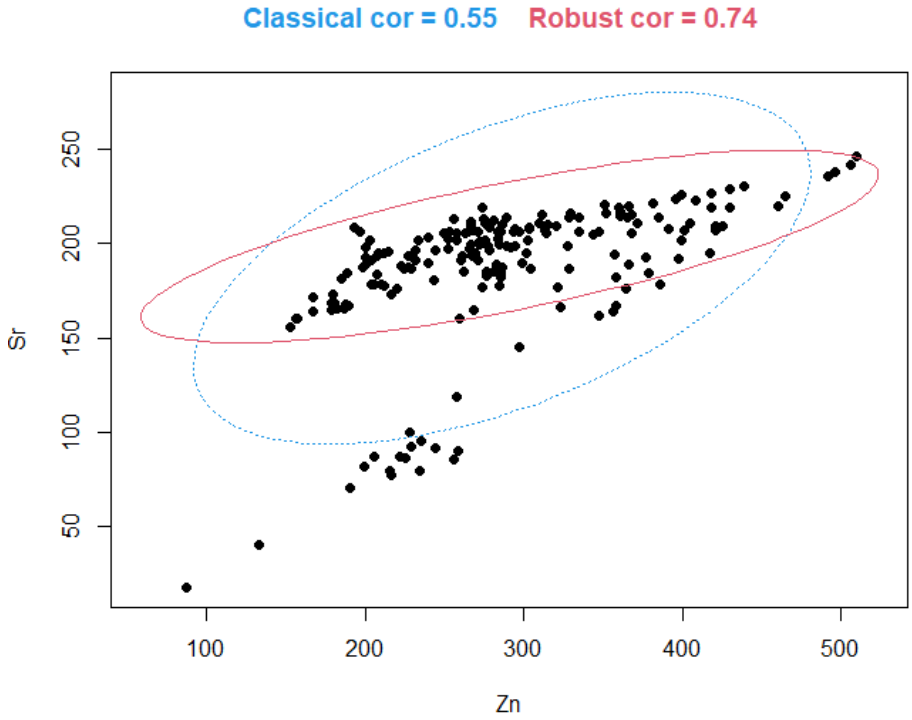
- **Ba vs Sr**

Classical test	Pearson's product-moment correlation data: Od533M_SD$Ba and Od533M_SD$Sr t = 28.16, df = 188, **p-value < 2.2e-16** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.8678047 0.9232742 sample estimates: **cor** **0.8990891**	Spearman's rank correlation rho data: Od533M_SD$Ba and Od533M_SD$Sr S = 197406, **p-value < 2.2e-16** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.8273117**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.8067172**	



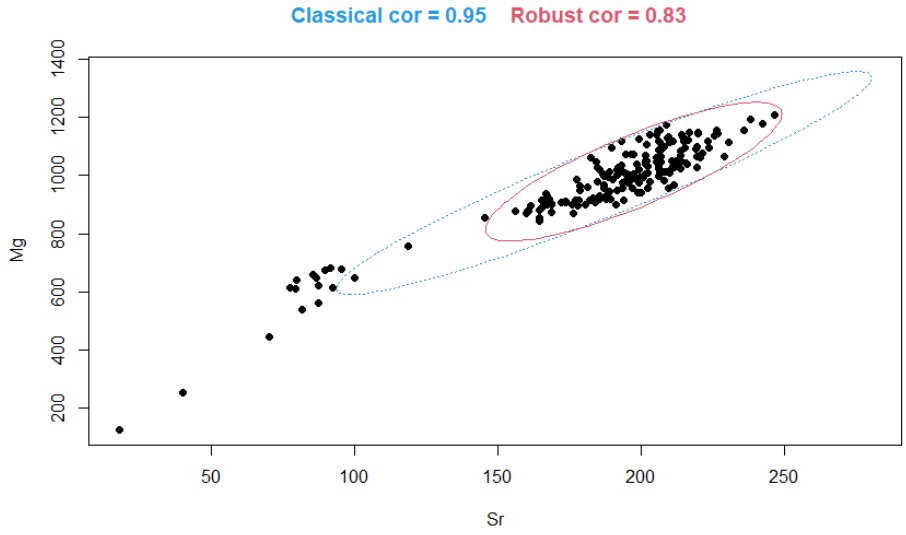
- **Zn vs Sr**

Classical test	Pearson's product-moment correlation data: Od533M_SD$Zn and Od533M_SD$Sr t = 9.0389, df = 188, **p-value < 2.2e-16** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.4427294 0.6424145 sample estimates: **cor** **0.5503947**	Spearman's rank correlation rho data: Od533M_SD$Zn and Od533M_SD$Sr S = 405396, **p-value < 2.2e-16** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.6453647**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.7399384**	



- **Mg vs Sr**

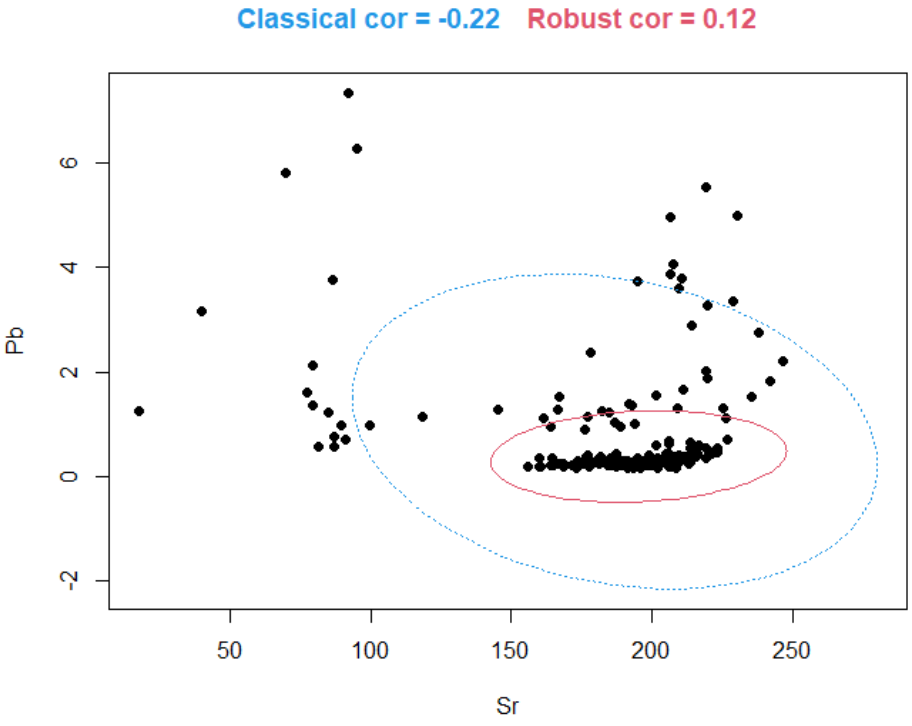
Classical test	Pearson's product-moment correlation data: Od533M_SD$Mg and Od533M_SD$Sr t = 39.904, df = 188, **p-value < 2.2e-16** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.9283560 0.9589761 sample estimates: **cor** **0.9457272**	Spearman's rank correlation rho data: Od533M_SD$Mg and Od533M_SD$Sr S = 160422, **p-value < 2.2e-16** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.8596649**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.8330961**	



- **Pb vs Sr**

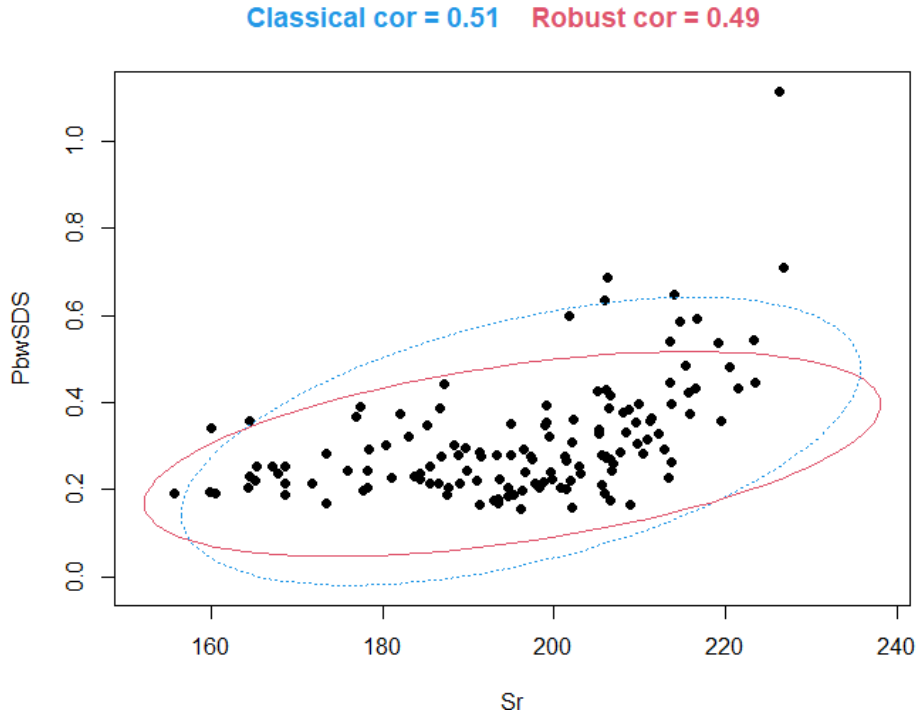
Whole secondary dentinee thickness:

Classical test	Pearson's product-moment correlation data: Od533M_SD$Sr and Od533M_SD$Pb t = -3.0443, df = 188, **p-value = 0.002666** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.34835595 -0.07676657 sample estimates: **cor** **-0.2167512**	Spearman's rank correlation rho data: Od533M_SD$Sr and Od533M_SD$Pb S = 967754, **p-value = 0.03466** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.1534211**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.1233295**	



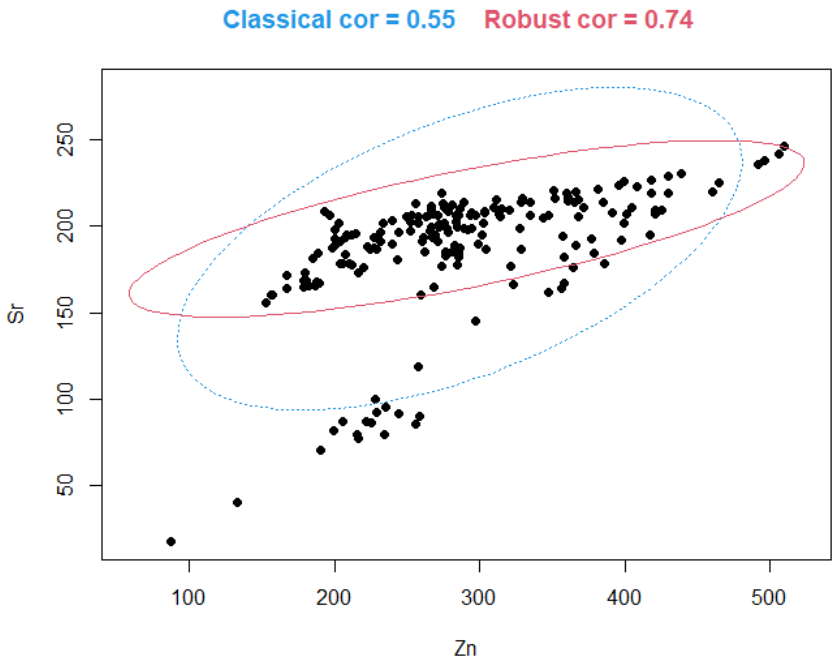
Removing 110 µm of Pb-enriched secondary dentinee surface:

Classical test	Pearson's product-moment correlation data: Od533M_SD_wSDS$Sr and Od533M_SD_wSDS$Pb t = 6.8029, df = 135, **p-value = 3.039e-10** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.3688022 0.6204068 sample estimates: **cor** **0.5052651**	Spearman's rank correlation rho data: Od533M_SD_wSDS$Zn and Od533M_SD_wSDS$Pb S = 106274, **p-value < 2.2e-16** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.7520068**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.4864732**	



- **Sr vs Zn**

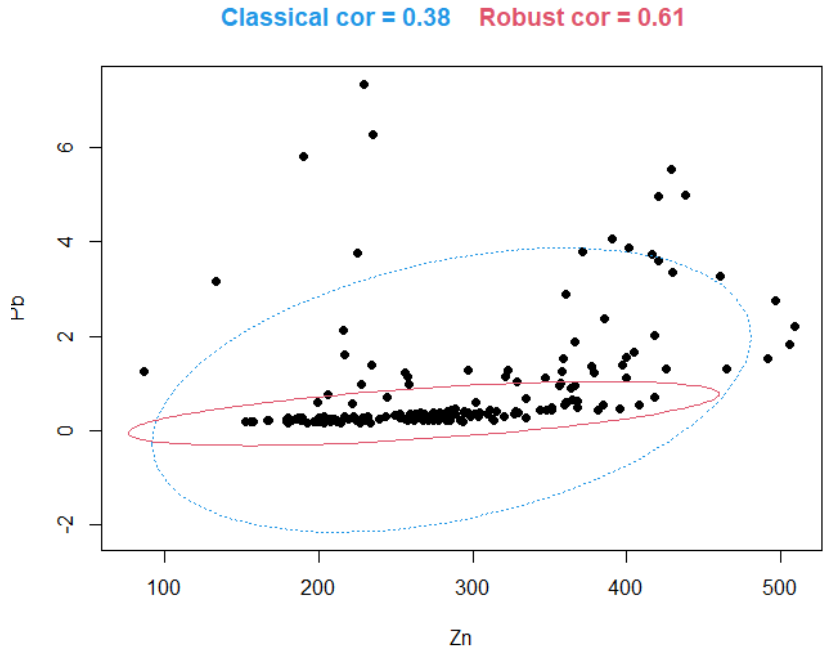
Classical test	Pearson's product-moment correlation data: Od533M_SD$Zn and Od533M_SD$Sr t = 9.0389, df = 188, **p-value < 2.2e-16** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.4427294 0.6424145 sample estimates: **cor** **0.5503947**	Spearman's rank correlation rho data: Od533M_SD$Zn and Od533M_SD$Sr S = 405396, **p-value < 2.2e-16** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.6453647**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.7399384**	



- **Pb vs Zn**

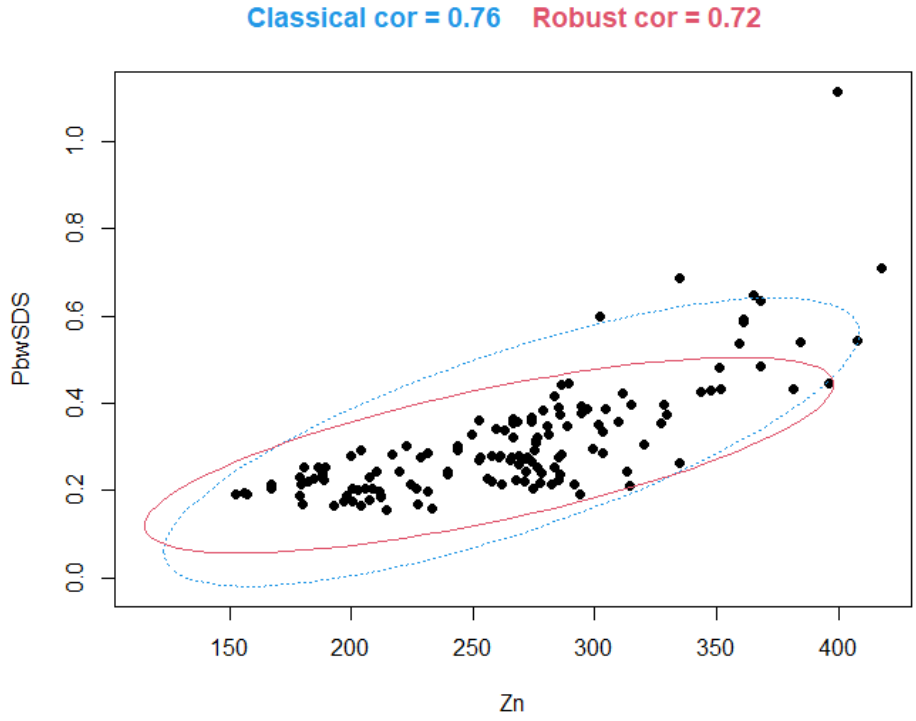
Whole secondary dentinee thickness:

Classical test	Pearson's product-moment correlation data: Od533M_SD$Zn and Od533M_SD$Pb t = 5.5906, df = 188, **p-value = 7.874e-08** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.2485614 0.4933909 sample estimates: **cor** **0.3775555**	Spearman's rank correlation rho data: Od533M_SD$Zn and Od533M_SD$Pb S = 411004, **p-value < 2.2e-16** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.6404589**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.6087622**	



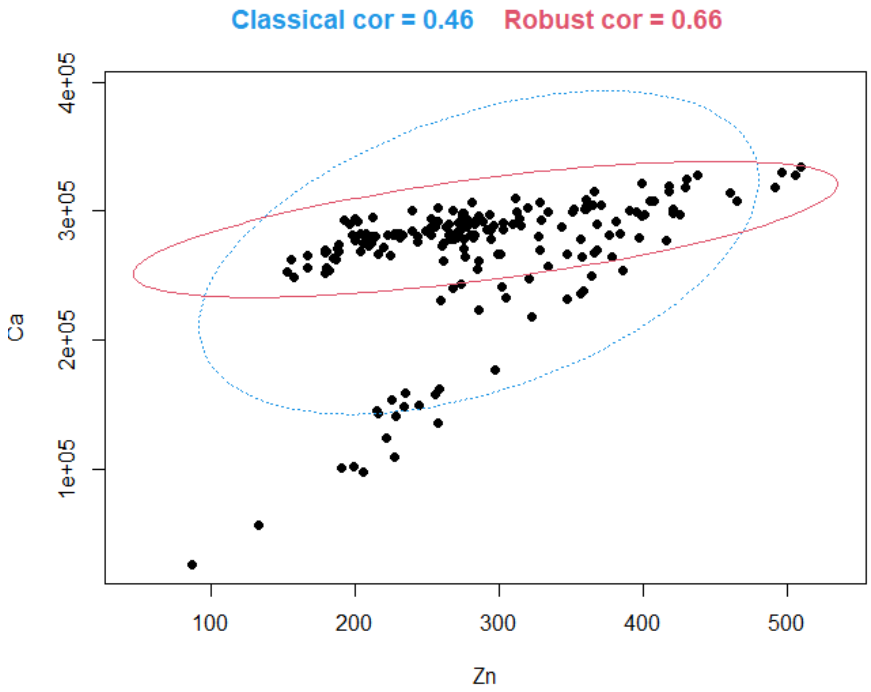
Removing 110 µm of Pb-enriched secondary dentinee surface:

Classical test	Pearson's product-moment correlation data: Od533M_SD_wSDS$Zn and Od533M_SD_wSDS$Pb t = 13.47, df = 135, **p-value < 2.2e-16** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.6752670 0.8207112 sample estimates: **cor** **0.7572247**	Spearman's rank correlation rho data: Od533M_SD_wSDS$Zn and Od533M_SD_wSDS$Pb S = 106274, **p-value < 2.2e-16** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.7520068**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.7244165**	



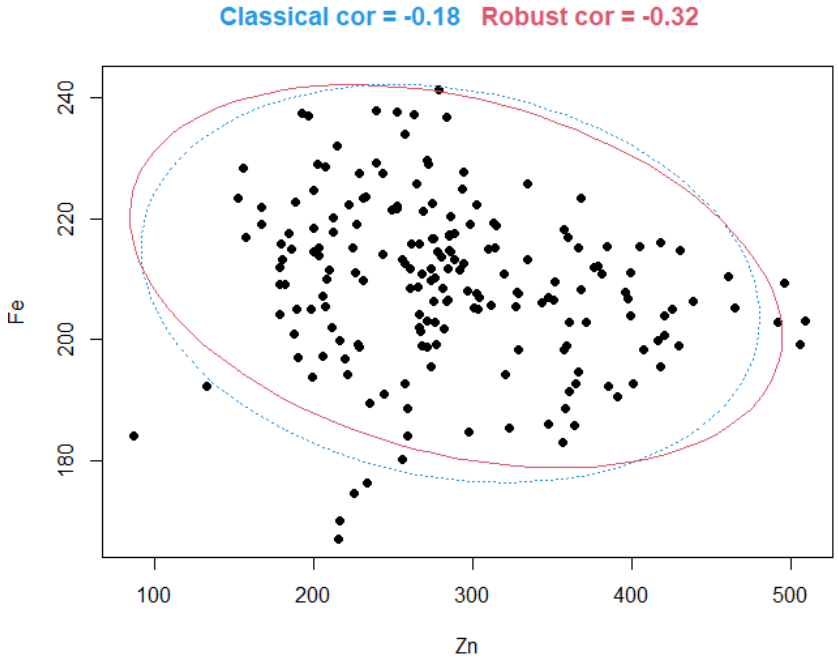
- **Zn vs Ca**

Classical test	Pearson's product-moment correlation data: Od533M_SD$Zn and Od533M_SD$Ca t = 7.0081, df = 188, **p-value = 4.196e-11** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.3344273 0.5611145 sample estimates: **cor** **0.4551141**	Spearman's rank correlation rho data: Od533M_SD$Zn and Od533M_SD$Ca S = 560218, **p-value < 2.2e-16** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.5099284**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.6601464**	



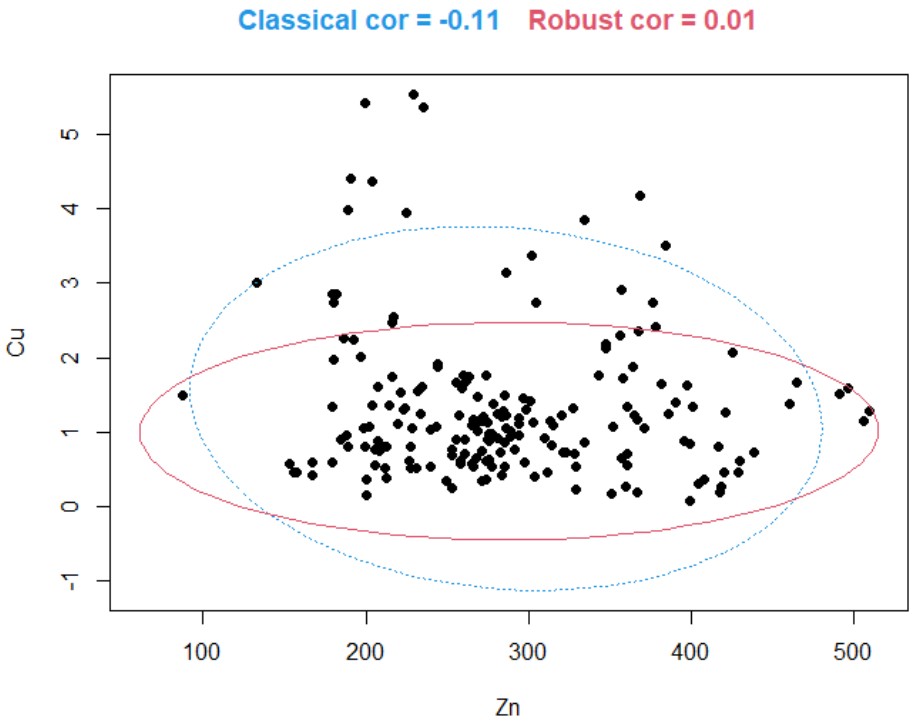
- **Zn vs Fe**

Classical test	Pearson's product-moment correlation data: Od533M_SD$Zn and Od533M_SD$Fe t = -2.455, df = 188, **p-value = 0.015** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.31080458 -0.03476824 sample estimates: **cor** **-0.1762492**	Spearman's rank correlation rho data: Od533M_SD$Zn and Od533M_SD$Fe S = 1399172, **p-value = 0.001936** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **-0.2239779**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **-0.3170197**	



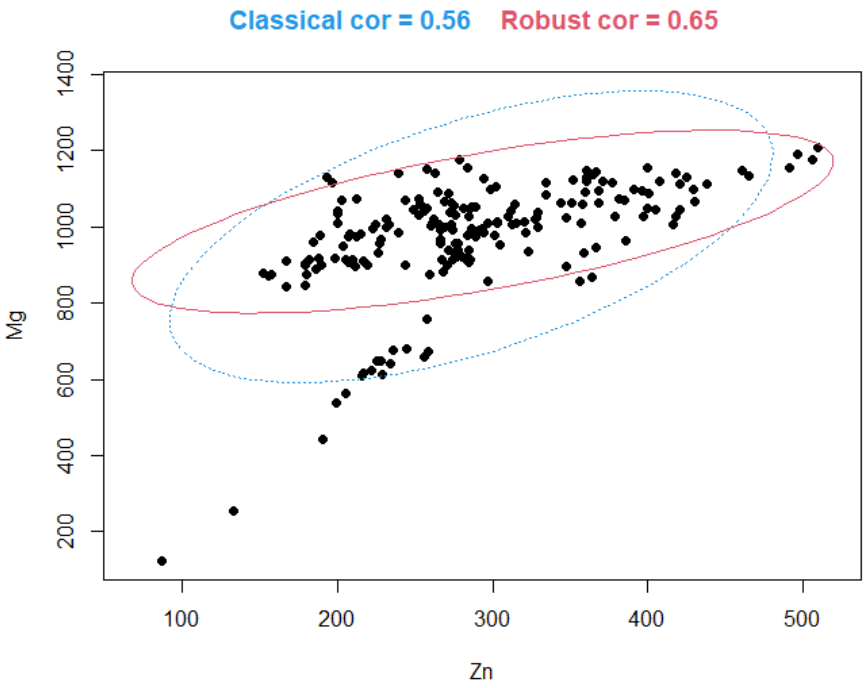
- **Zn vs Cu**

Classical test	Pearson's product-moment correlation data: Od533M_SD$Zn and Od533M_SD$Cu t = -1.4594, df = 188, **p-value = 0.1461** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.24450631 0.03707514 sample estimates: **cor** **-0.1058368**	Spearman's rank correlation rho data: Od533M_SD$Zn and Od533M_SD$Cu S = 1193286, **p-value = 0.5475** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **-0.04387146**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.009811241**	



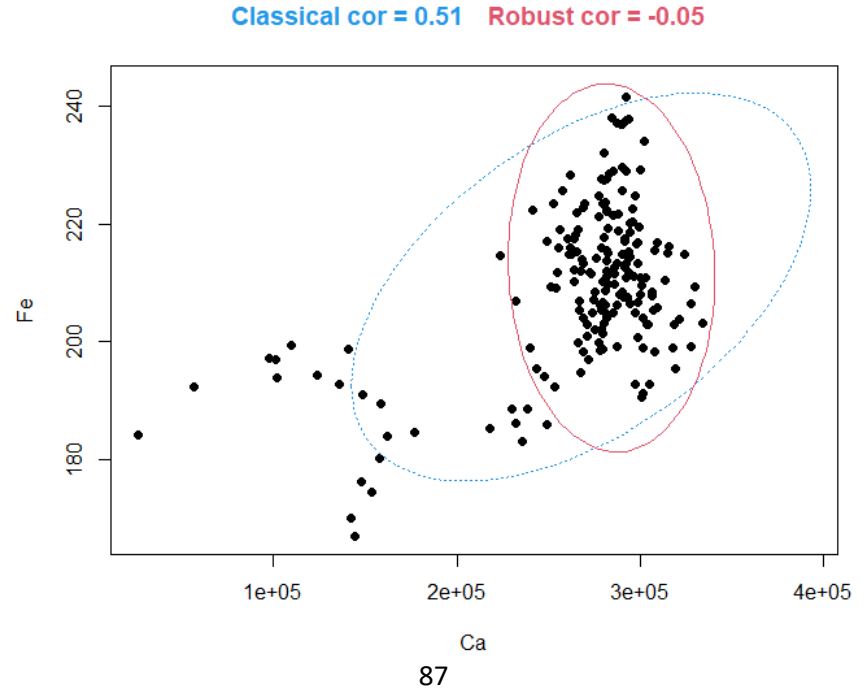
- **Zn vs Mg**

Classical test	Pearson's product-moment correlation data: Od533M_SD$Zn and Od533M_SD$Mg t = 9.3848, df = 188, **p-value < 2.2e-16** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.4594057 0.6545460 sample estimates: **cor** **0.5648209**	Spearman's rank correlation rho data: Od533M_SD$Zn and Od533M_SD$Mg S = 457680, **p-value < 2.2e-16** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.5996273**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.6538013**	



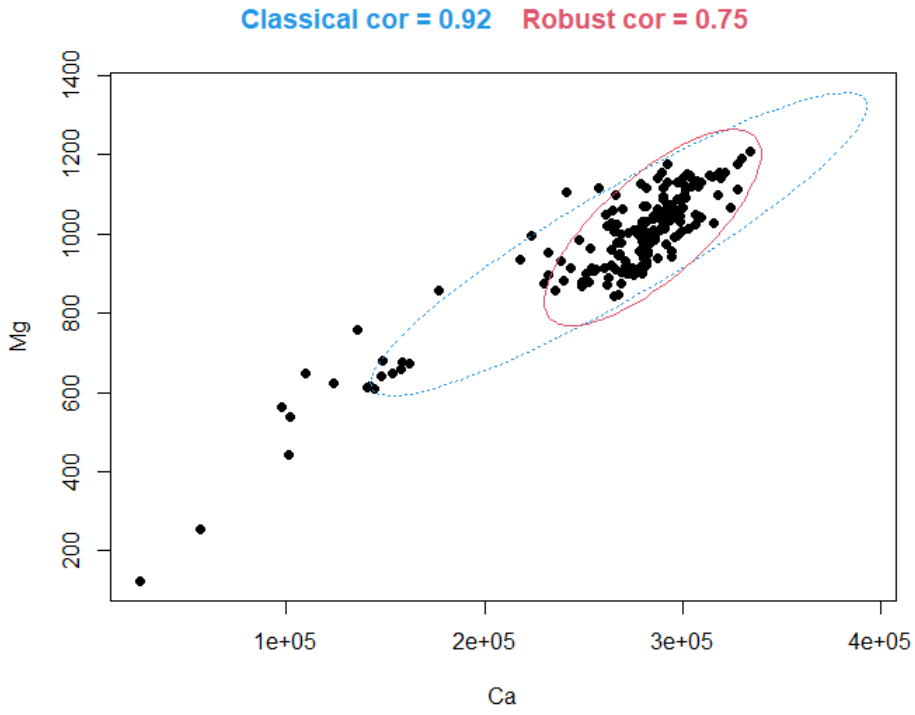
- **Ca vs Fe**

Classical test	Pearson's product-moment correlation data: Od533M_SD$Ca and Od533M_SD$Fe t = 8.0258, df = 188, **p-value = 1.063e-13** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.3909232 0.6040775 sample estimates: **cor** **0.5051645**	Spearman's rank correlation rho data: Od533M_SD$Ca and Od533M_SD$Fe S = 832466, **p-value = 0.0001572** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.2717693**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **-0.05379779**	



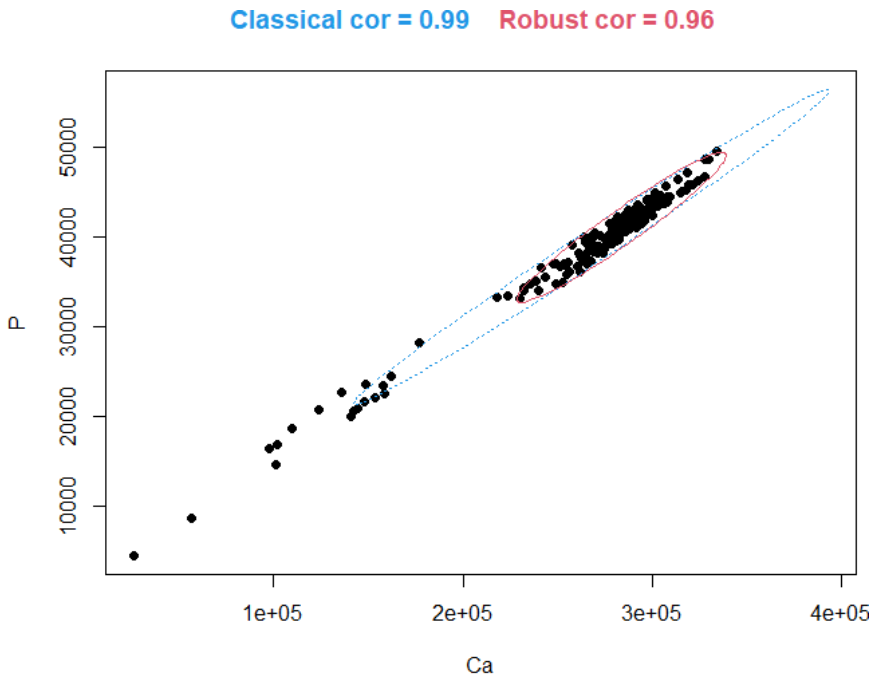
- **Ca vs Mg**

	Pearson's product-moment correlation	Spearman's rank correlation rho
Classical test	data: Od533M_SD$Ca and Od533M_SD$Mg t = 31.118, df = 188, **p-value < 2.2e-16** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.8884944 0.9355818 sample estimates: **cor** **0.9151051**	data: Od533M_SD$Ca and Od533M_SD$Mg S = 236192, **p-value < 2.2e-16** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.7933822**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.7510065**	



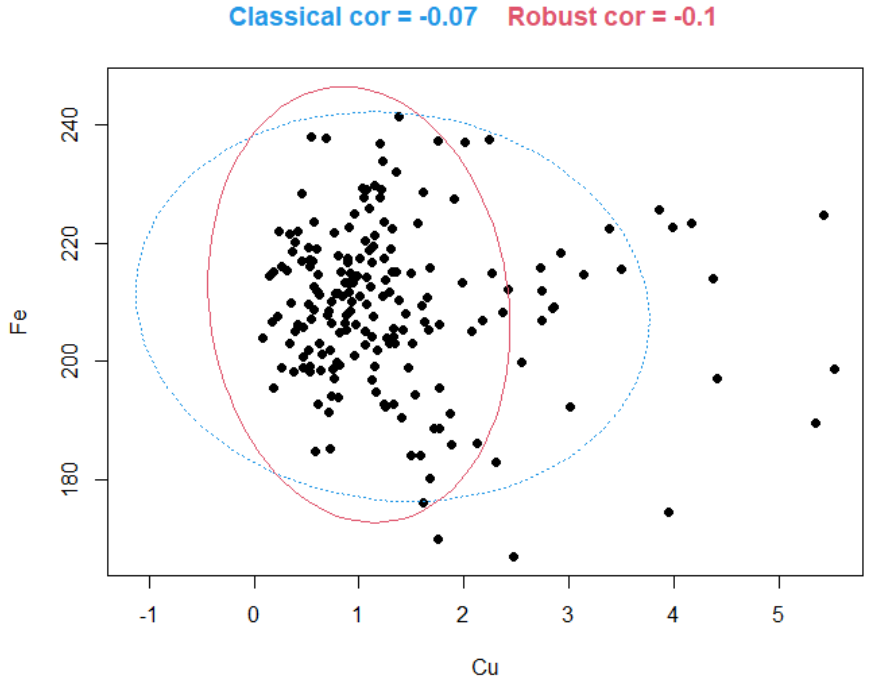
- **Ca vs P**

	Pearson's product-moment correlation	Spearman's rank correlation rho
Classical test	data: Od533M_SD$Ca and Od533M_SD$P t = 113.46, df = 188, **p-value < 2.2e-16** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.9903906 0.9945722 sample estimates: **cor** **0.9927769**	data: Od533M_SD$Ca and Od533M_SD$P S = 36556, **p-value < 2.2e-16** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.9680213**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.9609519**	



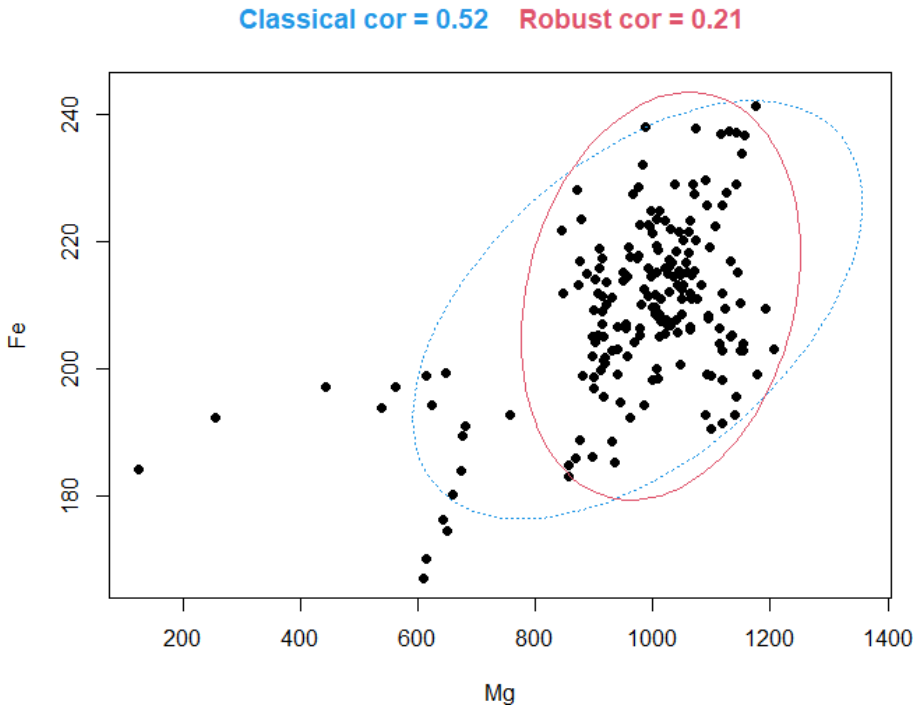
- **Cu vs Fe**

	Pearson's product-moment correlation	Spearman's rank correlation rho
Classical test	data: Od533M_SD$Cu and Od533M_SD$Fe t = -0.99885, df = 188, **p-value = 0.3192** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.21280835 0.07042566 sample estimates: **cor** **-0.07265607**	data: Od533M_SD$Cu and Od533M_SD$Fe S = 1199798, **p-value = 0.4967** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **-0.04956807**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **-0.1037514**	



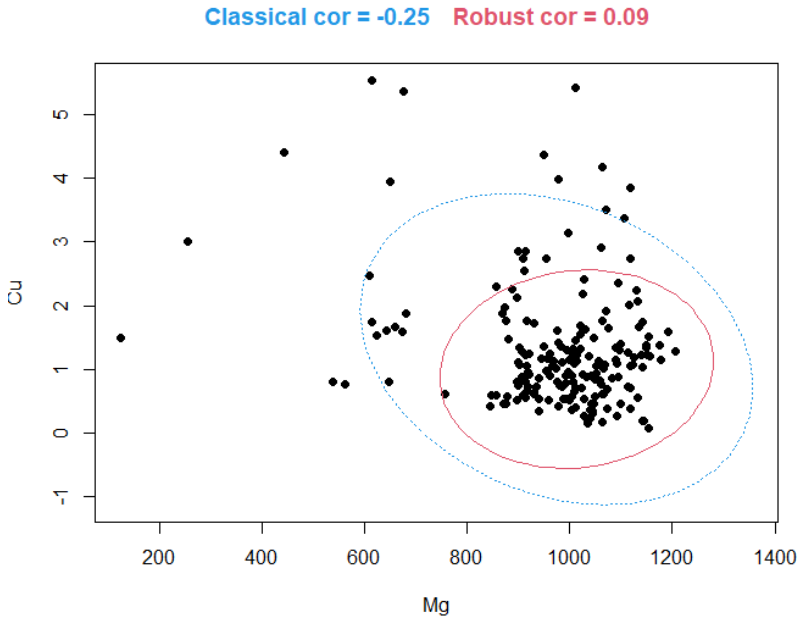
- **Mg vs Fe**

	Pearson's product-moment correlation	Spearman's rank correlation rho
Classical test	data: Od533M_SD$Mg and Od533M_SD$Fe t = 8.243, df = 188, **p-value = 2.823e-14** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.4024041 0.6126594 sample estimates: **cor** **0.5152425**	data: Od533M_SD$Mg and Od533M_SD$Fe S = 717378, **p-value = 1.513e-07** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.3724468**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.2092387**	



- **Cu vs Mg**

	Pearson's product-moment correlation	Spearman's rank correlation rho
Classical test	data: Od533M_SD$Mg and Od533M_SD$Cu t = -3.5432, df = 188, **p-value = 0.0004986** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.3790493 -0.1118258 sample estimates: **cor** **-0.2501963**	data: Od533M_SD$Mg and Od533M_SD$Cu S = 1249146, **p-value = 0.203** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **-0.09273708**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.08609909**	

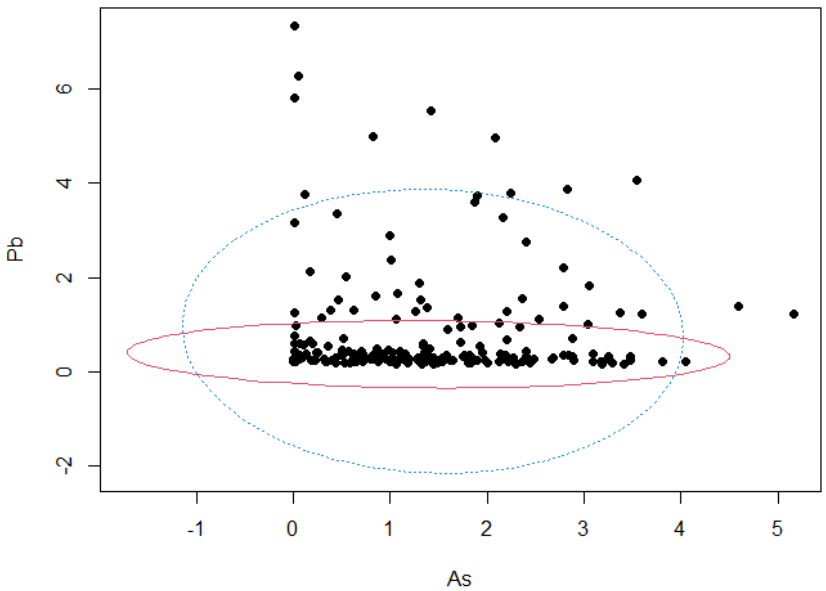


- **As vs Hg, Pb vs Hg (no Hg at all). => Not Applicable.**

- **Pb vs As**

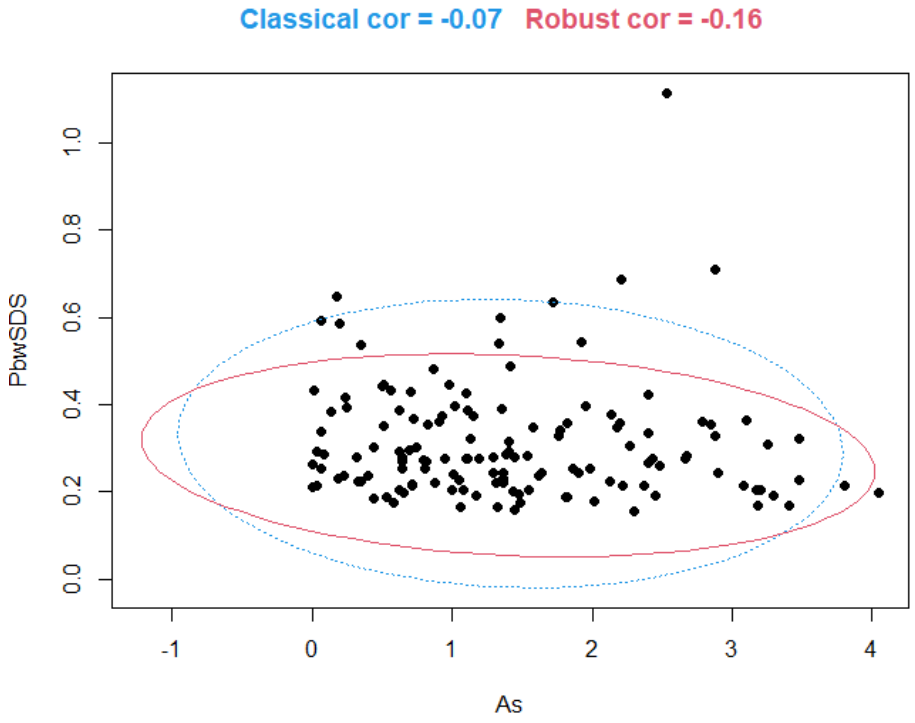
Whole secondary dentinee thickness:

	Pearson's product-moment correlation	Spearman's rank correlation rho
Classical test	data: Od533M_SD$As and Od533M_SD$Pb t = -0.57847, df = 188, **p-value = 0.5636** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.1834048 0.1008063 sample estimates: **cor** **-0.04215196**	data: Od533M_SD$As and Od533M_SD$Pb S = 1228634, **p-value = 0.3048** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **-0.07479344**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **-0.05585069**	



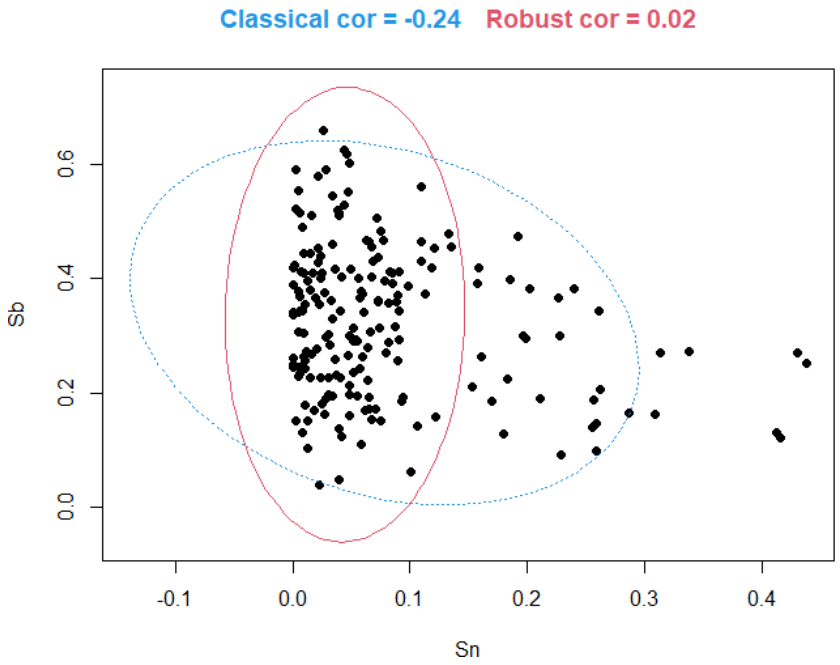
Removing 110 µm of Pb-enriched secondary dentinee surface:

Classical test	Pearson's product-moment correlation data: Od533M_SD_wSDS$As and Od533M_SD_wSDS$Pb t = -0.79052, df = 135, **p-value = 0.4306** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.2329440 0.1009847 sample estimates: **cor** **-0.0678805**	Spearman's rank correlation rho data: Od533M_SD_wSDS$As and Od533M_SD_wSDS$Pb S = 490286, **p-value = 0.09296** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **-0.1440952**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **-0.1582813**	



- **Sb vs Sn**

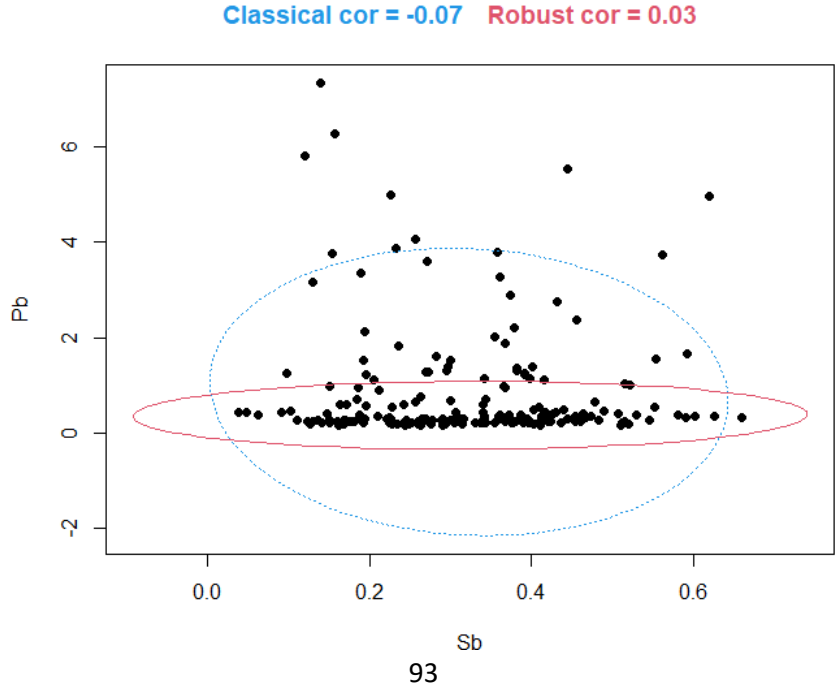
Classical test	Pearson's product-moment correlation data: Od533M_SD$Sn and Od533M_SD$Sb t = -3.4518, df = 188, **p-value = 0.0006878** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.3735037 -0.1054417 sample estimates: **cor** **-0.2441307**	Spearman's rank correlation rho data: Od533M_SD$Sn and Od533M_SD$Sb S = 1315916, **p-value = 0.03746** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **-0.1511466**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.023168**	



- **Pb vs Sb**

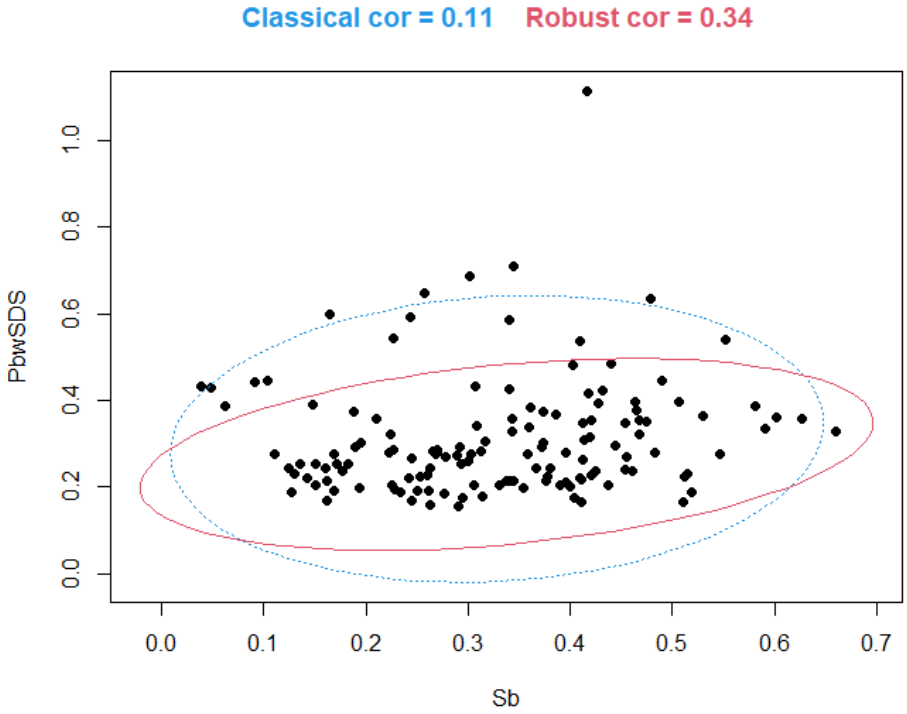
Whole secondary dentinee thickness:

Classical test	Pearson's product-moment correlation data: Od533M_SD$Sb and Od533M_SD$Pb t = -0.93918, df = 188, **p-value = 0.3488** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.20866014 0.07474378 sample estimates: **cor** **-0.06833665**	Spearman's rank correlation rho data: Od533M_SD$Sb and Od533M_SD$Pb S = 1110492, **p-value = 0.6955** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.02855568**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.03371059**	



Removing 110 µm of Pb-enriched secondary dentinee surface:

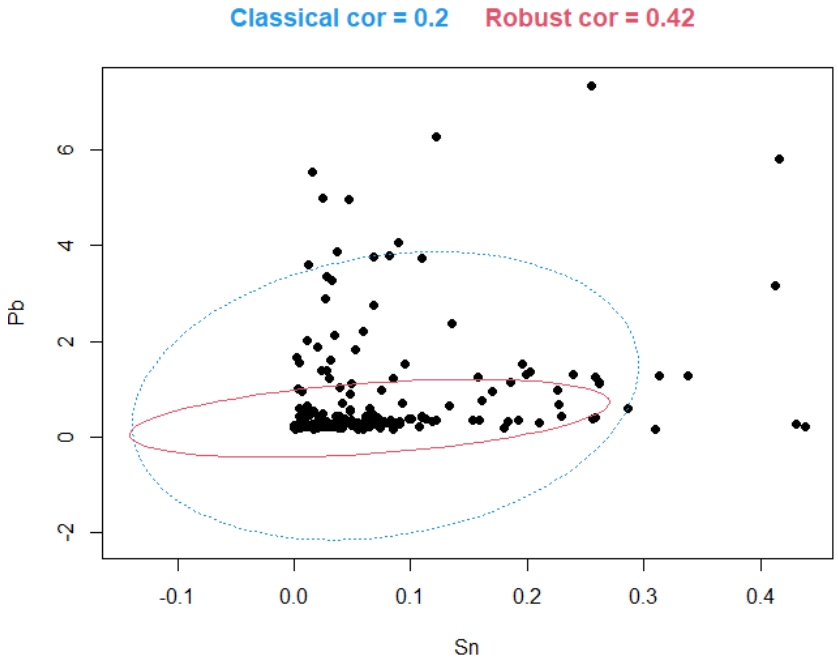
Classical test	Pearson's product-moment correlation data: Od533M_SD_wSDS$Sb and Od533M_SD_wSDS$Pb t = 1.284, df = 135, **p-value = 0.2013** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.05896091 0.27253560 sample estimates: **cor** **0.1098408**	Spearman's rank correlation rho data: Od533M_SD_wSDS$Sb and Od533M_SD_wSDS$Pb S = 356020, **p-value = 0.04817** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.169218**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.340878**	



- **Pb vs Sn**

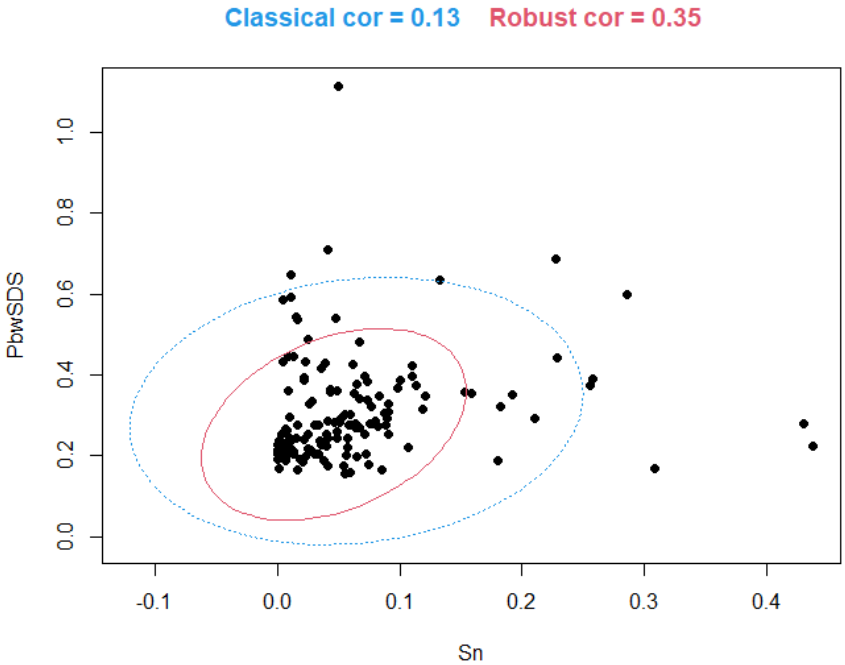
Whole secondary dentinee thickness:

Classical test	Pearson's product-moment correlation data: Od533M_SD$Sn and Od533M_SD$Pb t = 2.8353, df = 188, **p-value = 0.005079** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.06193476 0.33519342 sample estimates: **cor** **0.2025027**	Spearman's rank correlation rho data: Od533M_SD$Sn and Od533M_SD$Pb S = 805144, **p-value = 3.737e-05** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.2956702**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.424453**	



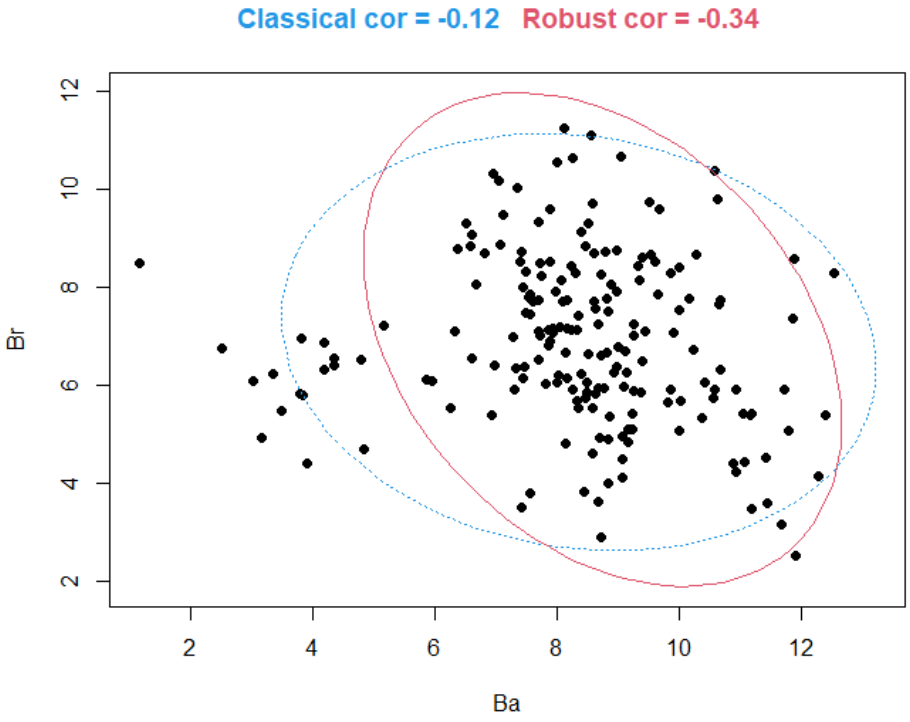
Removing 110 µm of Pb-enriched secondary dentinee surface:

Classical test	Pearson's product-moment correlation data: Od533M_SD_wSDS$Sn and Od533M_SD_wSDS$Pb t = 1.5529, df = 135, **p-value = 0.1228** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.0360418 0.2936653 sample estimates: **cor** **0.1324745**	Spearman's rank correlation rho data: Od533M_SD_wSDS$Sn and Od533M_SD_wSDS$Pb S = 304920, **p-value = 0.0006611** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **0.2884612**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **0.3515933**	



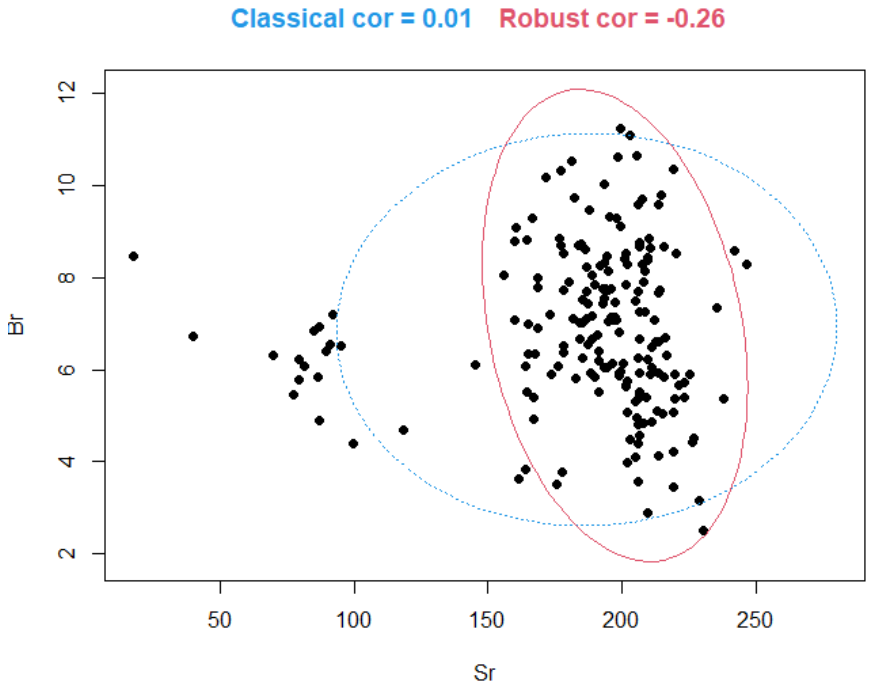
- **Br vs Ba**

Classical test	Pearson's product-moment correlation data: Od533M_SD$Ba and Od533M_SD$Br t = -1.6732, df = 188, **p-value = 0.09595** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.2590202 0.0215923 sample estimates: **cor** **-0.1211334**	Spearman's rank correlation rho data: Od533M_SD$Ba and Od533M_SD$Br S = 1364608, **p-value = 0.007479** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **-0.1937418**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **-0.3389472**	



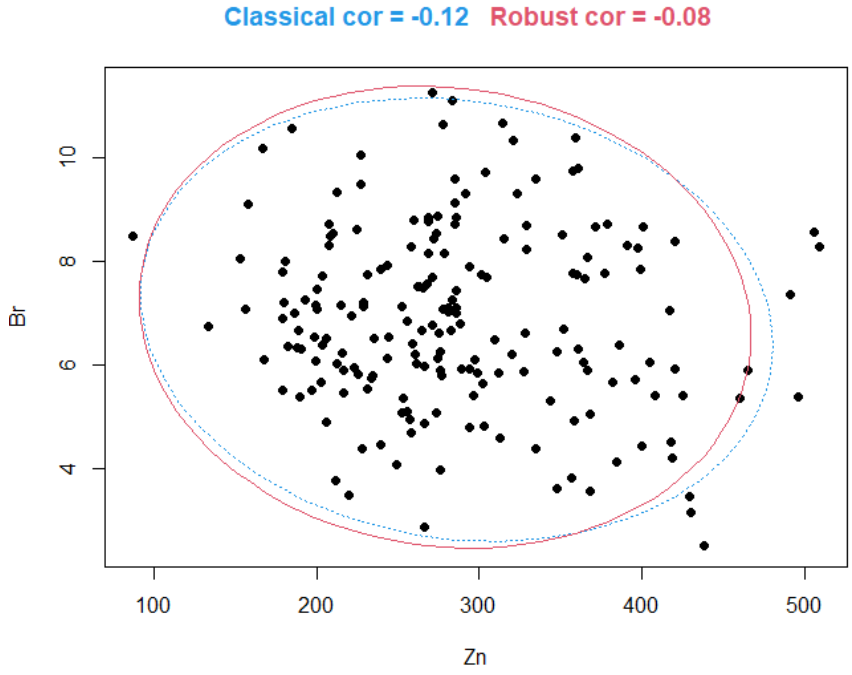
- **Br vs Sr**

Classical test	Pearson's product-moment correlation data: Od533M_SD$Sr and Od533M_SD$Br t = 0.19459, df = 188, **p-value = 0.8459** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.1284221 0.1562284 sample estimates: **cor** **0.01419062**	Spearman's rank correlation rho data: Od533M_SD$Sr and Od533M_SD$Br S = 1275574, **p-value = 0.1114** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **-0.115856**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **-0.2620026**	



- **Br vs Zn**

Classical test	Pearson's product-moment correlation data: Od533M_SD$Zn and Od533M_SD$Br t = -1.6138, df = 188, **p-value = 0.1083** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.25499849 0.02589603 sample estimates: **cor** **-0.1168882**	Spearman's rank correlation rho data: Od533M_SD$Zn and Od533M_SD$Br S = 1232840, **p-value = 0.2816** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **-0.0784728**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **-0.08039107**	



- **Br vs Ca**

Classical test	Pearson's product-moment correlation data: Od533M_SD$Ca and Od533M_SD$Br t = 0.59652, df = 188, **p-value = 0.5515** alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.09950427 0.18467540 sample estimates: **cor** **0.04346472**	Spearman's rank correlation rho data: Od533M_SD$Ca and Od533M_SD$Br S = 1193966, **p-value = 0.5421** alternative hypothesis: true rho is not equal to 0 sample estimates: **rho** **-0.04446631**
MCD (α=0.05; quant=0.8)	$cor.rob [1] **-0.2620026**