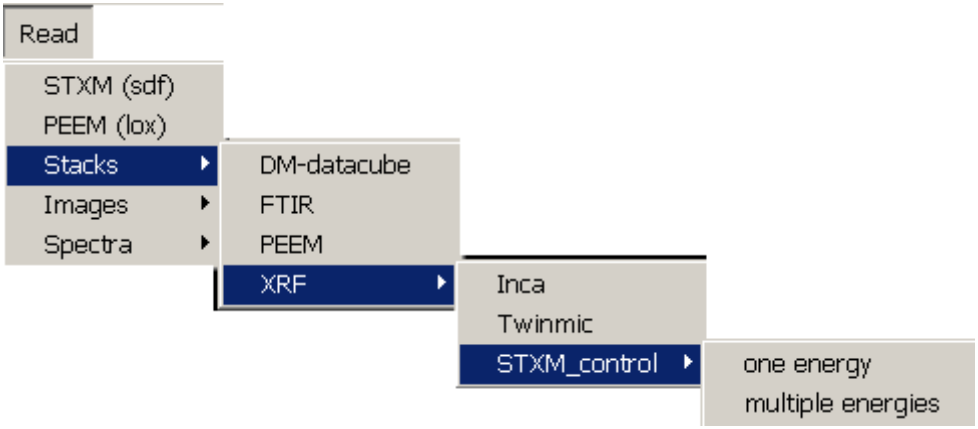
Converting X-ray Fluorescence stacks

GOAL: describe methods to convert X-ray florescence data at multiple spatial points recorded by various systems to a standard aXis2000 binary stack (*.ncb)



Types
Inca - from Oxford EDX systems (on Tescan VegaII SEM @ Mac)
Twinmic - from XGLabs SDD data recorded by Twinmic system
STXM_control - written by STXM_control for acquisition by
Amptek (ALS 11.0.2)
XGLabs (CLS-STXM)
one energy - XRF spectra at each pixel in an image at one photon energy
multiple energies - XRF stacks at a set of photon energies
(not described in this document)

EXAMPLES

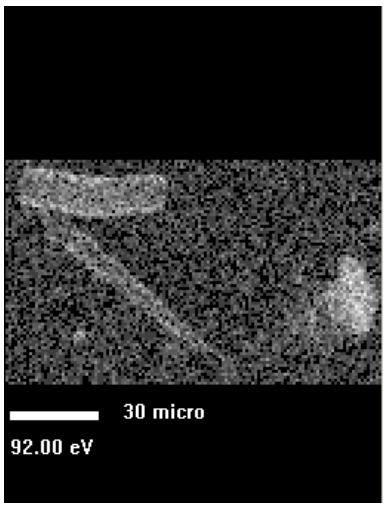
Inca	Ni10-map3 - river biofilm exposed to 10 ppm Ni
Twinmic	091207_145613 - Fe rich biofilm (Obst Dec 7, 2009)
STXM_control	11-100123013 As-loaded biofilm

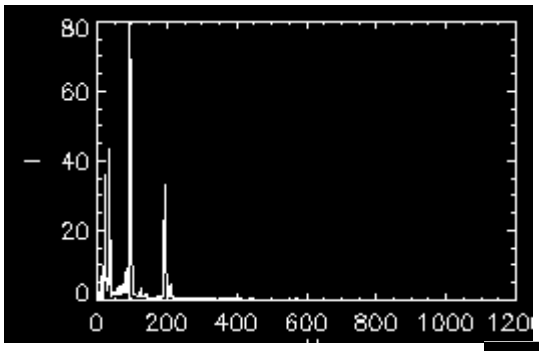
Inca XRF maps

Ni10-map3 - may23, 2010

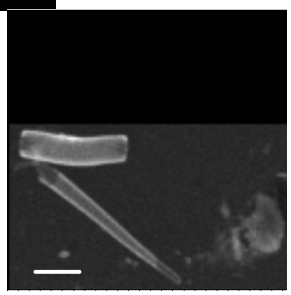
Ni10-map3.(raw, rpl) ⟶ Ni10-map3.(dat, ncb)

NB Inca stores only square arrays even if user selects sub-rectangle
(x,y are pixel number, not distance); E-axis is in channels, not X-ray energy



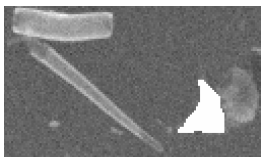


Spatial truncation and E-calibration can be done in stack_analyze

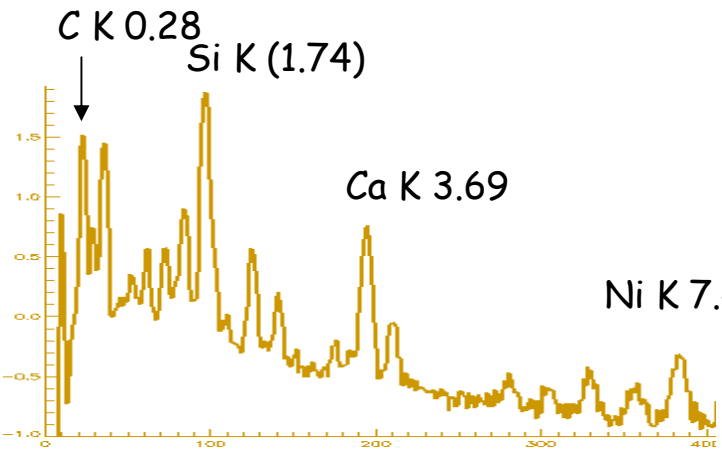


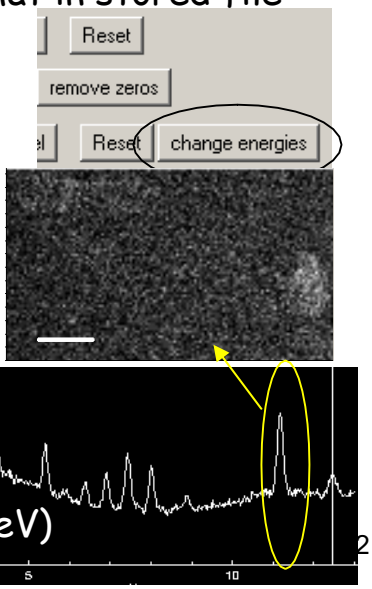
Spatial truncate -read stack into stack_analyze
generate average image
read into aXis2000 to find that 74 is upper row
write out stack and define upper row as 74

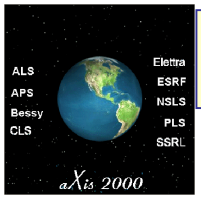
Energy calibrate -read stack into stack_analyze



select metal rich region
write out spectrum of that region
read spectrum into aXis2000
calibrate spectrum using known XRF lines
write out calibrated spectrum
in stack_analyze, change energies to that in stored file







Twinmic XRF maps

Reads data (*.dta) from new software (post Dec-09 detectors)

Method
^^^^^^

1. select first file (**091207_145613_Sum_0330.dta**)
2 select last file (**091207_145613_Sum_0350.dta**)
3. select name of folder for *.cts files (input to PyMCA)
4. define # of columns of map (X) **7**
5 define # of rows of map (Y) **3**
6 define upper cut-off energy (eV) in XRF scale (**4150 eV**)
7. select name of stack

Writes *.(dat,ncb) and puts sum of all XRF spectra into buffer 0

Fe hot spot

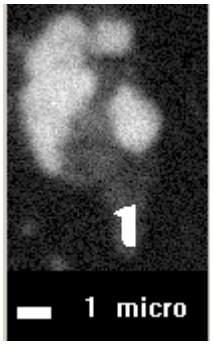
E-scale, and positional scales are not accurate - need to be set in stack_analyze

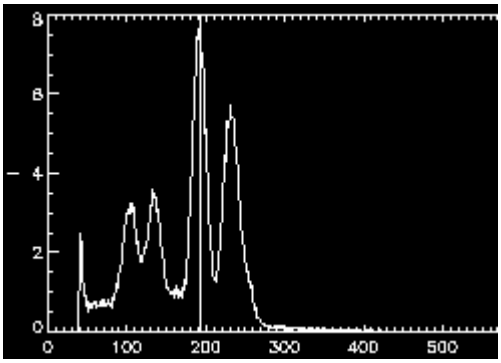
STXM_Control XRF maps

11_100123013.xrf → 11_100123013.(dat,ncb)

Unwashed Lake Constance (Fe.As) biofilm

E-scale uncalibrated; spatial scale is calibrated





Energy calibration - see description for Inca XRF files

XRF spectra of selected regions