



Identification and Classification of Bio-geophysical Parameters in Plymouth Coastal Waters, UK.



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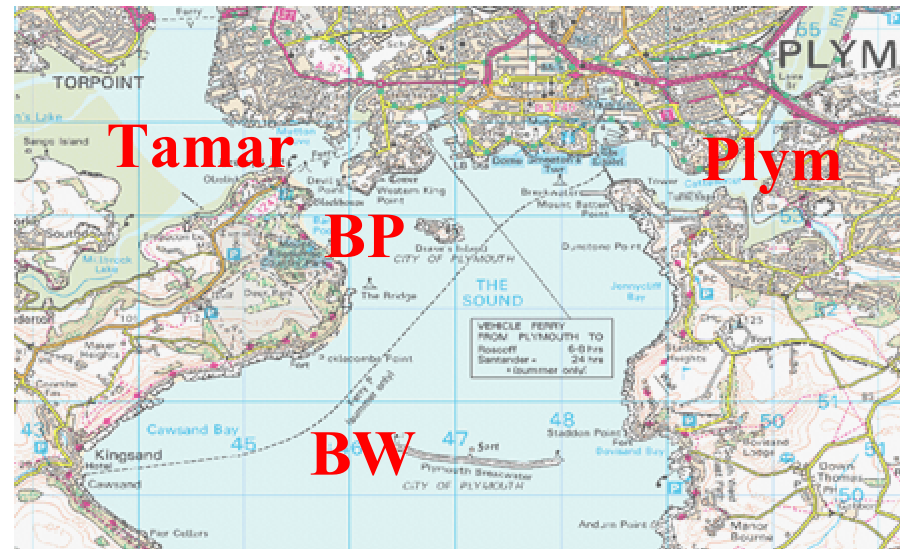
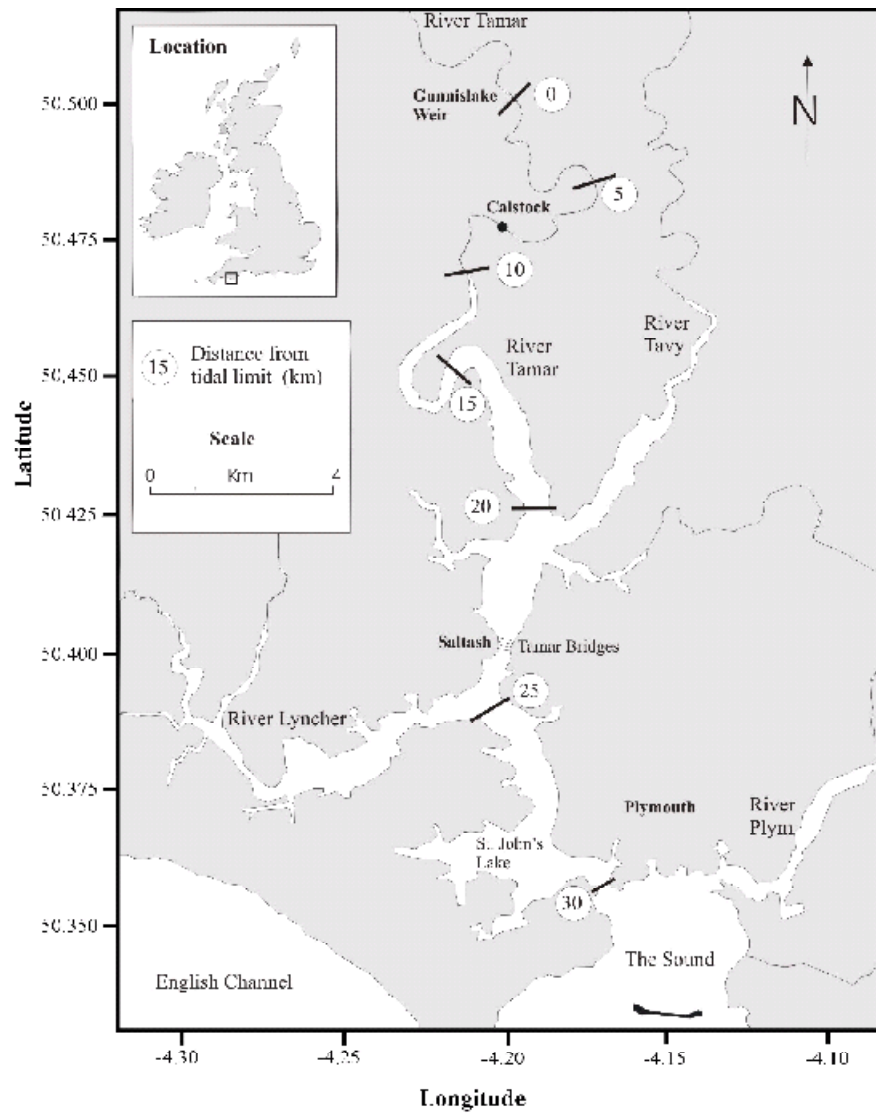
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- Investigate the influence of estuarine and coastal particulate material on the marine optical environment.
- Understand the hyperspectral behaviour of optically complex coastal waters
- Classify the suspended particulate matter (using techniques that include total concentration, organic/inorganic ratios, particle size, particulate absorption, atomic absorption spectroscopy and x-ray diffraction)
- Take measurements of the dissolved fraction





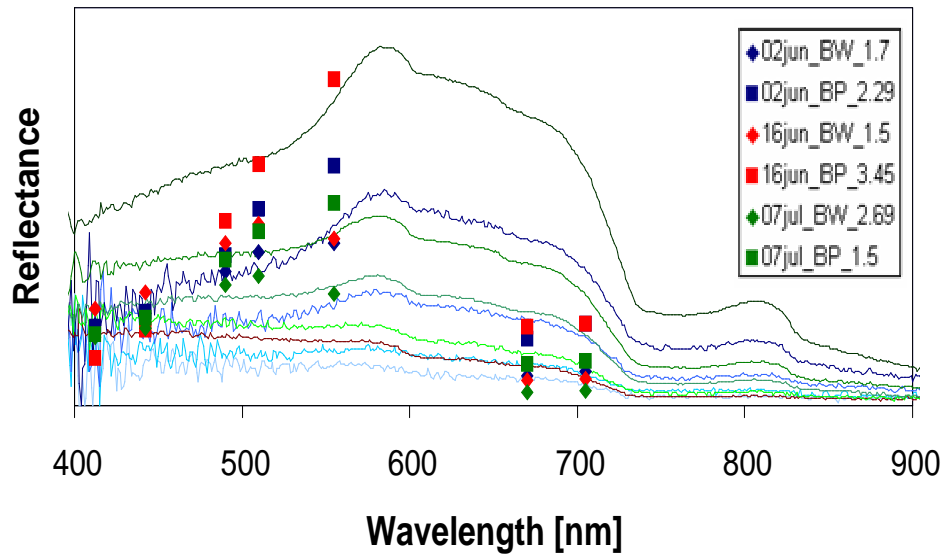
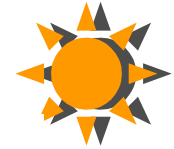
Location.



Plymouth provides an ideal location to study case-II waters as the Plym has a dominant geological source and the Tamar has a mixture of geological sources.

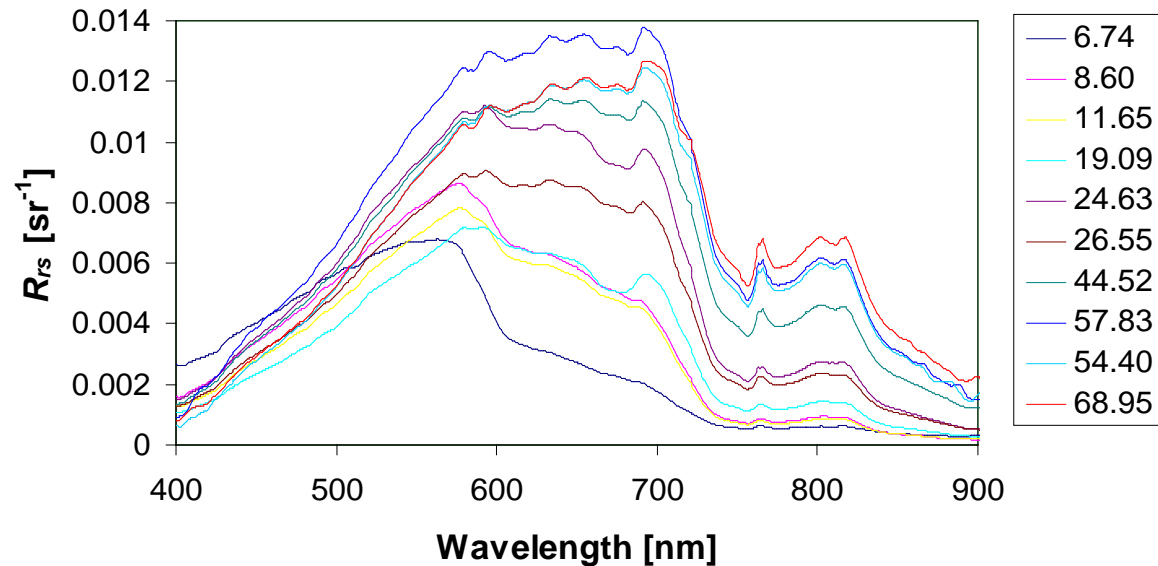


Hyperspectral signature of the Plymouth estuarine waters.

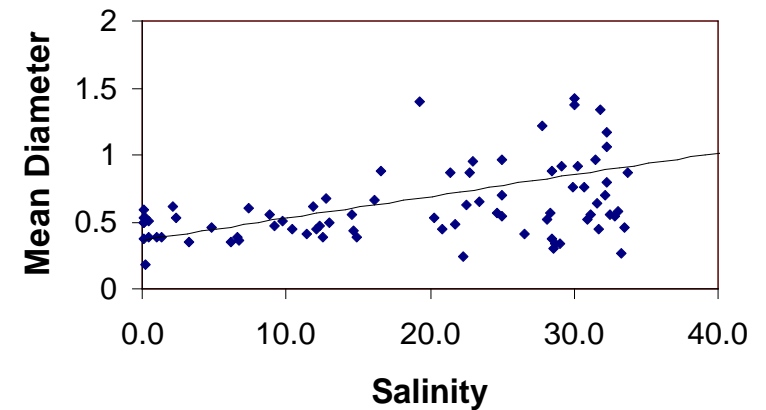
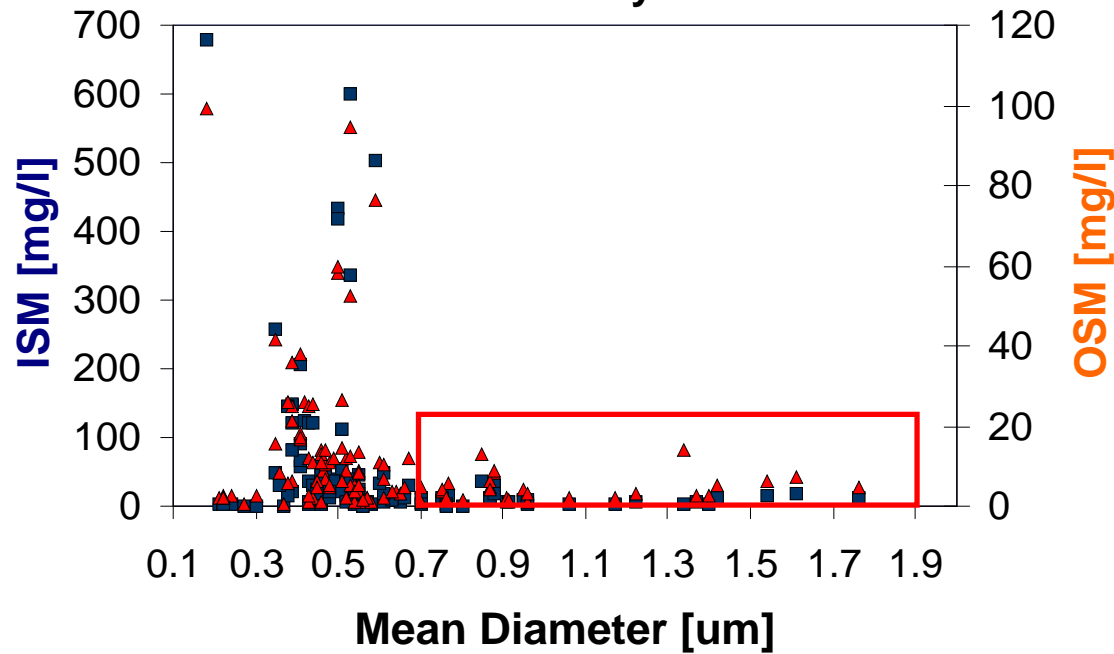
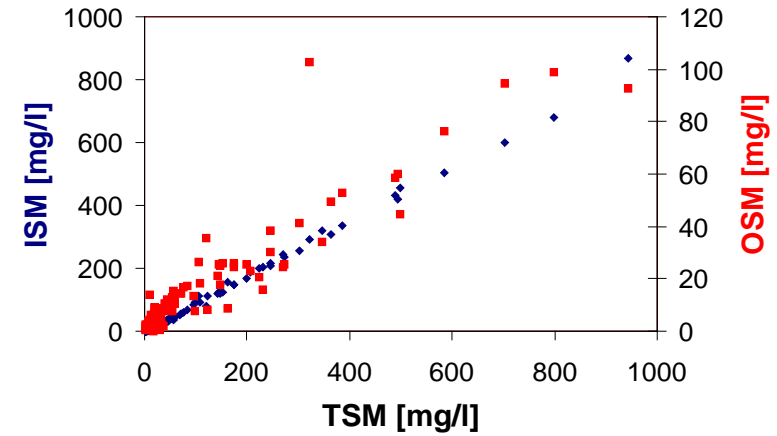
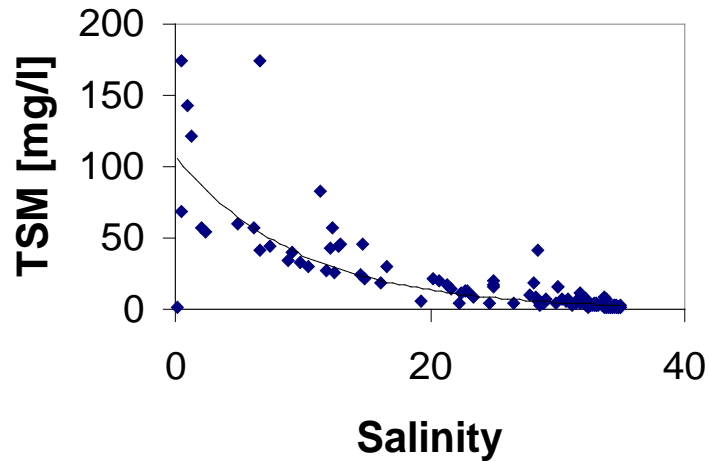


Spectra measured in an tank using inorganic samples from the Tamar and points derived from underwater light profiles taken in Barn Pool (just outside the mouth).

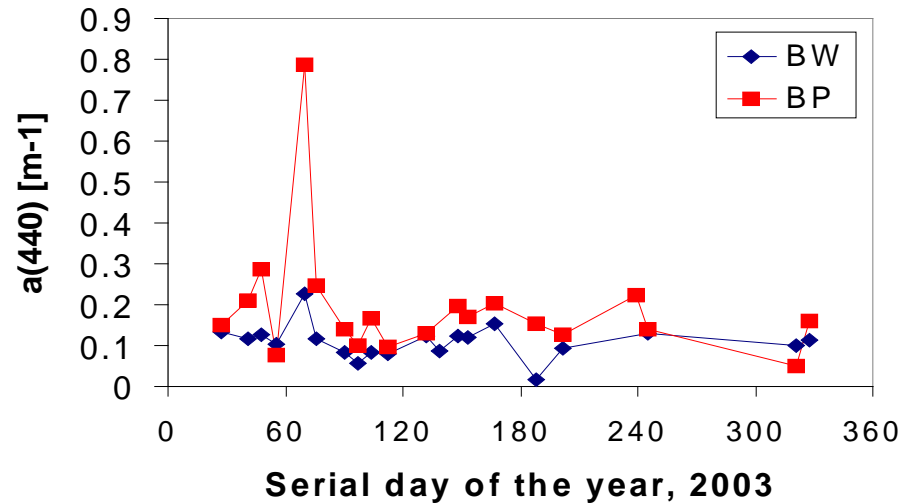
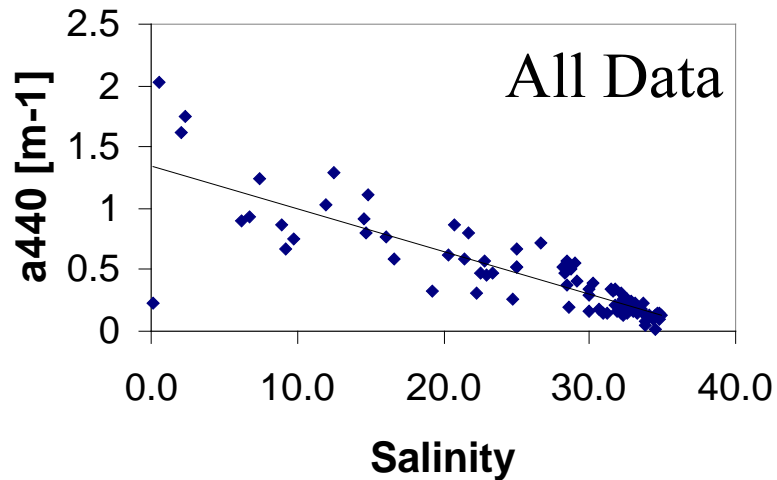
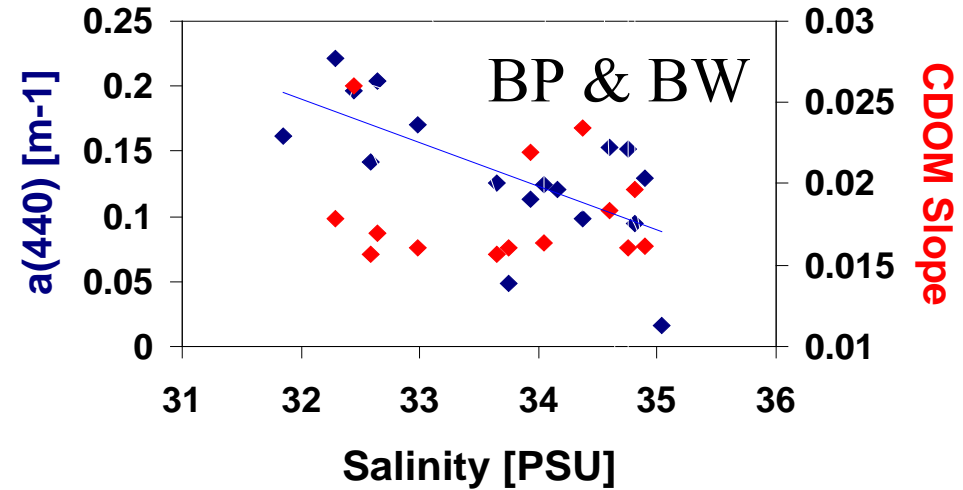
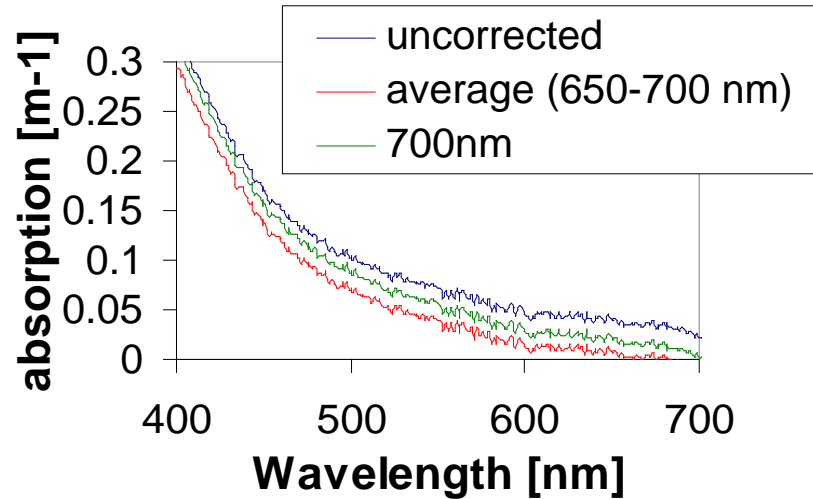
Spectra taken along the Tamar (from mouth to Calstock) 20/11/2003.



How does the SPM vary spatially and temporally?



How does CDOM vary spatially and temporally?



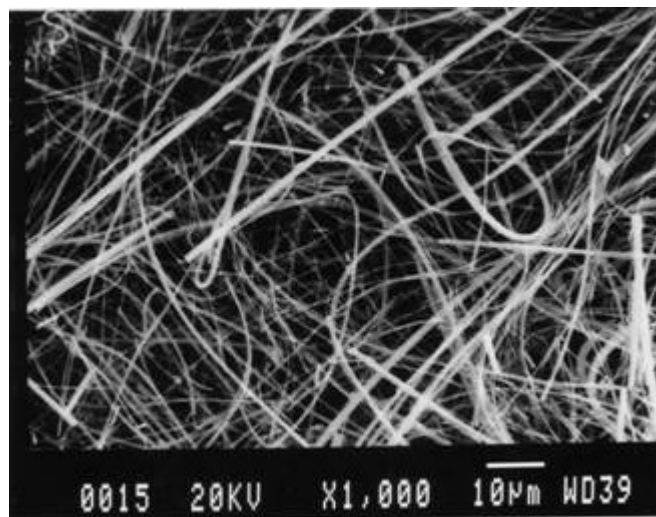


Geo-chemical status of the particulate material in collaboration with Camborne School of Mines

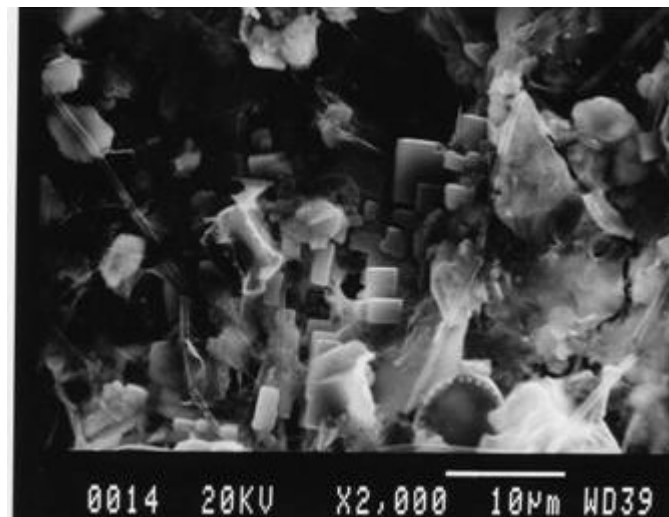
Techniques being investigated:

- Atomic Absorption Spectroscopy (AAS)
- X-Ray Diffraction (XRD)
- Scanning Electron Microscopy (SEM) & Energy Dispersive X-ray Analysis (EDAX)

GFF filter paper



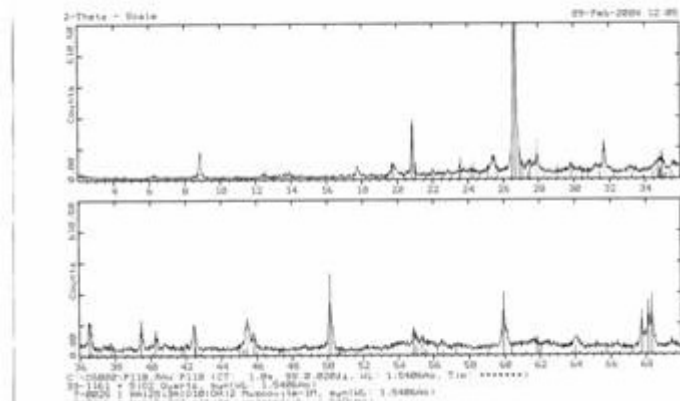
Cubic crystals of Halite (NaCl)



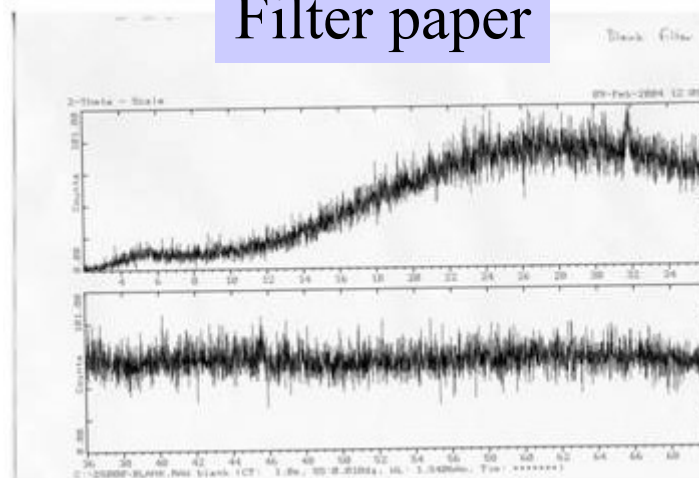


XRD Analysis

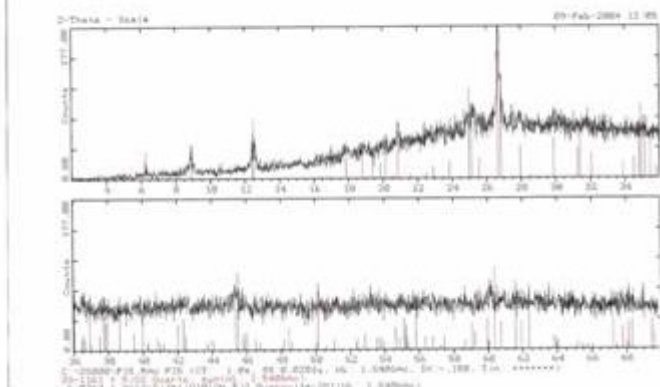
Sample not on a filter paper



Filter paper



Sample on a filter paper

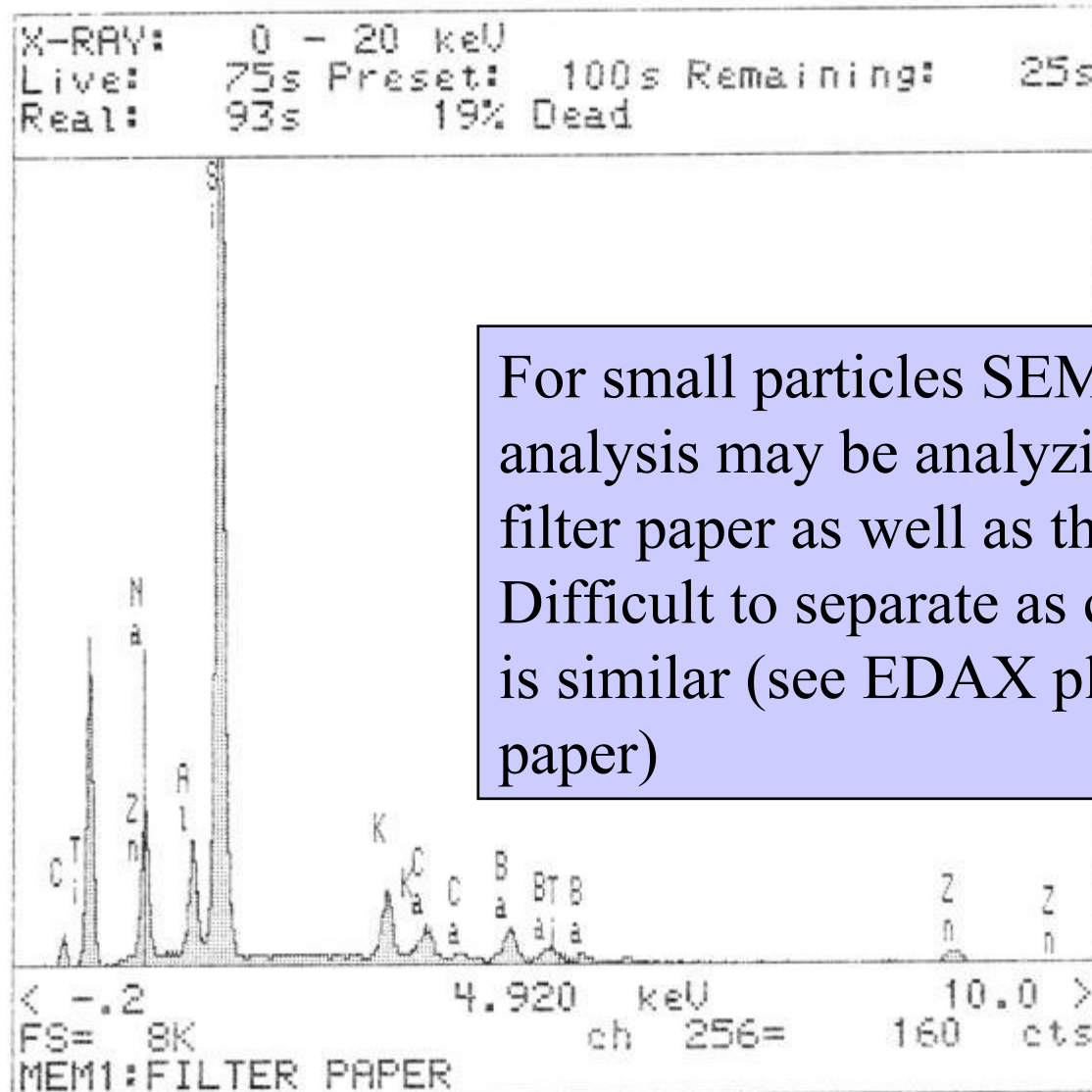


Minerals in order of relative abundance

| | | | |
|---------------------------|-----------|-----------|-----------|
| Calstock | Quartz | Muscovite | Kaolinite |
| Tamar | Quartz | Muscovite | Kaolinite |
| Tamar | Quartz | Kaolinite | Muscovite |
| Barn Pool (Mar to Aug) | Quartz | Muscovite | Kaolinite |
| P Sound (W) | Quartz | Kaolinite | Muscovite |
| Plym Estuary | Kaolinite | Muscovite | |
| Plym Estuary | Kaolinite | Quartz | Muscovite |



Problems with quantitative SEM EDAX analysis

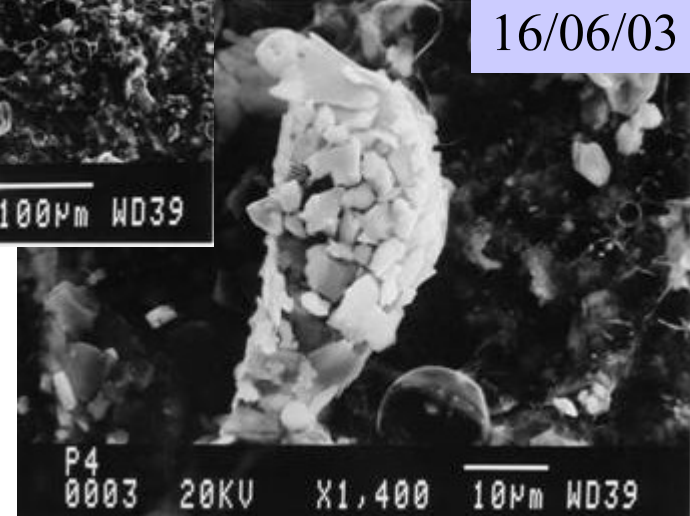
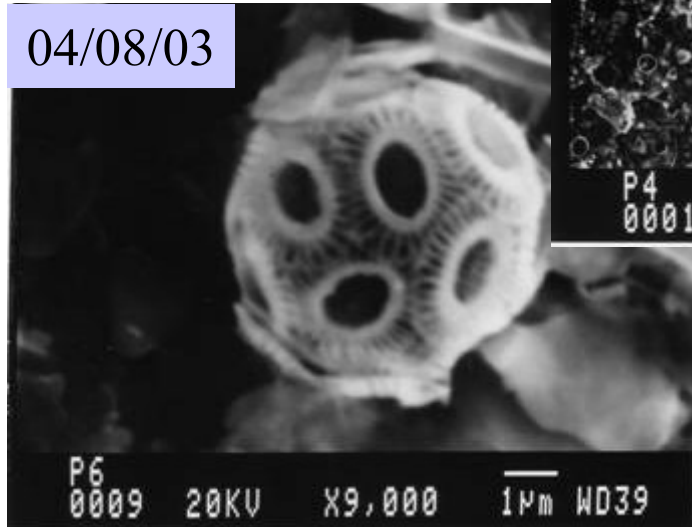
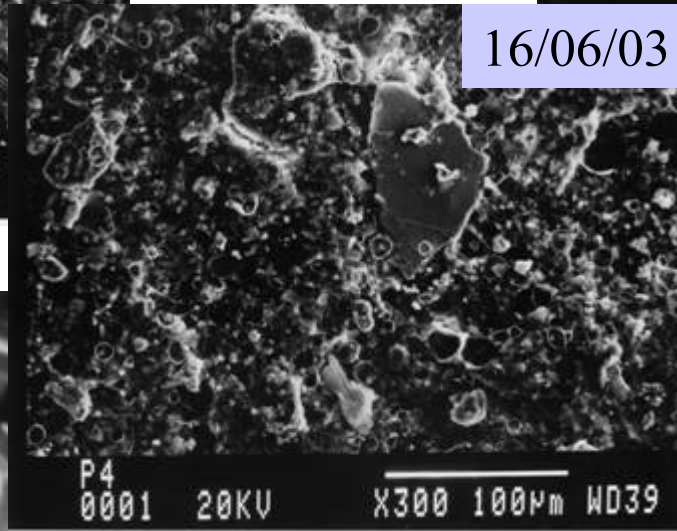
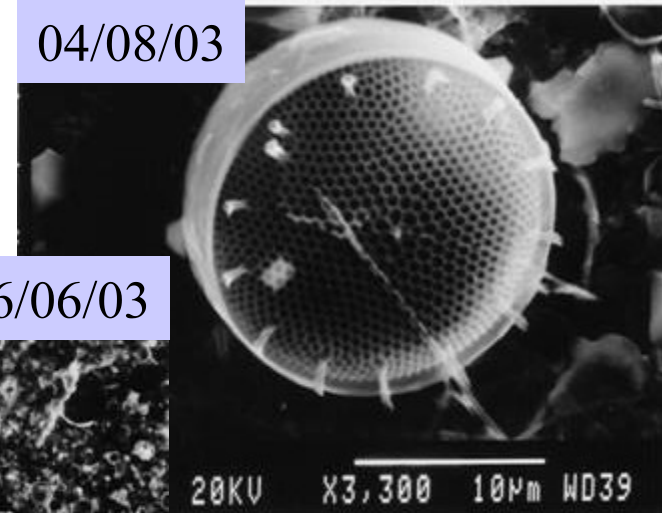
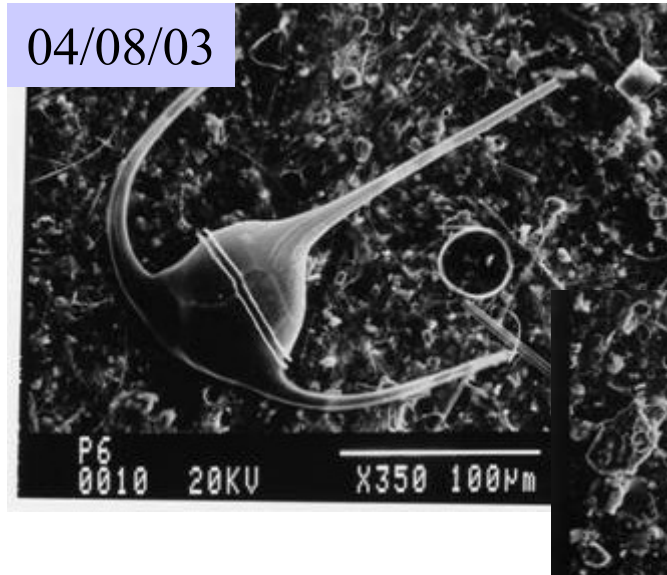


For small particles SEM EDAX analysis may be analyzing the GFF filter paper as well as the particles. Difficult to separate as composition is similar (see EDAX plot of filter paper)





Barn Pool particles via SEM





Conclusions and future research

- Problems faced with XRD: GFF filter papers will be replaced by membranes so that the particles remain on the surface and the filter paper doesn't show up in the analysis.
- Analyse samples using AAS (elements including Fe, Al and Si).
- Some results will be available from particulate absorption.
- Process collected satellite (CHRIS/PROBA) and aircraft (CASI) imagery.
- Enhanced biological sampling as previous research has indicated a summer bloom in the upper reaches of the Tamar.

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