Open images to analyse

1. Open a folder for MSC deployment (DY0XX\_MSCXX). Each MSC folder is one deployment therefore all calibrations and focusing should be the same for all of the images within the folder.

2) Open image in folder to check focus

a) is it in ok focus (can you tell if it is marine snow vs. a fecal pellet)? Go to 3)

b) is it not in focus? Add “bad” to end of folder name

3) Check all folders for focus and close images

4) Select images that do not overlap or have edges if possible – use these for analysis

4) Open MSC\_Calibration file – this is calibration and deployment metadata and most MSCs have been calibrated already. Each excel spreadsheet row has the calibrated #pixels per mm and field of view for the images (in mm2) in each MSC deployment.

a) is it a small tray? Tray area is 6017.82 mm2

b) is it a large tray? Tray area is 24710.88 mm2

5) Find calibration coefficient required for calculating particle area and volume for analysis

Analysis – what needs to be done here to sort particles?

Create new spreadsheet for each MSC (tray)

Will need columns - exif (date image was taken), file name of whole image, cruise number (DY0XX) and folder number (MSCXXX) for spreadsheet.

1) Open selected image(s)

2) Detect particles (minimum area of 0.5 mm) – avoid scratches in the tray, edges, shadows, glare, etc

3) Vignette each particle that meets requirements – make separate image of just that particle

4) Particle Class - sort each vignette into separate folder based on characteristics

a) does it look dense and ovoid/ellipsoid, cylindrical, tabular, or spherical in shape? 🡪 fecal pellet 🡪 what shape? what colour?

b) is it amorphous and fluffy looking? 🡪 marine snow

c) is it stringy and fibrous looking? 🡪 plastic debris

d) is it black, spherical, and small? 🡪 sediment/soot

e) is it green, very symmetrical and semi transparent? 🡪 phytoplankton

f) does it look like an animal? 🡪 zooplankton 🡪 copepod most likely

g) is it something else? 🡪 “other” (e.g. paint chip, scratch)

h) is it something to exclude? 🡪 (e.g. edge, stain on tray, glare, shadow)

Volume calculations

1) Is it a fecal pellet or marine snow?

a) if no, just count numbers in each image

b) if yes, continue

2) Is it marine snow?

a) calculate area of each particle (in mm2)

b) estimate volume from area and equivalent spherical diameter – equivalent spherical volume

3) is it a fecal pellet?

a) is it cylindrical?

- measure width and length of pellet (in mm) and calculate volume of cylinder

🡪 pi \* (1/2 width)^2 \* length

b) is it ovoid/ellipsoid?

- measure width and length of pellet (in mm) and calculate volume of ellipsoid

🡪 4/3 \* pi \* width \* length

c) is it tabular (rectangular)?

- measure width and length or pellet (in mm) and calculate volume

🡪 length \* width \* ½ width

d) is it spherical?

- measure diameter (in mm) and calculate volume

🡪 4/3 \* pi \* (1/2 diameter)^3

Carbon calculations

1) If it is marine snow:

a) calculate carbon for each piece or cluster of marine snow

🡪 Carbon (in micrograms) = 0.99 \* volume (in mm3) ^ 0.52 (from Alldredge et al. 1998)

b) sum total marine snow carbon for each deployment

2) if it is a fecal pellet:

a) calculate carbon for each pellet

🡪 Carbon (in mg) = 0.08 \* volume (in mm3) (from Wilson et al. 2008)

b) sum total pellet carbon for each deployment, also sum by shape

3) for both items (but calculate separately):

a) is the MSC deployment from a large or small MSC? In MSC\_calibrations file

b) what is the area of each tray? large = 24710.88, small = 6017.82 mm2

c) what is the area for each image? In MSX\_calibrations file

d) total area for images analysed = image area \* number of images analysed

e) carbon per tray = sum carbon (of total pellets, pellet by shape, or total marine snow) \* area of tray/area analysed = total carbon per tray (in mg)

4) calculate flux for fecal pellets ( in total and by shape) and marine snow ( in total) separately:

MSC tube opening area = 1m for large, ¼ m for small

Incubation time = 2 hours

Flux (in mgC/m2/hr) = total carbon per tray/ tube area (m2) / 2 hours

For all other particles:

1) count by category – number of particles in each category

2) total counts per tray = counts \* area of tray/area analysed

3) count flux (in number/m2/hr)

List of Results

1) fecal pellet flux (mgC/m2/hr)

a) ovoid/ellipsoid pellet flux

b) cylindrical pellet flux

c) tabular pellet flux

d) spherical pellet flux

e) total pellet flux

2) marine snow (mgC/m2/hr)

3) other particles (number/m2/hr)

a) plastic debris

b) sediment/soot

b) phytoplankton

c) zooplankton

d) other