Particulate barium at station ALOHA and K2 during VERTIGO I & II

Objectives:

*** Evaluate the potential of biogenic Ba, barite, as a proxy for organic carbon mineralization in the twilight zone, by comparing this proxy-tool with other approaches (NBST, bacterial production, respiration)**

*** Compare the outcome of this proxy-tool between an oligotrophic (ALOHA, Hawaii) and a HNLC system (K2, NW Pacific)**

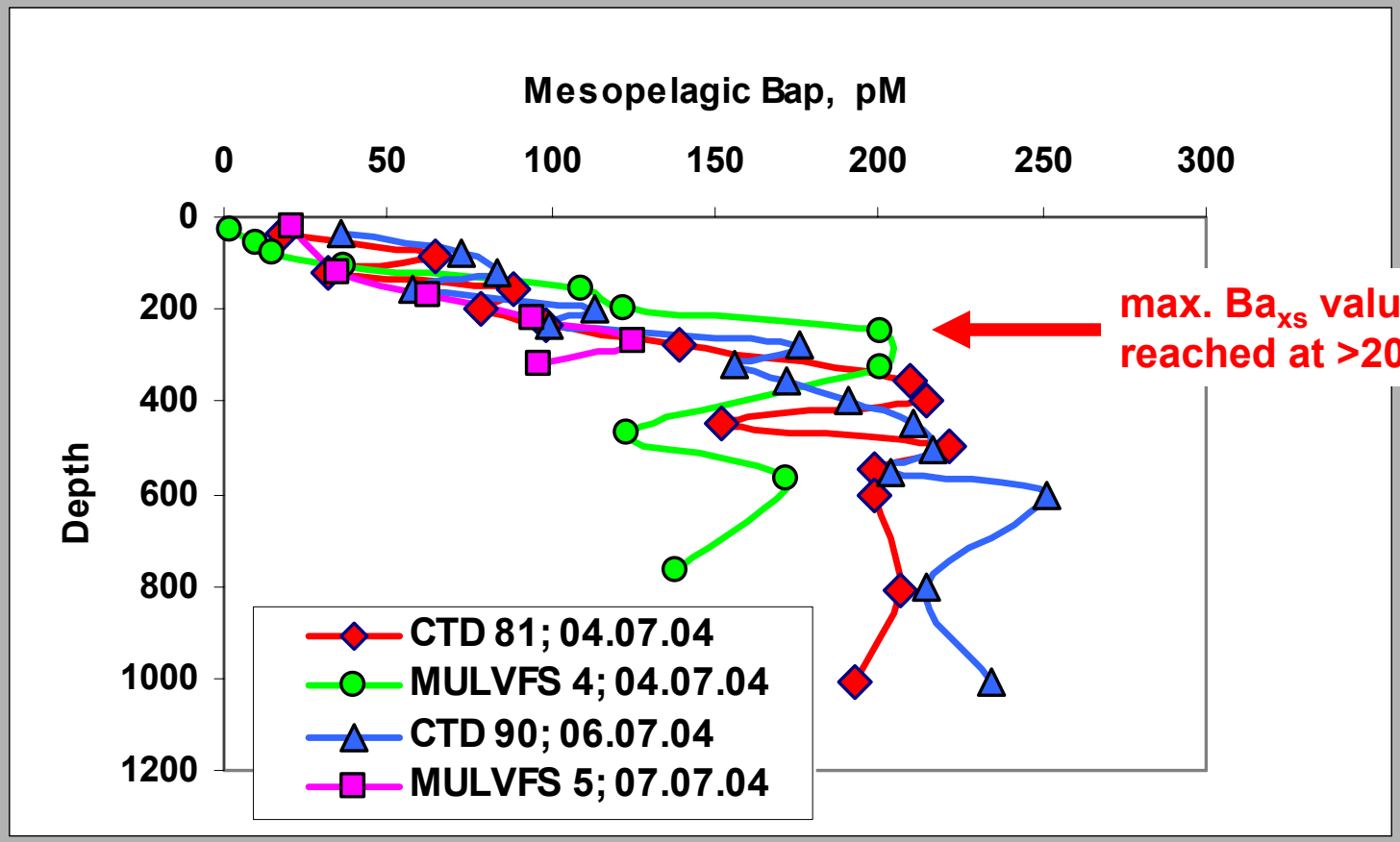
State of the art:

The non-lithogenic fraction of Ba (i.e. excess Ba or Ba_{xs}) in suspended matter is present mainly as micro-crystalline barite

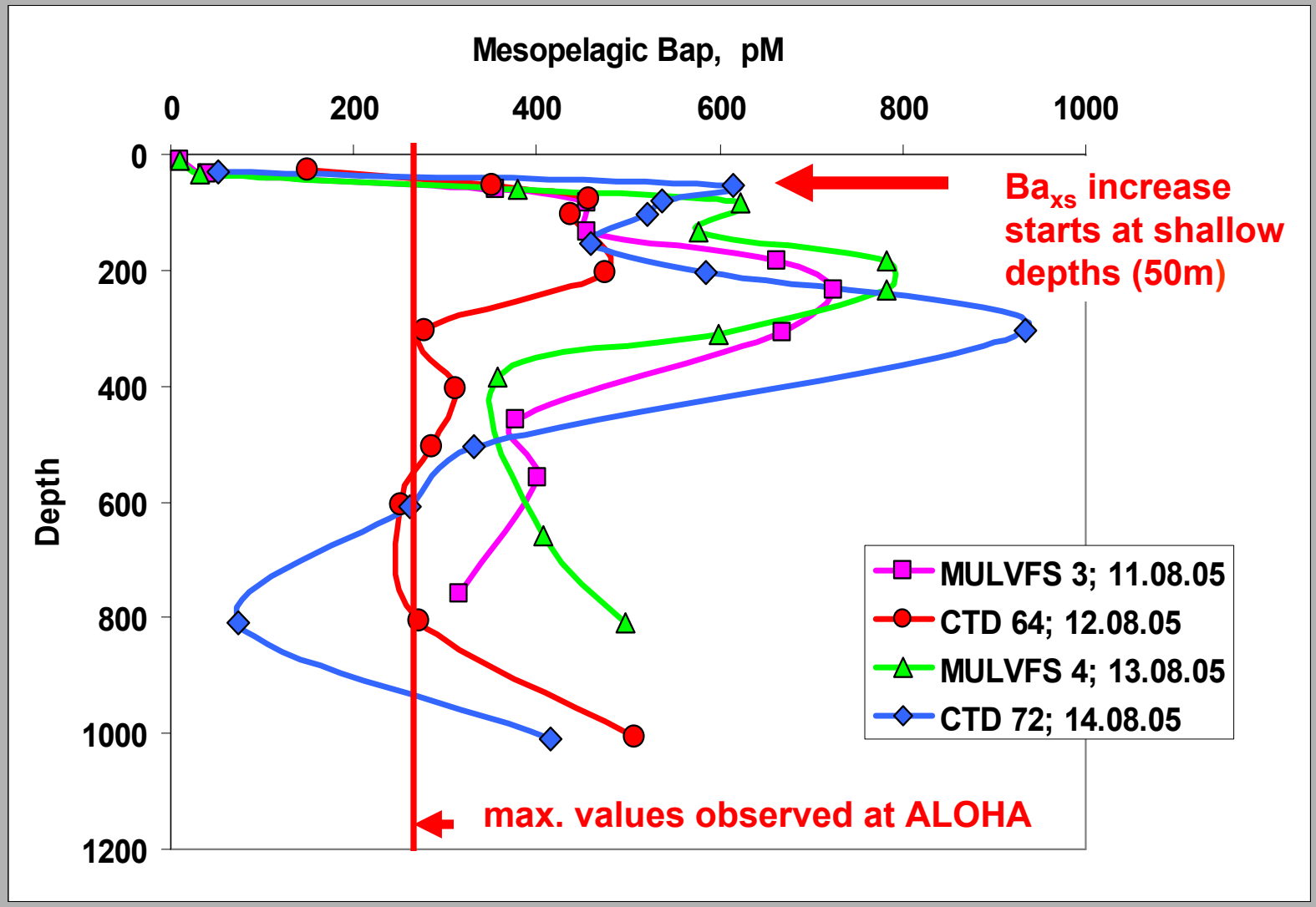
This barite appears to be formed in degrading biogenic material (aggregates, fecal pellets) settling through the water column

Profiles of suspended Ba usually show increased concentrations at mesopelagic depths, which appear to reflect mineralization of exported matter

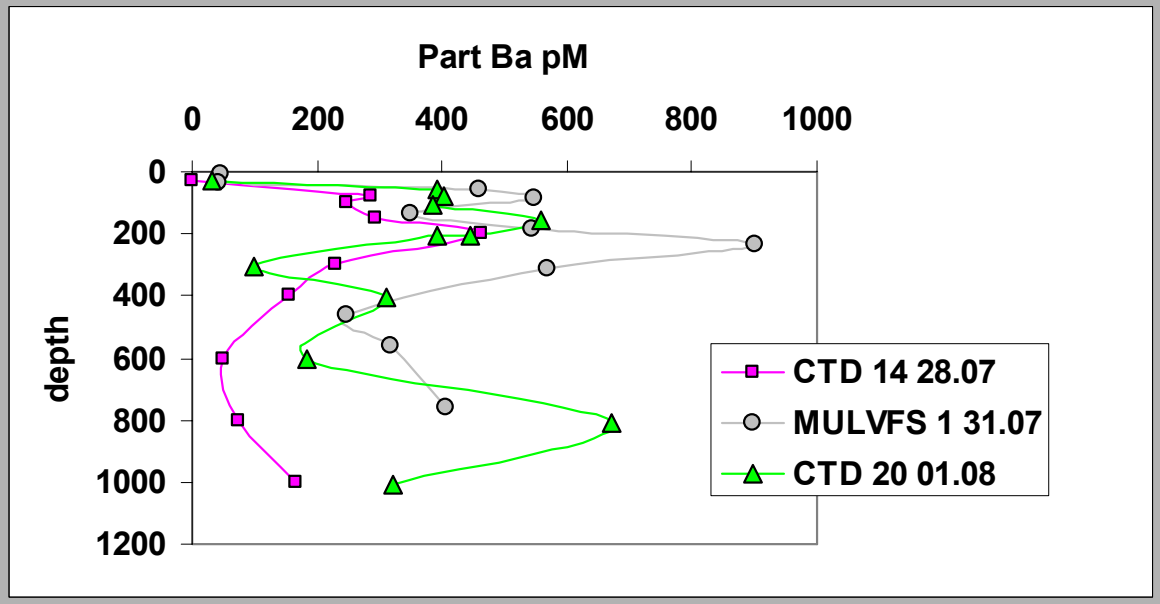
Ba_{xs} profiles at ALOHA (Jun-Jul 2004)

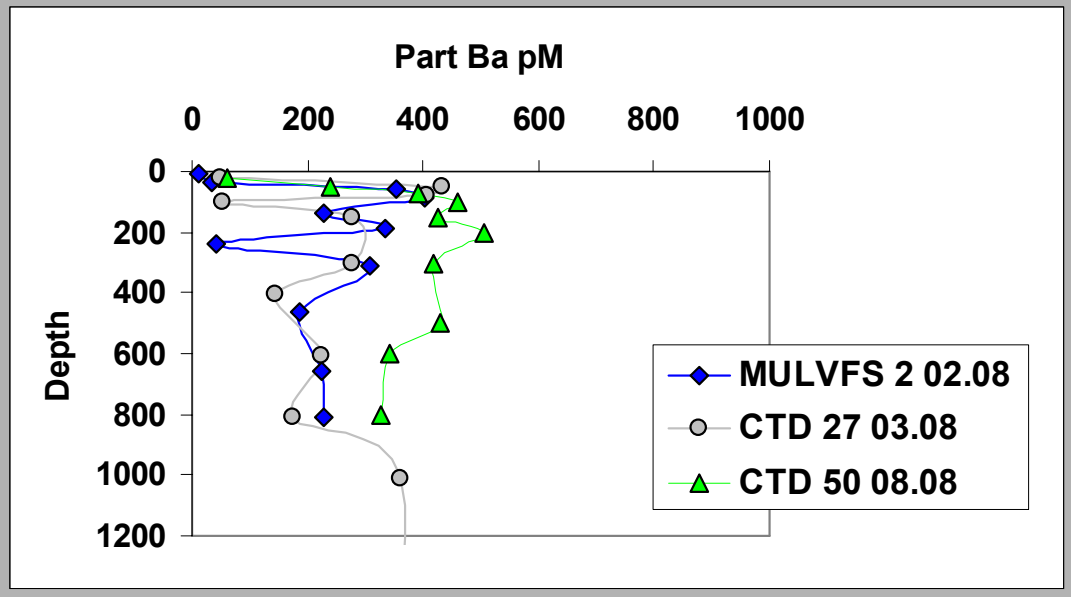


Ba_{xs} profiles at K2 (Jul-Aug 2005)

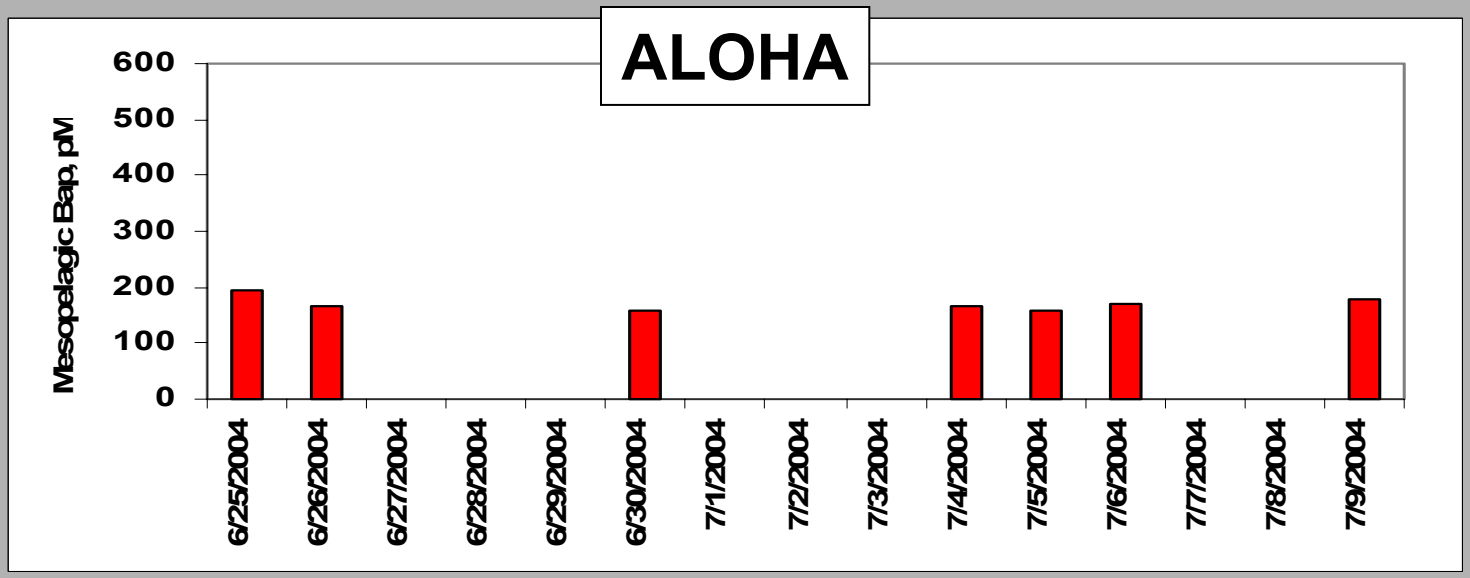


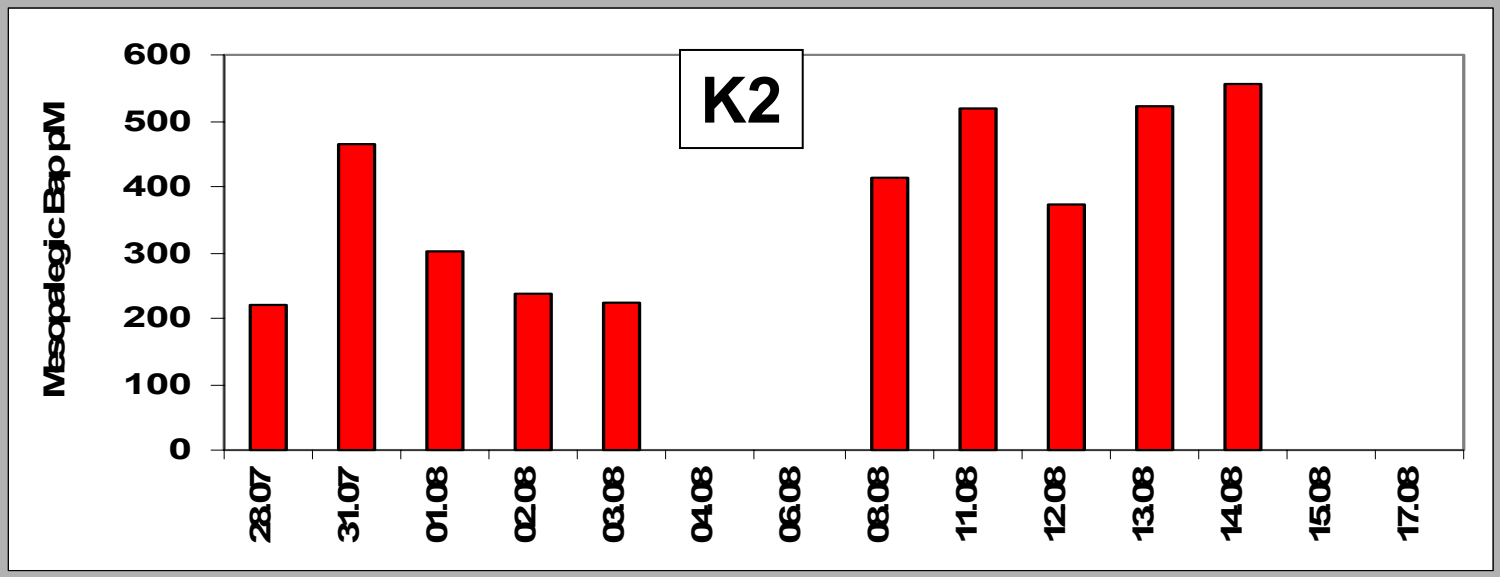
Ba_{xs} profiles at K2



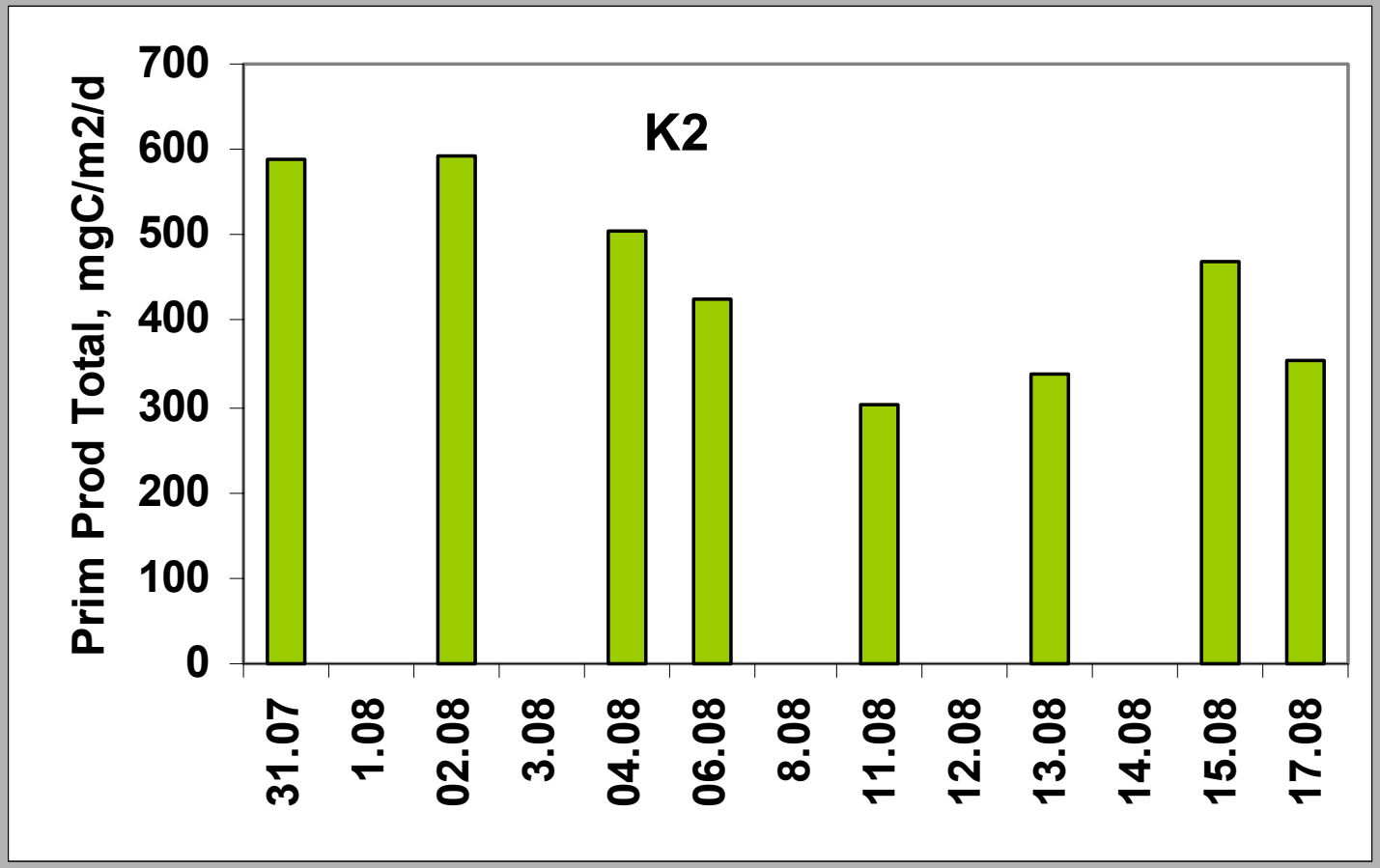


Depth weighted average Ba_{xs} (pM) in 150 to 500m depth layer

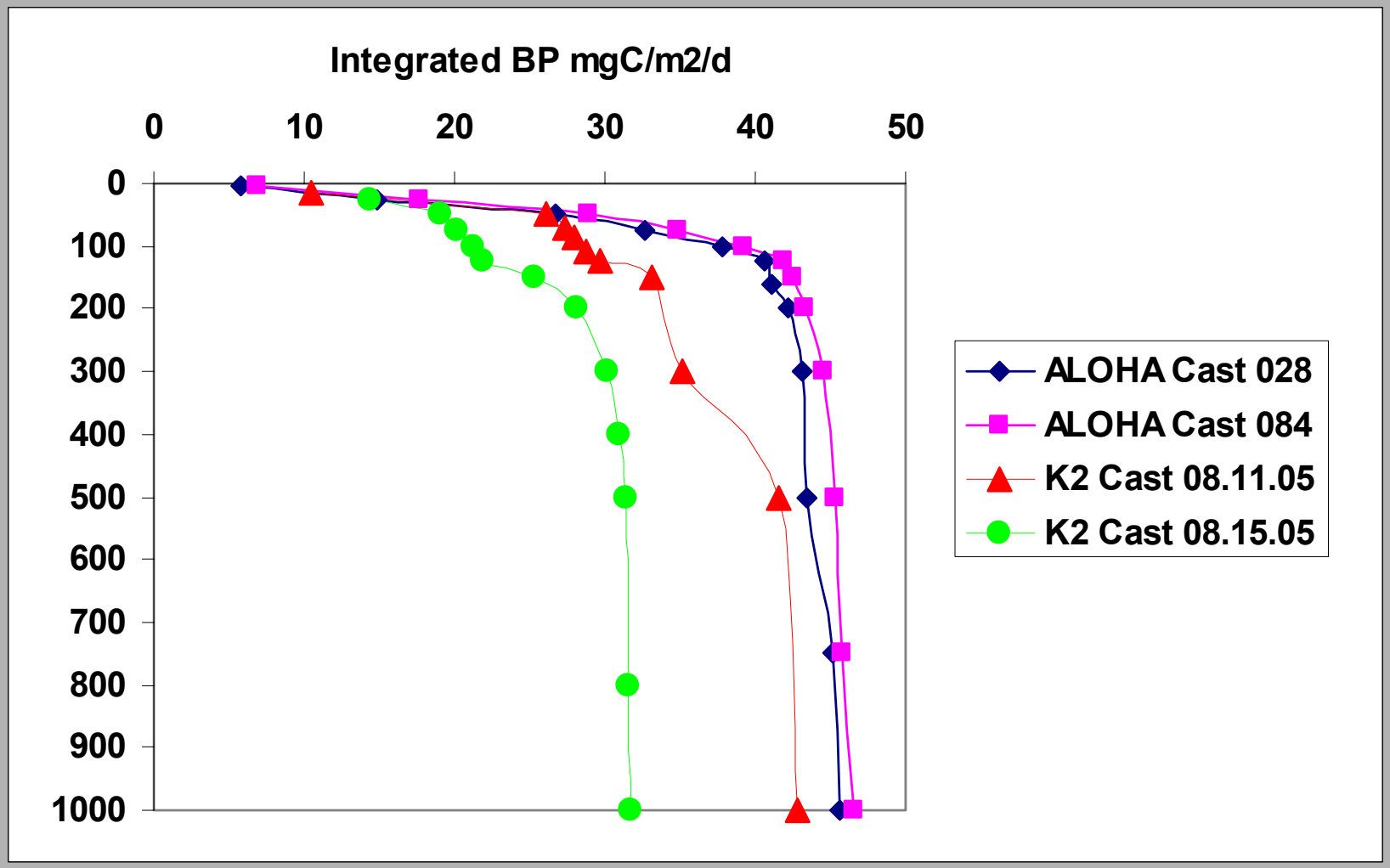


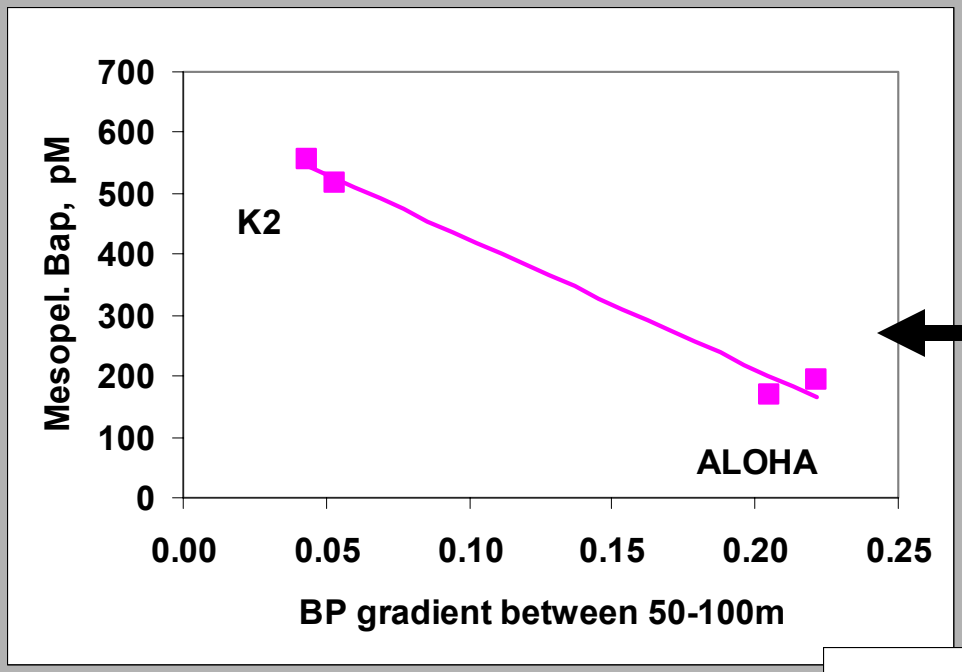


Column integr. Prim Prod from Phil



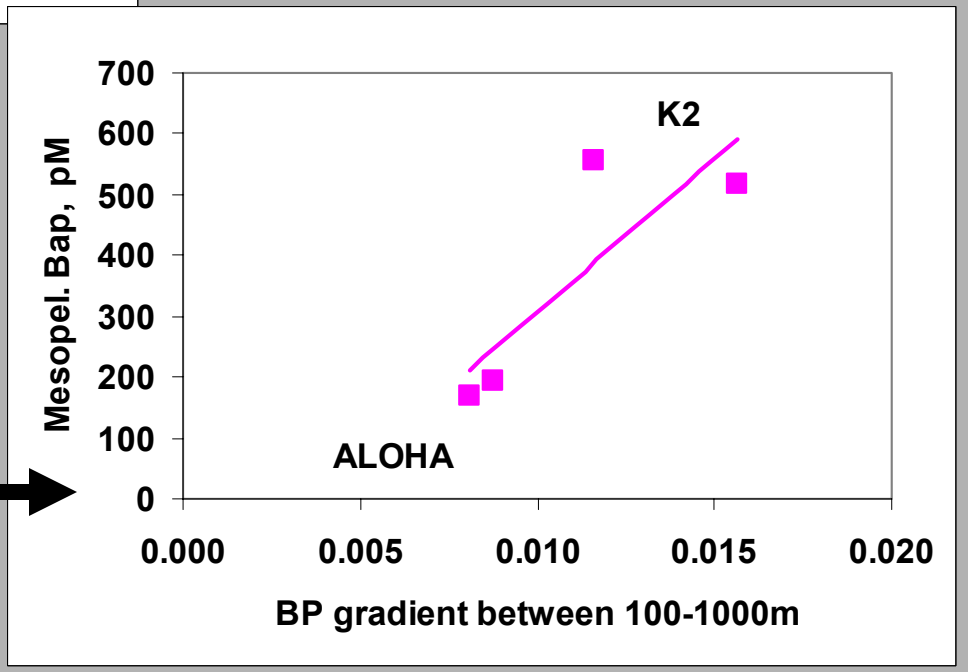
Column integrated Bact. Prod. from Ben & Phil



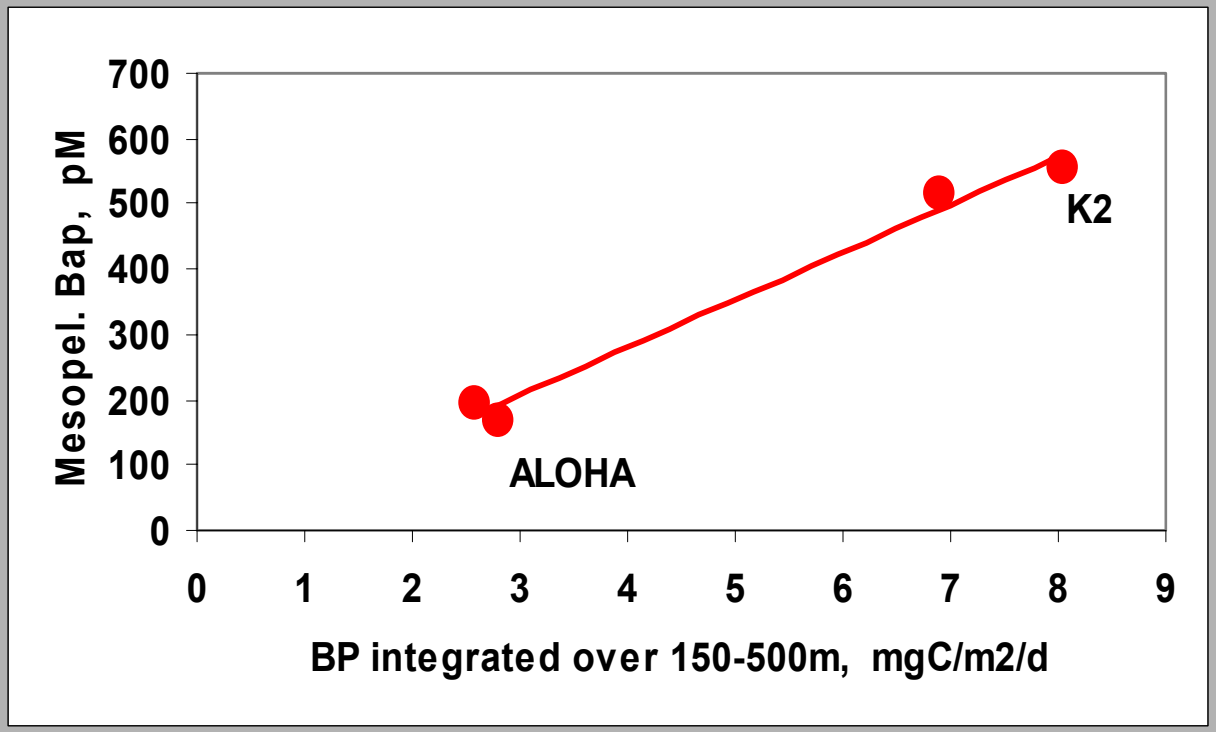


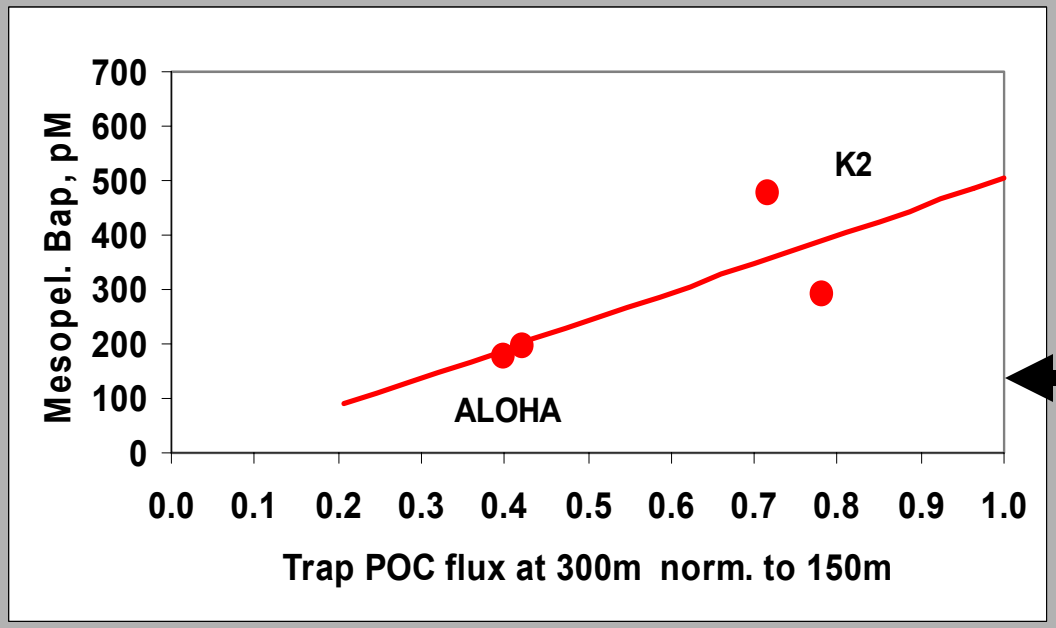
av. mesopelagic Ba_{xs} vs. gradient of integrated bacterial production between 50 and 100m

av. mesopelagic Ba_{xs} vs. gradient of integrated bacterial production between 100 and 1000m



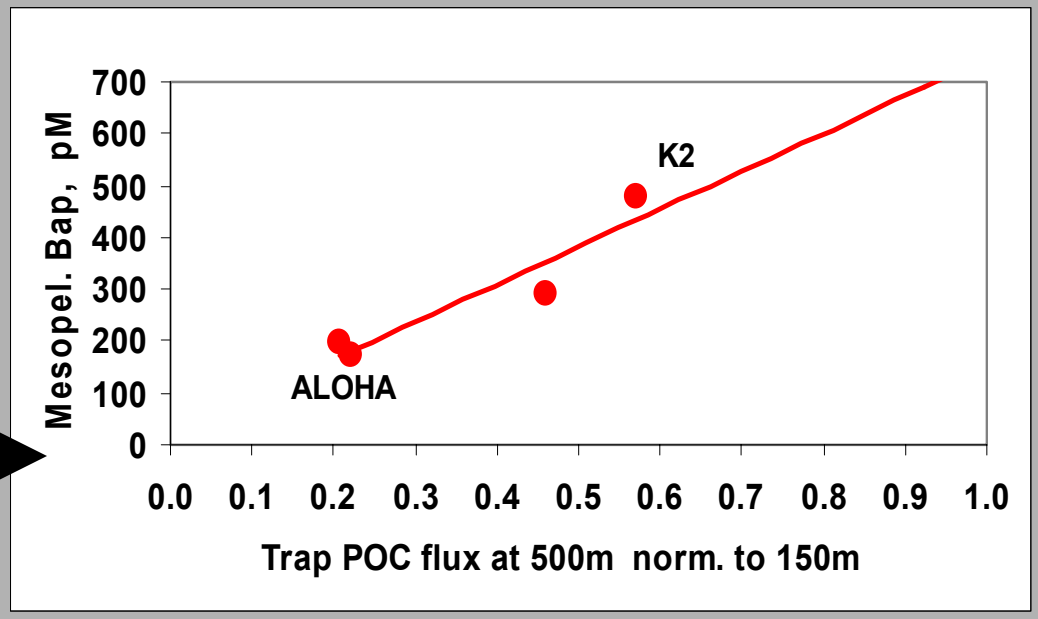
av. mesopelagic Ba_{xsc} vs. bacterial production integr. between 150 and 500m

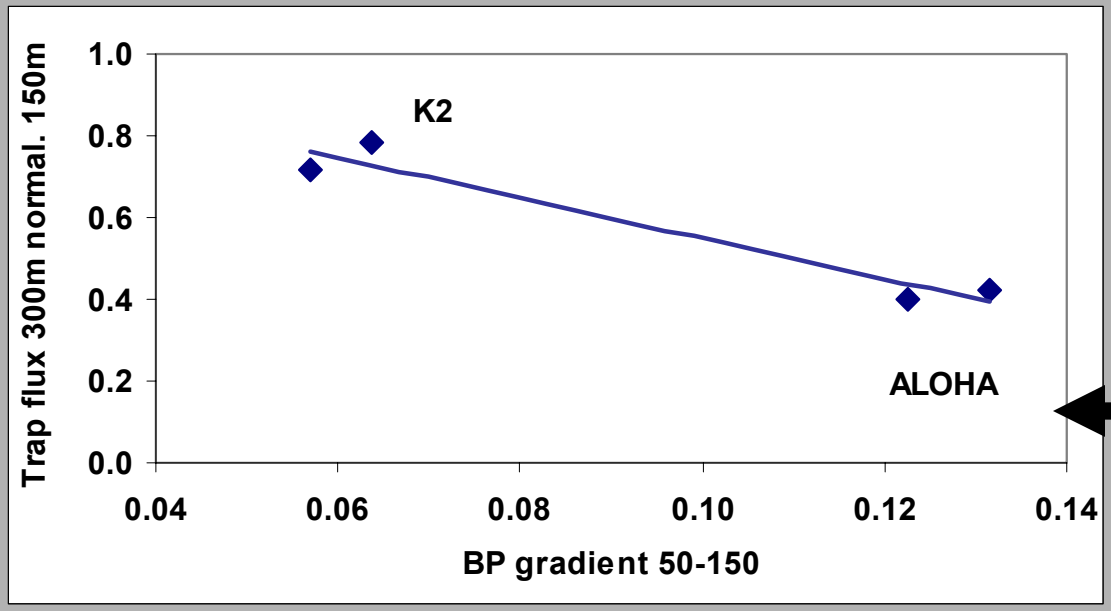




av. mesopelagic Ba_{xs} vs. 300m NBST POC flux norm. to POC flux at 150m

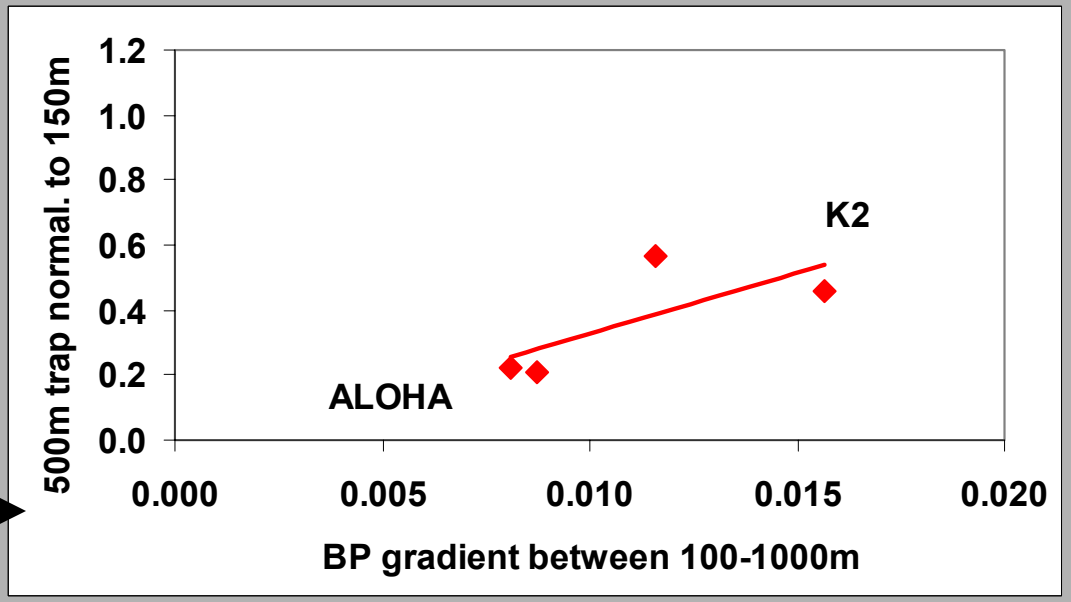
av. mesopelagic Ba_{xs} vs. 500m NBST POC flux norm. to POC flux at 150m

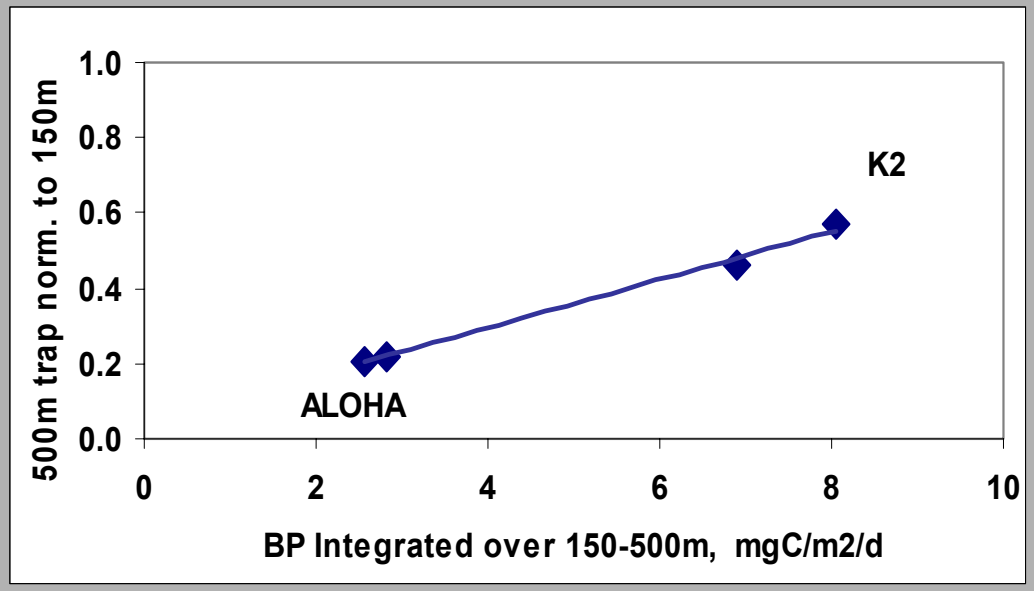




300m NBST POC flux norm. to POC flux at 150m vs. bacterial production gradient between 50 and 150m

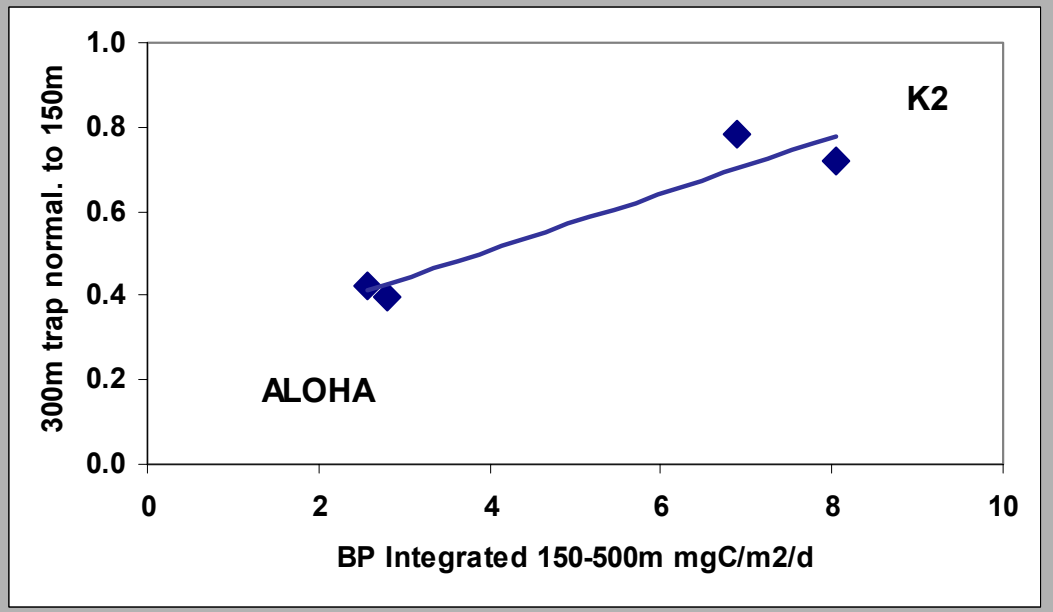
500m NBST POC flux norm. to POC flux at 150m vs. bacterial production gradient between 100 and 1000m





500m NBST POC flux norm. To POC flux at 150m vs. bacterial production integr. between 150 and 500m

300m NBST POC flux norm. to POC flux at 150m vs. bacterial production integr. between 150 and 500m



Mesopelagic Ba_{xs} stocks and POC mineralization:

Earlier Southern Ocean results revealed the following empirical relationship:

$$JO_2 = \{[Ba_{xs}]_{meso} - bgrd\} / 17200$$

In terms of POC mineralized and integrated between 150 and 500m (i.e. depth range of the sediment traps):

$$JPOC = JO_2 * (125/175) * 350$$

	NBST ΔPOC flux 150-500m mgC/m2/d	**POC min. from Ba 150-500m mgC/m2/d**
ALOHA #1	**13.7**	**18**
#2	**16.6**	**17**
K2 #1	**36.7**	**34**
#2	***10.2***	***67***

	From B.P. 10% G.E. ?? 150-500m mgC/m2/d	POC min. from Ba 150-500m mgC/m2/d
ALOHA depl #1	~28	18
depl #2	~28	17
K2	~70 (11.08)	65 (11.08)
	~80 (15.08)	80 (14.08)