Overview comments from Sea-Bird - 15 April 2016

1	Current SBE-37 microCAT specifications, INCLUDING drift for 1 year deployment: P: 0.15% FS (11 dbar) T: 0.004 C C: 0.0039 S/M ->S: 0.050 psu (worst case sum of error)
2	Current practical realizable data accuracies, INCLUDING drift for 1 year deployment: Kistler P: 10 dbar T:0.002 C C: 0.0015 S/M ->S: statistical </= 0.020 psu Groups like Lukas U Hi demonstrate that very stable salinity data from microCATs are possible.
3	Aspirational, developmental, 1-yr, data accuracy goals for OceanSITES instruments IF: -the mission includes monitoring of change in climate signals, -and data are to converge to comparable accuracy with other deep measurements (aspiration voiced by Lindstrom-NASA): Kistler P: 2-3 dbar T: 0.001 C C: 0.0005 S/M ->S: statistical </= 0.005 psu
4	The current microCAT with the current standard calibration process will meet the original scientific goals of OceanSITES re temperature, but is not adequate as a "off the shelf" deep ocean instrument to produce the highest quality (WOCE) time series data accuracies from pressure and conductivity(salinity) measurements without design & validation method improvements. These improvements in design, conditioning, screening, signal characterization and calibration & at-sea validation methods would be ported from the learned and applied improvements of other instrument systems (SBE-3+, 4+, 35, 56, 41CP, & 61). This development is possible, but expensive, and the resulting price depends on the real volumes and uptake of a new instrument system into deep observatory use. We are committed to working with the OceanSITES commmunity to develop and provide such an instrument if deep observing moves to this platform.
5	Our thinking is based on a long discussion with OceanSITES, but remains based on some assumptions about the evolving scientific mission and goals (variables and accuracy) of deep observing and assumptions about an objective that data sets from the major observing systems (GOSHIPS, Argo, Deep Argo, OceanSITES, etc) converge in compatible reliability. These assumptions have to be vetted carefully so that we are on the same page with the community and that we can coordinate our effort to develop and supply the required instruments on schedule and to the correct future accuracy need.
6	For this to work well, we need common vision, with the buy in and cooperative development contribution from the community - we each have contributions and requirements to make this succeed.
7	If we agree to embark on option "C" or "D" (see the option matrix), then Sea-Bird anticipates a delay in initiating its engineering effort by perhaps 18 months, because our people and resources for this project are largely occupied on an existing critical effort.

Action Items tab: From OceanSITES meeting at NOC Southampton, UK 25-29 April 2016

	Action list	notes
1	Ask OceanSITES to edit the "scientific rationale" tab to correspond to the hierarchy of scientific drivers and corresponding data requirements	
2	Ask OceanSITES to rank order their preferences in the "option matrix" tab, vis-à-vis existing and future scientific needs, being mindful of the requirements of both parties	
3	Confirm the specifications (scientific data requirements) needed of the top ranked options	
4	Confirm the uptake rates of the top ranked options by the existing OceanSITES participants	
5	To help us prioritize & meet schedule and total demand, ask OceanSITES to give us the estimated growth of the OceanSITES program and instrument inventories over the next decade. What is the vision of the mature program and growth curve to get there?	
6		
7		
8		

Scientific Rationale tab

	scientific basis / rationale	need - requirement - implication	data requirements
I	Original scientific rationale for OceanSITES is: make competent bottom temperature measurements to constrain / improve the accuracy of "surface" ocean (circulation) models	-coordinated ocean network, -coordinated measurement approach, -internally consistent calibration work on pool of OceanSITES instruments	stability - T: accuracy - T: resolution - T:
II	Acquire a temperature data set capable of decerning change in climate signals and measure variation and trends accurately	-improved calibration method to ensure instruments are stable, with characterized drift rates, and accurate to 1mK leaving Sea-Bird, -add at-sea validation methods to bound and document data accuracy (SBE-56, NOC 911 methods, SBE-35, at-sea TPW work)	stability - T: accuracy - T: resolution - T:
III	Add climate-quality salinity measurements to enable TS / watermass analysis to discriminate between ocean processes in the interpretation of data.	-adding to II, develop improved instrument for the most stable P&C measurements, -develop corresponding calibration methods to impart the highest accuracy calibrations to instruments, -develop corresponding at-sea validation methods to enable assessment of data accuracy (II methods extended to S & P) -establish a cooperative feedback between lab and at-sea information and practices to enable iterative improvements	II requirements plus stability - P: , S: accuracy - P: , S: resolution - P: , S:
IV	Add dissolved oxygen as an additional oceanographic variable for discriminating between ocean processes	-verify oxygen data accuracy with at-sea validation methods (NOC 911 method) -establish a cooperative feedback between lab and at-sea information and practices to enable iterative improvements in oxygen measurements, -new oxygen calibration methods may be required	III requirements plus stability - Ox: accuracy - Ox: resolution - Ox:
V	Add high accuracy pressure to moored measurements to enable analyses of (order of increasing difficulty): -mooring motion, -tsunami monitoring, -absolute pressure, water column mass / sea surface height	-potential digi screening, -potentially SBE53 or SBE-54 pressure calibration methods, -at-sea validation mthods for digiquartz pressure sensors, -establish a cooperative feedbackbetween lab and at-sea information and practices to enable iterative improvements in high accuracy bottom pressure measurements	IV requirements plus stability digi P: accuracy digi P: resolution digi P:
VI	Add solid state (ISFET) pH measurement?		

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OceanSITES Instrument Option Matrix tab

	SBE requirement			cooperative requirement		OceanSITES requirement	
option	instrument	calibration	price range*	validation work		scientific	fleet upgrade
A as-is	current microCAT versions as-is	current 37 standard (37-SM/SMP typically used by OceanSITES)	$7.5K, std cal	-feedback desirable about lab/ocean performance, -per agreement discount on purchases by OceanSITES group, -per agreement contributed microCAT at certain purchase qty's		-coordinate purchases of OceanSITES members' -manage placements & use of the contributed microCATs	-none
B dev T cal	focus on recent versions	Special calibration procedure, multiple cals, historical context, 41-T process, T-single pt, ?	$7.5 K, plus new T cal price	-feedback required on ocean performance from select groups -per agreement establish a pool of instruments for OceanSITES calibration treatment -decide when goal is achieved (2 yrs?) and move calibrations to paid status		-commit to cooperative evaluation work and documentation of performance and improvements -eventually publish results -per agreement coordinate a pool of instruments and keep SBE aprised of distribution	-replace the fleet slowly to recent versions that are supported by the new calibration methods
C "Climate" uCAT	circuit improvements, sensing element conditioning and screening, state of knowledge signal characterization & error corrections	New calibration methods (ala 61), sensor characterization focused on environmental range (5-6000 dbar, 2C, 34.7psu), extensive post-calibration checks	$12+ K, plus new TSP cal price	-mutual feedback on lab and ocean performance -mutual development of best practices, and methods of validation and error correction -decide when data goals are achieved (2 yrs?)and replace fleet, move calibrations to paid status		-commit to cooperative evaluation work and best practices evolution (see sci rationale III), -documentation of results and improvements, -publish results	-commit to replace the fleet with version "C" instruments within 3 years
C.5 - add DO	"C" but add optical DO	-expect to use current calibration methods for optical DO	add std DO cal	-add feedback on DO ocean performance -dev improved methods of cal and validation if necessary		-field validation using NOC 911 methods, and/or in-air calibratioin point	-optional - fleet replacement for added DO
D "Climate" uCAT with Digiquartz pressure sensor	"C" instrument + digiquartz pressure	-"C" calibrations plus -digi calibrations (ala SBE 53 & 54) -potential digi drift screening	$18+ K, plus new TSP(digi) cal price	same as "C"		-requirements same as "C"	-commitment same as "C"
D.5 - add DO	"D" instrument but add optical DO	-expect to use current calibrations methods for optical DO	add std DO cal	same as "C.5"		-requirements same as "C.5"	-optional - fleet replacement for added DO

* Note: the price range is an informational estimate, based on assumptions & in part the uptake of quantities of approx 1000 units over approx 5 yr

Matrix version 3, - 15 April 2016