

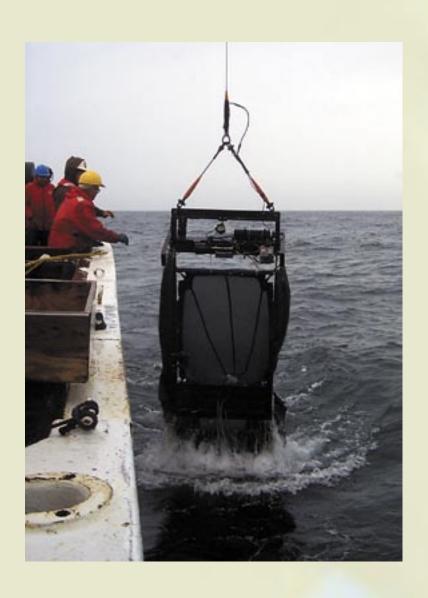


US GLOBEC Data Management R.C. Groman, P.H. Wiebe, M.D. Allison, and G.F. Heimerdinger Woods Hole Oceanographic Institution, Woods Hole, MA 02543

Abstract

he U.S. GLOBEC Program is a large, multi-disciplinary effort, **L** involving over 200 scientific investigators from over 70 research, educational, and governmental organizations. There are three program modules in the U.S. GLOBEC science effort: Georges Bank, Northeast Pacific, and Southern Ocean. Each of these components is in a different study phase: data collection, synthesis, or analysis, and requires different kinds of data management support. The management strategies and systems support are, by design, flexible enough to meet the changing needs of each component. The backbone of the system is the JGOFS Data Management software package, which enables the user community to access data sets via the Internet using standard web browsers. It is configured as a distributed data system consisting of a central data management computer with many data sets stored locally and remote servers with other data sets. Data management begins at the planning stages of field work, setting the ground rules for the establishment of data acquisition protocols and the logging of the basic observations. This is followed by data collection, data entry into the system, and further data quality review. Data management also includes assistin the scientists to fulfill their obligations of submitting metadata and data for archiving and retrieval. With the advent of the internet and versatile powerful distributed computers, organized data distribution and data management has become a mainstay in large multidisciplinary oceanographic programs such as U.S. GLOBEC. They are essential elements for effective program information distribution, data analysis and product development, and data synthesis.

Introduction

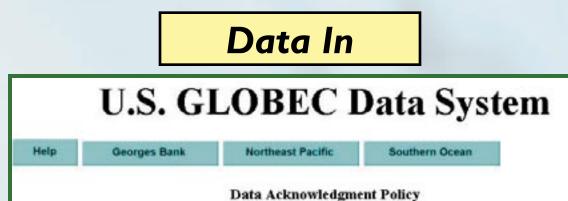


The primary goal of the U.S. GLOBEC program is to be able to predict changes in the distribution and abundance of target species as a result of changes in their physical and biotic environment as well as to anticipate how their population might respond to climate change. The U.S. GLOBEC Data Management system was initially created to foster the easy exchange of data and information among the participants of the U.S. GLOBEC Georges Bank project. Since its inception, the system has expanded to include serving data for the U.S. GLOBEC's

Northeast Pacific and Southern Ocean projects as well. The requirements for the system had to take into account that data would be contributed by many researchers, in many different formats, and that these data would be made available when they became useful, oftentimes much sooner than when the data would be considered in final form. Because the projects' participants were geographically distributed (from over 30 oceanographic institutions, colleges, and universities in the United States and Canada, it was felt that a Webbased solution would serve us best. Consequently, we chose the U.S. JGOFS data management software, developed by Flier, et al. [1992]. This public domain software, available at ftp://globec.whoi.edu/ pub/software/JGOFS_GLOBEC is based on the Internet's Hypertext Transmission Protocol (http) and uses a simple ASCII transfer of information to move data between server and client. It supports multiple data servers. We have more than nine data servers in use by the U.S. GLOBEC program, and data are accessible via any standard browser such as Internet Explorer and Netscape. Because the JGOFS/ GLOBEC system is based on the Web's underlying protocol it is easy to integrate our system within web pages and we take full advantage of this capability to serve data and information from our Georges Bank web site (http://globec.whoi.edu). This poster will highlight the simple Web interface of the system, showing how data are accessed, downloaded and plotted. It will also discuss how our data management decisions fostered the sharing of data and facilitated the goals of our project.

Tabular data are easily served and the system can automatically restructure tabular data into a hierarchical (relational) form to simplify data access.

Gmtdate gmttime	lat lon sog	head head2	cmg mPAR	sstemp sscond
14/04/02	00:00:00	-64.3342	-69,6008	11.31 0.00
14/04/02	00:01:00	-64,3372	-69,6031	11.14 0.00
14/04/02	00:02:00	-64,3401	-69,6054	11.17 0.00
14/04/02	00:03:00	-64,3430	-69,6078	11.25 0.00
14/04/02	00:04:00	-64,3460	-69,6102	11.40 0.00
14/04/02	00:05:00	-64,3489	-69,6125	11.22 0.00
14/04/02	00:06:00	-64,3519	-69,6147	11.15 0.00
14/04/02	00:07:00	-64.3548	-69,6170	11.26 0.00
14/04/02	00:08:00	-64.3577	-69,6194	11.17 0.00
14/04/02	00:09:00	-64,3607	-69,6216	11.23 0.00
14/04/02	00:10:00	-64,3636	-69,6239	11.14 0.00
14/04/02	00:11:00	-64,3666	-69,6261	11.55 0.00
14/04/02	00:12:00	-64,3695	-69,6284	11.09 0.00
14/04/02	00:13:00	-64,3724	-69,6307	11,26 0,00
14/04/02	00:14:00	-64,3754	-69,6330	11.49 0.00
14/04/02	00:15:00	-64,3784	-69,6350	11.26 0.00
14/04/02	00:16:00	-64,3813	-69,6373	11.08 0.00
14/04/02	00:17:00	-64.3841	-69,6397	11.17 0.00
14/04/02	00:18:00	-64,3871	-69,6420	11,18 0,00
14/04/02	00:19:00	-64,3900	-69,6443	11.14 0.00
14/04/02	00:20:00	-64,3929	-69,6464	11.26 0.00
14/04/02	00:21:00	-64,3959	-69,6487	11.08 0.00
14/04/02	00:22:00	-64,3988	-69.6510	11.18 0.00



n permission from the U.S. GLOBEC Data Management Office. Please read the compl wledgment policy. To submit your data for inclusion in the system, contact the U.S. GLOBEC Data Management O ork supported by the National Science Foundation under Grant No. OPP-0096445. Any opinions, findings, and ms expressed in this material are those of the author(s) and do not necessarily reflect the views of the National

Directory of Data in /globec/soglobec/ Description and Documentation Investigator

ourly	L. Padman L. Padman	Hourly ADCP data Five minute ADCP data	/globec/soglobec/along
rack	Ch. Scientist	Data collected daily al	8 8 8
1a 1ce	C. Fritsen	Ice core bacteria data	
ia water	C. Fritsen	Water column bacteria c	
	T.Bolmer/R.Beardsley	Best bathymetry to date	Directory Documentation Plotting an
ffort	C. Ribic/E.Chapman	Seabird Survey Effort 1	
bserv	C. Ribic/E.Chapman	Seabird Survey Observat	
8.8	P. Wiebe	BiomanerII environments	Level 0 Next level Flat listing
			# Along track data, including CTD, MI # The JGOFS data set is obtained prin # and decimating to whole minute in: # from more than a single raw input # See documentation for details. ====================================
			LMG0103 2001
			LMG0104 2001
			LMG0106 2001
			LMG0201a 2002
			LMG0203 2002
			LMG0205 2002
			LMG0302 2003
			NBP0103 2001
			NBP0104 2001
			NBP0202 2002
			NBP0204 2002
			MD10201 2002

The data system supports data selection and projection. The selection option allows

Data Subsetting

one to select data that match your criteria, such as the data where the temperature is only greater than 10 degrees. The projection option allows one to select only those data fields of interest, i.e. perhaps only temperature, but not salinity.

Please see examples in ---> (Help) Or, enter the criteria for new subsetting below: Directory... Documentation Plotting and Other Operations. Then, continue using the new subset list Level 0 Next level Flat listing long track data, including CTD, MET and navigation information he JGOFS data set is obtained primarily by applying calibrations to raw date and decimating to whole minute intervals. Several fields are derived om more than a single raw input documentation for details. Wiebe, Ch. Scientist ------------uiseid year 90202 2002 lon sstemp sscond depth_w -58.2091 -65.0021 4.18 3.20 -50.2119 -65.0020 4.10 3.20 -58.2147 -65.0020 4.17 -58.2174 -65.0019 4

1261 -65.0020 4. 2289 -65.0021 4. .2317 -65.0022 4. .2344 -65.0019 4

372 -65.0021 4.21 3.20

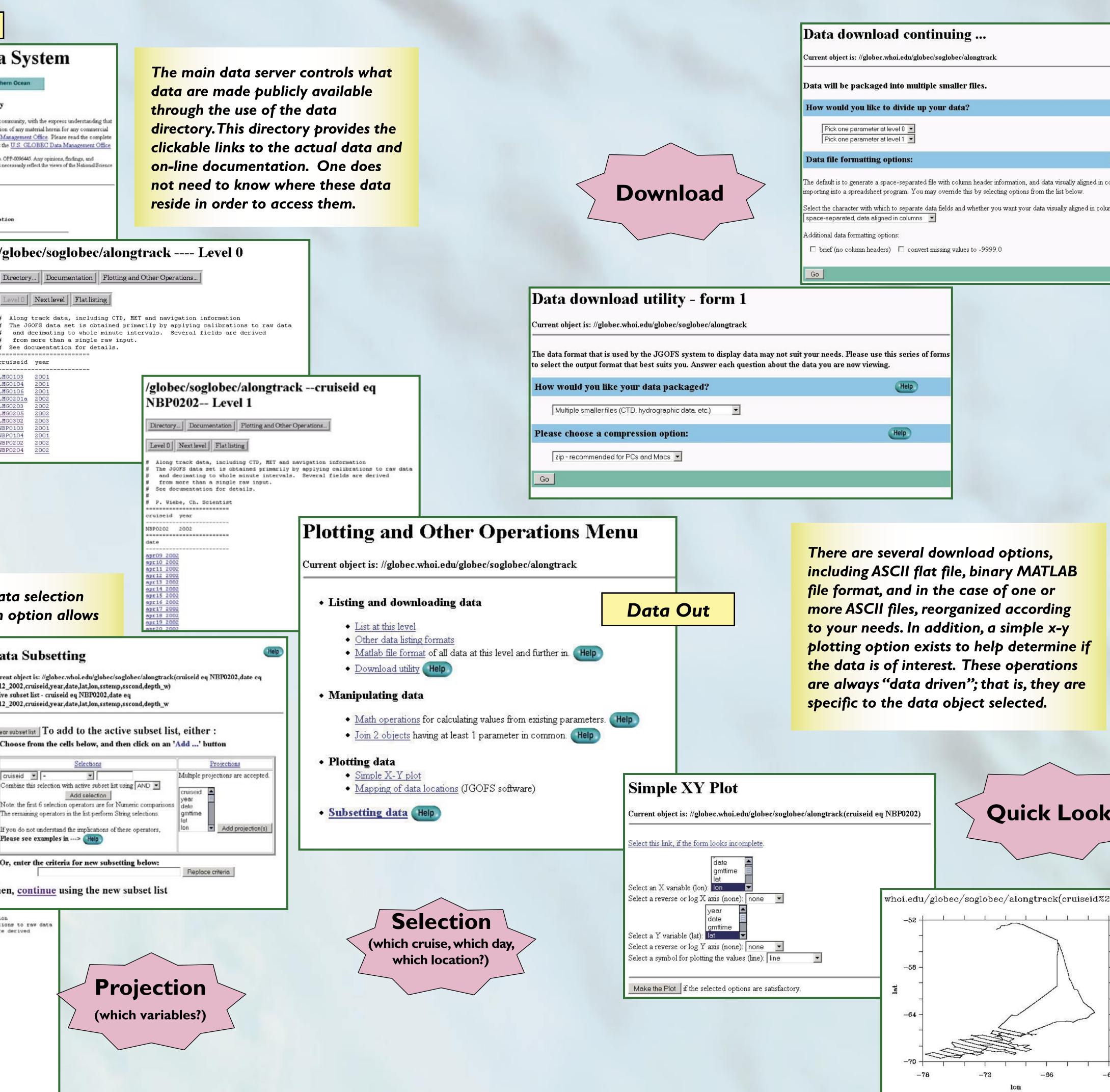
The JGOFS/GLOBEC Software

The U.S. Joint Global Ocean Flux Study (JGOFS) data managemen software (Flierl, et al., 1992) provides a distributed, flexible, extensible and data driven methodology to store and serve data and information about the data (metadata). The JGOFS/GLOBEC system uses HyperText Transmission Protocol (HTTP) to exchange data between servers and clients. Any UNIX based computer can be a server. In addition, any networked computer system running a Web browser is a supported client and has access to our on-line data and information. One does not need to know where the data are stored to access it because the system automatically generates the necessary hypertext links each time data are requested (Groman and Wiebe, 1998).

The JGOFS/GLOBEC system can handle many data formats and data types. This is because it uses the data object concept where data and the necessary software to access it are linked into a "data object". Because

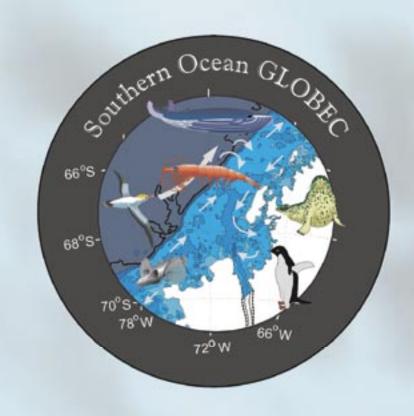
the networking and inter-operational software are common to every data object software module, only the code specific to accessing and reading the data needs to be written. We are therefore able to serve both ASCII, image and video data using the same software.

Typically, data are stored in flat files, as tables. This format and organization can easily be handled by the software. In fact, if ASCII data are separated by either spaces, tabs, or commas, one re line, then these data can be served without any additional s development effort, or changing the input files. If the data l complicated organization, such as embedded header record write a method (software program) to handle these data.Tl can be written in any language supported by the compute most of the time, the software is written in Perl or C.









Data Management

To accommodate the needs of a large, multidisciplinary program, it is important that (1) a data policy be decided on early and adopted by all participants, (2) data acquisition protocols be well defined and shared among all participants, and (3) the data management strategy be directed by and for the participating scientists. The data management office must be able to meet the needs of the researchers to be considered successful.

Date A almanda daama ant Dali

are			ledgem	-	
	U.S. GLOBEC Data Acknow	vledgement Policy		US CLOPE	C Data Policy
more	It is not ethical to publish data without proper attribution or co-authorship. The data are the intellectual property of the			U.S. GLOBEC Data Policy Report Number 10	
en we	collecting investigator(s). The intellectual investment and time committed to the collection of a data set entitles the investigator to the fundamental			February 1994	
ogram	benefits of the data set. Publication of descriptive or interpretive results privilege and responsibility of the investigators who collect the data.	derived immediately and directly from the data i			
em, but	The purpose of a data archive is to facilitate collaboration between sci- interdisciplinary and comparative studies, and the development and tes- system are made available even though they may not be "final" (i.e. error	ting of new theories. The data contained in this or free) data. This is dictated by and consistent w		GLOBEC Home Page	
	U.S. GLOBEC's data policy, Report #10 available on-line in Web for Any person making substantial use of a data set must communicate wit	th the investigators who acquired the data prior to		Table of	Contents
	publication and anticipate that the data collectors will be co-authors of to data organized for retrospective studies.		and • <u>Nan</u> • <u>Obj</u>	onal Requirements actives of the U.S. GLOBEC Data Policy by Statements	
	The data available here are intended for scholarly use by the academic understanding that any such use will properly acknowledge the originat	ting investigator. Use or reproduction of any mate	erial	 Quality and Methodology Data Exchange and Archival - Methods and Sci 	he dule
	herein for any commercial purpose is prohibited without prior written p Management Office.	ermission from the U.S. GLOBEC Data		 Sample Preservation Modification of Policy Management for Global Change Research Policy 	Statements
	Last modified: January 8, 2003				
_	Establ	ish Protocols	s in adv	ance includi	na
	LStabi				ing
Help		procedures	s anu va	riadies.	
	Data Acquisition <u>Procedures and Pr</u>	rotocols			
lelp	The fundamental objectives of U.S. GLOBEC are dependent upon the cooperation chemists must make use of <u>data collected</u> during U.S. GLOBEC field programs to chemistry. Our objectives require quantitative analysis of interdisciplinary data set	o further our understanding of the interplay of physics, b	biology, and		
mns, suitable for	extract the full scientific value, data must be made available to the scientific comm As a component of the U.S. Global Change Research Program (USGCRP), U.S.	unity on a timely basis.			
\$?	As a component of the U.S. Global Change Research Program (USGCRP), U.S. U.S. Global Change Program. All principal investigators are required to submit plans for the collection of data pr				
	expected to be similar to the information provided in proposals submitted prior to resource for the participating scientists to evaluate the suitability of the expected d the expected data sets, a "data plan", will be derived by the Data Management Of cooperating investigators. Where a group of investigators is cooperating in manage	funding. The purpose of this requirement is to provide lata set for achieving their scientific objectives. A single ffice from the submitted plans of individual investigators	a common e description of s or groups of		
	for each measurement type. To provide the opportunity for comparison with historical data, measurement tech data unless there is significant scientific justification for change. When new technic	niques should be consistent with techniques used to co	entries data		
	should be developed. This requirement extends to regional comparisons as well]	Procedures and protocols			
	The principal investigators will document the procedures that will be used to co For additional information about the U.S. GLOBEC Data Policy, see <u>U.S. GL</u> <u>Number 10, February 1994</u> from which much of the above material is extract	Accessing Georges bank SST images Alcohol preserved robramples Adding data to the system			
	Number 10, February 1994 from which much of the above material is extracts For information about adding your data to the U.S. GLOBEC Georges Bank is	 Bongo Sampler Towing Procedure for GLOBEC Bro Broad-scale Station Plans Broad-scale water sampling for compeniestope analy 			
		Chief Scientist Data Reporting Requirements Cruise Preparations Data acknowledgement policy			
		Data errors reporting protocol Data reporting and use protocol Drifter deployment procedure.			
		 Infityoplashton Sampling After ALL Pankwide Stab IELNET protocol Microscoplashtos Recording Protocol 	sone Are Occupied		
		MOCNESS 1-Meter ² Towing Procedure for GLOB MOCNESS 10-Meter ² Towing Procedure for GLOB			
		Mooring positions Post cruise obligations - Preliminary Cruise Report Predator DNA Gut Content Protocol			
		 Presidential ansatz collection protocol Preropod collecting protocol A rabonale for when to steam back to station. 			
		Sampling larval cod (Clarks morthus) and haddock (SeaWiFS images Software documentation form.	(Melannogrammus anglefinus) it s	JELNET Protocol for Broad	l-scale Cruises
		Station protocol for Broad-Scale cruises Zooplankton Collections in Alcohol Zooplankton Counting Protocol		Please Be Gentle. This Net System is Designed to	
		Zooplankton Pump Procedure		Fragile Zooplankton	
			weather conditions, we would	I especially like the JellNet tow to be made, since it w	s where a 10 m MOCNESS trawl is NOT made because of ould then be the only sample for large jellies. 5 m off the bottom) or to 100 m at the deeper stations. It is not
	and the second state of th		necessary to use a flowmeter wire out when the net is at the	with these tows, we will calculate volume filtered from surface. The wire out, and not the target depth, is th	n mouth diameter and depth. Suggest the winch operator zeros the e distance value logged at sea and then used to compute the
	A STATE OF	Statistics and a line	Control of the second s Second second s Second second sec second second sec	ters a minute, while it should be retrieved at no more	than 5 m/min. Do not allow the net to rest at the surface when
	and the Articles	Address of the second of the		ship's roll may act to spill a portion of the catch. t. Lean the frame on it's edge and gently rinse the cat	ch down into the codend bucket.
	a second s				ew on the light table. Since much of the cast may be fragile (large
	· · · · · · · · · · · · · · · · · · ·	In the second second	ctenophores, etc.), it need be		ad like a count of the large jellies, particularly lobate ctenophores
			ctenophores, etc.), it need be (i.e. Bolmopris, Mnemiopris)	and an oral / aboral length measurement of all the an thin a given taxa. Measurements are made with a rule	
			 ctenophores, etc.), it need be (i.e. Bolmopnis, Mnemiopnis), is more than ten individuals w preserved in a liter jar in 10% 6. Label jar and <u>COMPLETE I</u> 	and an oral / aboral length measurement of all the an thin a given taxa. Measurements are made with a rule buffered formalin. <u>ATASHEET</u> . Please keep these samples in a separa	Id like a count of the large jellies, particularly lobate ctenophores imals of a given taxa, or a subsample of ten measurements if there ir from underneath the dish. The entire catch should then be
		L. Madin	ctenophores, etc.), it need be (i.e. Bolmopnis, Mnemiopnis), is more than ten individuals w preserved in a liter jar in 10% 6. Label jar and <u>COMPLETE I</u> fontact Erich Horgan (ehorgan@w	and an oral / aboral length measurement of all the an thin a given taxa. Measurements are made with a rule buffered formalin. <u>ATASHEET</u> . Please keep these samples in a separa toi edu or 508-289-3207) for further details.	Id like a count of the large jellies, particularly lobate ctenophores imals of a given taxa, or a subsample of ten measurements if there ir from underneath the dish. The entire catch should then be
		L. Madin	ctenophores, etc.), it need be (i.e. Bolmopnis, Mnemiopnis), is more than ten individuals w preserved in a liter jar in 10% 6. Label jar and <u>COMPLETE I</u> fontact Erich Horgan (ehorgan@w	and an oral / aboral length measurement of all the an thin a given taxa. Measurements are made with a rule buffered formalin. <u>ATASHEET</u> Please keep these samples in a separa toi edu or 508-289-3207) for further details. the <u>Reeve Net Protocol</u> was used.	Id like a count of the large jellies, particularly lobate ctenophores imals of a given taxa, or a subsample of ten measurements if there ir from underneath the dish. The entire catch should then be
		T. Madin	ctenophores, etc.), it need be (i.e. Bolmopnis, Mnemiopnis), is more than ten individuals w preserved in a liter jar in 10% 6. Label jar and <u>COMPLETE I</u> fontact Erich Horgan (ehorgan@w lote: prior to the 1999 field season	and an oral / aboral length measurement of all the an thin a given taxa. Measurements are made with a rule buffered formalin. <u>ATASHEET</u> Please keep these samples in a separa toi edu or 508-289-3207) for further details. the <u>Reeve Net Protocol</u> was used.	Id like a count of the large jellies, particularly lobate ctenophores imals of a given taxa, or a subsample of ten measurements if there ir from underneath the dish. The entire catch should then be
	Maintain up-to	uipew T	ctenophores, etc.), it need be (i.e. Bolmopnis, Mnemiopnis), is more than ten individuals w preserved in a liter jar in 10% 6. Label jar and <u>COMPLETE I</u> fontact Erich Horgan (ehorgan@w lote: prior to the 1999 field season	and an oral / aboral length measurement of all the an thin a given taxa. Measurements are made with a rule buffered formalin. <u>ATASHEET</u> Please keep these samples in a separa toi edu or 508-289-3207) for further details. the <u>Reeve Net Protocol</u> was used.	Id like a count of the large jellies, particularly lobate ctenophores imals of a given taxa, or a subsample of ten measurements if there ir from underneath the dish. The entire catch should then be
		uipew T	ctenophores, etc.), it need be (i.e. Bolmopnis, Mnemiopnis), is more than ten individuals w preserved in a liter jar in 10% 6. Label jar and <u>COMPLETE I</u> fontact Erich Horgan (ehorgan@w lote: prior to the 1999 field season	and an oral / aboral length measurement of all the an thin a given taxa. Measurements are made with a rule buffered formalin. <u>ATASHEET</u> Please keep these samples in a separa toi edu or 508-289-3207) for further details. the <u>Reeve Net Protocol</u> was used.	Id like a count of the large jellies, particularly lobate ctenophores imals of a given taxa, or a subsample of ten measurements if there ir from underneath the dish. The entire catch should then be
	Maintain up-to Thesaurus	-date s	ctenophores, etc.), it need be (i.e. Bolmopnis, Mnemiopnis), is more than ten individuals w preserved in a liter jar in 10% 6. Label jar and <u>COMPLETE I</u> fontact Erich Horgan (ehorgan@w lote: prior to the 1999 field season	and an oral / aboral length measurement of all the an thin a given taxa. Measurements are made with a rule buffered formalin. <u>ATASHEET</u> Please keep these samples in a separa toi edu or 508-289-3207) for further details. the <u>Reeve Net Protocol</u> was used.	Id like a count of the large jellies, particularly lobate ctenophores imals of a given taxa, or a subsample of ten measurements if there ir from underneath the dish. The entire catch should then be
	Maintain up-to Thesaurus	o-date saurus	ctenophores, etc.), it need be (i.e. Bolmopnis, Mnemiopnis), is more than ten individuals w preserved in a liter jar in 10% 6. Label jar and <u>COMPLETE I</u> fontact Erich Horgan (ehorgan@w lote: prior to the 1999 field season	and an oral / aboral length measurement of all the an thin a given taxa. Measurements are made with a rule buffered formalin. <u>ATASHEET</u> Please keep these samples in a separa toi edu or 508-289-3207) for further details. the <u>Reeve Net Protocol</u> was used.	Id like a count of the large jellies, particularly lobate ctenophores imals of a given taxa, or a subsample of ten measurements if there ir from underneath the dish. The entire catch should then be
	Maintain up-to Thesaurus	o-date s saurus 2	ctenophores, etc.), it need be (i.e. Bolmopnis, Mnemiopnis), is more than ten individuals w preserved in a liter jar in 10% 6. Label jar and <u>COMPLETE I</u> fontact Erich Horgan (ehorgan@w lote: prior to the 1999 field season	and an oral / aboral length measurement of all the an thin a given taxa. Measurements are made with a rule buffered formalin. <u>ATASHEET</u> Please keep these samples in a separa toi edu or 508-289-3207) for further details. the <u>Reeve Net Protocol</u> was used.	Id like a count of the large jellies, particularly lobate ctenophores imals of a given taxa, or a subsample of ten measurements if there ir from underneath the dish. The entire catch should then be
	Maintain up-to U.S. GLOBEC Data Thes Revised: December 3, 200	e-date s saurus 2 sed by the U.S. GLOBEC	ctenophores, etc.), it need be (i.e. Bolmopnis, Mnemiopnis), is more than ten individuals w preserved in a liter jar in 10% 6. Label jar and <u>COMPLETE I</u> fontact Erich Horgan (ehorgan@w lote: prior to the 1999 field season	and an oral / aboral length measurement of all the an thin a given taxa. Measurements are made with a rule buffered formalin. <u>ATASHEET</u> Please keep these samples in a separa toi edu or 508-289-3207) for further details. the <u>Reeve Net Protocol</u> was used.	Id like a count of the large jellies, particularly lobate ctenophores imals of a given taxa, or a subsample of ten measurements if there ir from underneath the dish. The entire catch should then be
	Maintain upote District and upote Distre District and	e-date s s s s s s s s s s s s s s s s s s s	ctenophores, etc.), it need be (i.e. Bolmopnis, Mnemiopnis), is more than ten individuals w preserved in a liter jar in 10% 6. Label jar and <u>COMPLETE I</u> fontact Erich Horgan (ehorgan@w lote: prior to the 1999 field season	and an oral / aboral length measurement of all the an thin a given taxa. Measurements are made with a rule buffered formalin. <u>ATASHEET</u> Please keep these samples in a separa toi edu or 508-289-3207) for further details. the <u>Reeve Net Protocol</u> was used.	Id like a count of the large jellies, particularly lobate ctenophores imals of a given taxa, or a subsample of ten measurements if there ir from underneath the dish. The entire catch should then be
		e-date s s s s s s s s s s s s s s s s s s s	ctenophores, etc.), it need be (i.e. Bolmopnis, Mnemiopnis), is more than ten individuals w preserved in a liter jar in 10% 6. Label jar and <u>COMPLETE I</u> fontact Erich Horgan (ehorgan@w lote: prior to the 1999 field season	and an oral / aboral length measurement of all the an thin a given taxa. Measurements are made with a rule buffered formalin. <u>ATASHEET</u> Please keep these samples in a separa toi edu or 508-289-3207) for further details. the <u>Reeve Net Protocol</u> was used.	Id like a count of the large jellies, particularly lobate ctenophores imals of a given taxa, or a subsample of ten measurements if there ir from underneath the dish. The entire catch should then be
		e-date s s s s s s s s s s s s s s s s s s s	ctenophores, etc.), it need be (i.e. Bolmopnis, Mnemiopnis), is more than ten individuals w preserved in a liter jar in 10% 6. Label jar and <u>COMPLETE I</u> fontact Erich Horgan (ehorgan@w lote: prior to the 1999 field season	and an oral / aboral length measurement of all the an thin a given taxa. Measurements are made with a rule buffered formalin. <u>ATASHEET</u> Please keep these samples in a separa toi edu or 508-289-3207) for further details. the <u>Reeve Net Protocol</u> was used.	Id like a count of the large jellies, particularly lobate ctenophores imals of a given taxa, or a subsample of ten measurements if there ir from underneath the dish. The entire catch should then be
	Image: Description of the state of the	endate s s s s s s s s s s s s s s s s s s s	ctenophores, etc.), it need be (i.e. Bolmopnis, Mnemiopnis), is more than ten individuals w preserved in a liter jar in 10% 6. Label jar and <u>COMPLETE I</u> fontact Erich Horgan (ehorgan@w lote: prior to the 1999 field season	and an oral / aboral length measurement of all the an thin a given taxa. Measurements are made with a rule buffered formalin. <u>ATASHEET</u> Please keep these samples in a separa toi edu or 508-289-3207) for further details. the <u>Reeve Net Protocol</u> was used.	Id like a count of the large jellies, particularly lobate ctenophores imals of a given taxa, or a subsample of ten measurements if there ir from underneath the dish. The entire catch should then be
eq%20N		ed (mg/m ²) or micrograms per	ctenophores, etc.), it need be (i.e. Bolmopnis, Mnemiopnis), is more than ten individuals w preserved in a liter jar in 10% 6. Label jar and <u>COMPLETE I</u> fontact Erich Horgan (ehorgan@w lote: prior to the 1999 field season	and an oral / aboral length measurement of all the an thin a given taxa. Measurements are made with a rule buffered formalin. <u>ATASHEET</u> Please keep these samples in a separa toi edu or 508-289-3207) for further details. the <u>Reeve Net Protocol</u> was used.	Id like a count of the large jellies, particularly lobate ctenophores imals of a given taxa, or a subsample of ten measurements if there ir from underneath the dish. The entire catch should then be
eq%20N		ed (mg/m ³) or micrograms per bed (mg/m ³) or micrograms per	ctenophores, etc.), it need be (i.e. Bolmopnis, Mnemiopnis), is more than ten individuals w preserved in a liter jar in 10% 6. Label jar and <u>COMPLETE I</u> fontact Erich Horgan (ehorgan@w lote: prior to the 1999 field season	and an oral / aboral length measurement of all the an thin a given taxa. Measurements are made with a rule buffered formalin. <u>ATASHEET</u> Please keep these samples in a separa toi edu or 508-289-3207) for further details. the <u>Reeve Net Protocol</u> was used.	Id like a count of the large jellies, particularly lobate ctenophores imals of a given taxa, or a subsample of ten measurements if there ir from underneath the dish. The entire catch should then be
eq%20N		ed (mg/m ³) or micrograms per bed (mg/m ³) or micrograms per	ctenophores, etc.), it need be (i.e. Bolmopnis, Mnemiopnis), is more than ten individuals w preserved in a liter jar in 10% 6. Label jar and <u>COMPLETE I</u> fontact Erich Horgan (ehorgan@w lote: prior to the 1999 field season	and an oral / aboral length measurement of all the an thin a given taxa. Measurements are made with a rule buffered formalin. <u>ATASHEET</u> Please keep these samples in a separa toi edu or 508-289-3207) for further details. the <u>Reeve Net Protocol</u> was used.	Id like a count of the large jellies, particularly lobate ctenophores imals of a given taxa, or a subsample of ten measurements if there ir from underneath the dish. The entire catch should then be
eq%20N		ed (ng/m ³) or micrograms per bed (ng/m ³) or micrograms per	ctenophores, etc.), it need be (i.e. Bolmopnis, Minemioprist) is more than ten individuals w preserved in a liter jar in 10% 6. Label jar and <u>COMPLETE I</u> Contact Erich Horgan (shorgan@wl lote: prior to the 1999 field searon bebruary 17, 1999 - Brick Horgan	and an oral / aboral length measurement of all the an thin a given taxa. Measurements are made with a rule buffered formalin. (ATASHEET Please keep these samples in a separa noi edu or 508-289-3207) for flatther details. (the <u>Reere Net Protocol</u> was used.	Id like a count of the large jellies, particularly lobate ctenophores imals of a given taxa, or a subsample of ten measurements if there ir from underneath the dish. The entire catch should then be
eq%20N		ed (mg/m ³) or micrograms per bed (mg/m ³) or micrograms per	ctenophores, etc.), it need be (i.e. Bolmopnis, Minemioprist) is more than ten individuals w preserved in a liter jar in 10% 6. Label jar and <u>COMPLETE I</u> Contact Erich Horgan (shorgan@wl lote: prior to the 1999 field searon bebruary 17, 1999 - Brick Horgan	and an oral / aboral length measurement of all the an thin a given taxa. Measurements are made with a rule buffered formalin. (ATASHEET Please keep these samples in a separa noi edu or 508-289-3207) for flatther details. (the <u>Reere Net Protocol</u> was used.	Id like a count of the large jellies, particularly lobate ctenophores imals of a given taxa, or a subsample of ten measurements if there ir from underneath the dish. The entire catch should then be

This usually means sufficient people to work with the data contributions so that all data are preserved, variable naming conventions are adhered to, data protocols are followed, and all supporting information and metadata are collected and preserved.

To attain our program goals, scientific investigators must be able to analyze their data and combine their data with others into a coherent synthesis. In the U.S. GLOBEC program, we realized that to fully utilize our wealth of data, additional tools to facilitate the modeling and synthesis efforts are needed. The first tool developed, EasyKrig, uses a graphical user interface (GUI) to simplify the operation. It requires Matlab 5.x with or without the optimization toolbox and consists of five components, or processing stages:

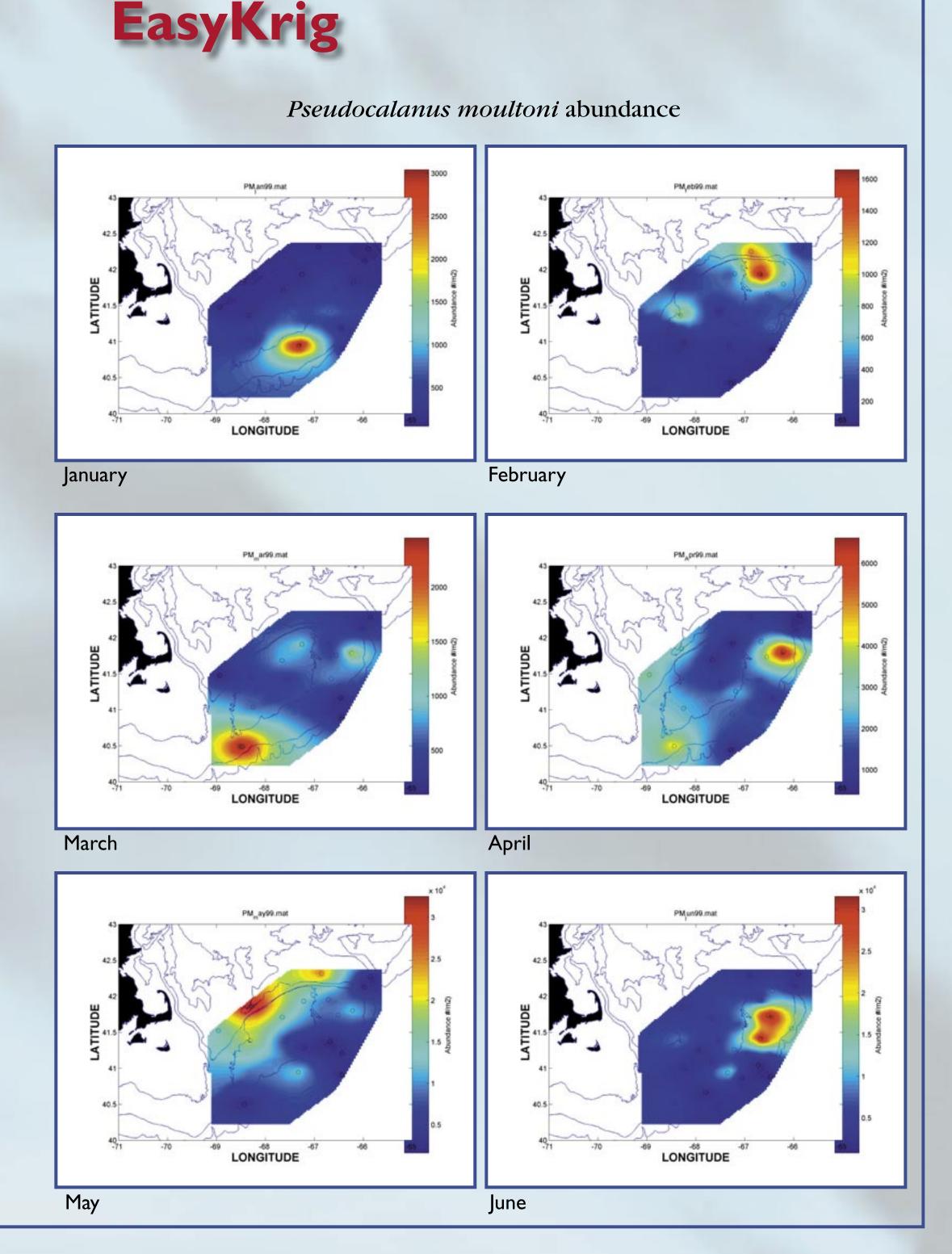
The JGOFS/GLOBEC data management program provides the software building blocks for the U.S. GLOBEC data management effort. Its flexible and extensible capabilities allow it to be used to serve data in a distributed environment, addressing the needs of three large multi-disciplinary programs. These programs need to be able to share many different biological and physical data sets for analysis and synthesis among hundreds of scientific investigators.

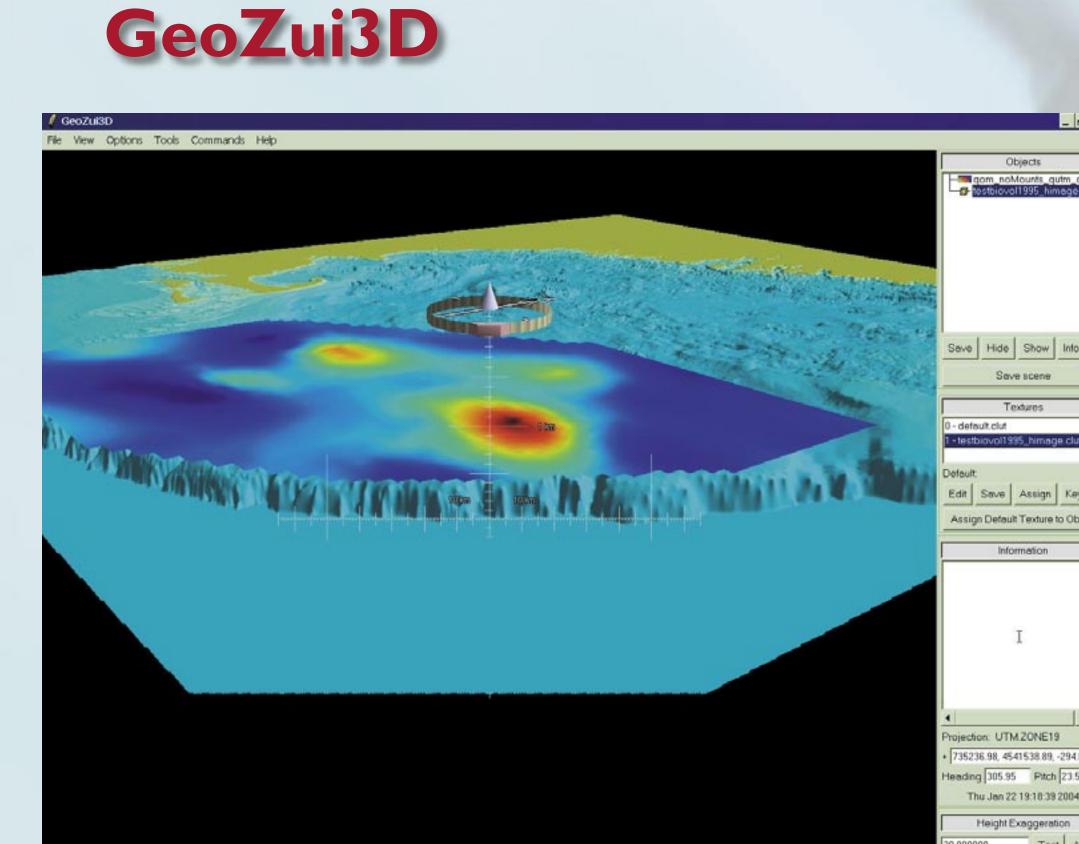
Flierl, G, et al, 1992. A Data and Information system for JGOFS. http://lake.mit.edu/~glenn/datasys/gofsms.ps Groman, R.C. and P.H. Wiebe, 1998. Data management in the U.S. GLOBEC Georges Bank Program. Ocean Community Conference '98 Proceedings, Marine Technology Society, Baltimore MD. pp.807-812.



- (1) data preparation,
- (2) variogram computation,
- (3) kriging,
- (4) visualization and
- (5) saving results.

It allows the user to process isotropic and anisotropic data, select a list of variogram models, and a choice of kriging methods, which are also common features of the other existing software packages. One of the major advantages of this program package is that the program minimizes the users' requirements to "guess" the initial parameters and automatically generates the required default parameters. In addition, because it uses a GUI, the modifications from the initial parameter settings can be easily performed. Another feature of this program package is that it has a built-in, on-line, help library that allows the user to understand the use of parameter and operation buttons by just a simple click.





- The second tool, still under
- development through a partnership with the Center of Coastal and Ocean Mapping at the University of New Hampshire, i called GeoZui3D. GeoZui3D, a highly interactive 3D visualization system, has the following features:
- * Uses a standard mouse interface. It is only necessary to click on a point of interest for the area to be moved to the center of the screen.
- * With appropriate hardware, the system provides a stereoscopic (3D)
- * Unix and PC/Windows compatible * Fully georeferenced
- The full power of this software is evidenced when multiple objects of different types are viewed simultaneously. One is then able to "fly through" the 3D representation of the data gaining insight and perspective.
- [Ware, C., http://www.ccom.unh.edu/ vislab/projects/GeoZui3D.html]

Conclusions



Acknowledgements



Close Frame

We would like to thank Ann Bucklin and Dennis McGillicuddy for providing the *Pseudocalanus* data. This work is supported by the NSF Ocean Science Division and the NOAA Coastal Ocean Program.