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PREFACE

The National Ocean Survey (NOS) provides charts and related information for the safe navigation of marine and air commerce. NOS also furnishes other Earth science data from geodetic, hydrographic, oceanographic, geomagnetic, seismologic, gravimetric, and astronomic surveys, observations, investigations, and measurements.

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Alger, D. E.

The design, development, and implementation of the National Geodetic Survey Data Base Query System. Proceedings of the International Symposium, Management of Geodetic Data, Danish Geodetic Institute, International Association of Geodesy/International Union of Geodesy and Geophysics, Aug. 1981, p. 77-93.

The National Geodetic Survey Data Base (NGSDB) Query System was designed and developed with three major goals in mind. These goals were: (1) a user-oriented system, (2) an expandable query system, and (3) a maintainable system.

Each of these design goals has been achieved in the development of the system. They have been tested in a "real world" environment, ever changing during the implementation phase, and proven successful.

The NGS Data Base is somewhat different by design than most commercial systems. It not only provides basic storage, update, and retrieval capabilities, but controls the use of entry and retrieval paths through application programs in the data base environment. A hierarchical menu selection system was designed for the NGSDB Query System because it best satisfied our required goals; a detailed description of the system explains how this is achieved. A modular design enables the system to expand with new applications, new data types, and new functions. In addition, the menu selection system provides up-to-date documentation of the system for users as well as designers; it requires limited training of users, provides a range of accessibility to functions, and is easily maintained.

Alger, D. E.

The new adjustment of the North American Horizontal Datum. Article no. 24: an update on the data base management system. American Congress on Surveying and Mapping Bulletin, No. 74. Aug. 1981. p. 53-54.

Building the National Geodetic Survey data base is a large complex task which involves the storage of voluminous data, collection of different data elements, and the need to expand elements and functions within the data base environment. The data base management system provides the user with a hierarchical prompting system, which allows "menu selection" for formulating data base requests. The structure of the data base prompting system includes three levels of menus to achieve the desired function.

Baer, L.

Users' needs for wave data--applications. Proceedings of the Symposium on Wave-Measurement Technologies, National Research Council, Marine Board, Apr. 1981 (in press).

Operational wave measurements are important for many applications. Unfortunately, cost effective systems that can meet the needs for such operational systems are inadequate. Some of the special problems which must be attacked are: evaluation of system accuracy, increased reliability, better directional resolution, longer ranges and duty cycles, and decreased system cost.

Baer, L. (Damans & Assoc., ed.)

Transcript of workshop on wind-wave hindcasting and forecasting models. Sponsored by the NOAA Coastal Waves Program, June 1980, NOAA Report, Oct. 1981, 433 pp.

This report is an edited transcript of a workshop which reviewed all aspects of wind-wave hindcasting and forecast models. In the workshop, four major presentations reviewed the state-of-the-science in the areas of basic theory, deep-water models, shallow-water models, and winds. Then, each participant briefly summarized his ongoing activities and plans. This was followed by working groups on deepwater models, shallow-water models, and winds. Participants were limited to 25 scientists who were mostly from the United States but included representation from four other countries.

Baer, L., and Earle, M. D. (Senior Oceanographer, Marine Environments Corp.)

Effects of uncertainties on extreme wave heights. Journal of the Waterway, Port, Coastal, and Ocean Division of the American Society of Civil Engineers (in press) 16 pp.

The relative effects of uncertainties due to record lengths, natural variability, and measurement or hindcast errors on estimated extreme significant wave heights has been assessed objectively through simulation. The probability distributions describing extreme heights at a given return period have confidence intervals broader than those computed from typically used techniques and show substantial positive biases. Both the widths of the confidence intervals and the biases increase with the size of the total uncertainty which represents the combined effects of measurement or hindcast errors and natural variability. Tables and nomograms are provided for practical assessment of record lengths, natural variability and errors on extreme wave estimates.

Baer, L., Esteva, D., Huff, L., Iseley, W., and Earle, M.

Development of the National Coastal Waves Program. Presented to the Inter-Union Committee on Radio Meteorology Symposium on Wave Dynamics and Radio Probing of the Ocean Surface, May 1981. Proceedings (in press).

A national Coastal Waves Program has been established to provide the statistical information for determining environmental design criteria, to support government management decisions, and to provide real-time information for wave forecasting in support of marine operations. The technical considerations and analyses behind program decisions such as: the type of measurement and communication systems, its configuration and duty cycle, and the advantages and disadvantages of field measurements versus hindcasting are presented. Results from a pilot network of conventional Waverider systems show that 38 percent of the records have data losses which degrade computation of spectra. This can be improved by filters and directional antennas; however, buoys with satellite communications and onboard computers offer even less losses and offer more flexibility in deployment but have stringent power limitations. It is shown that the effects of such limitations can be minimized by careful selection of the duty cycle. Although hindcasting has been the traditional method of determining extreme wave statistics, it is shown that when relative accuracy is taken into consideration, shorter term measurements are often more useful than longer term hindcasts.

Bass, G. R.

A geographic coordinate data base approach to nautical chart compilation. Technical papers of the American Society of Photogrammetry 47th Annual Meeting, Feb. 1981, p. 296-297.

The National Ocean Survey is in the final stages of implementation of the National Ocean Survey Automated Information System (NOS/AIS). The NOS/AIS is a computer-based system designed to provide on-line disk storage for the features of nautical chart published by the National Ocean Survey (NOS), to provide cartographic personnel the capability of maintaining these nautical charts, and to support the production of current and new charts.

The NOS/AIS stores chart features uniquely by their geographic position. This method avoids the redundancy involved by storing a feature once for each chart on which it may fall, and reduces the chance one feature is depicted differently on two charts.

This paper describes the NOS/AIS approach to chart continual maintenance, the organization of the data base, the present configuration of the hardware, and considerations for cartographic work stations in the future.

Bossler, J. D.

New adjustment of North American Datum. Presented to the American Society of Civil Engineers Spring Convention, May 1981. Journal of Surveying and Mapping Division, American Society of Civil Engineers (in press).

The new adjustment of the North American Datum will be completed in 1984. The numerical problems associated with the solution of 500,000 unknown

parameters, simultaneously, appear to be minimal. The results of several large test adjustments using the Helmert Block software system indicate the adjustment can be achieved in an efficient manner. Several new policies affecting a variety of users have been defined and will be discussed. A definition of the state plane coordinate system resulting from the adjustment is emerging and will be presented.

Bossler, J. D.

A note on global positioning system activities. American Congress on Surveying and Mapping Bulletin, No. 74, Aug. 1981, p 39-40.

The National Oceanic and Atmospheric Administration of the Department of Commerce in cooperation with the Department of Defense (DoD) and the Department of the Interior are evaluating the NAVSTAR Global Positioning System developed by DoD. This system, which incorporates advanced space technology, has the potential capability of revolutioning geodetic surveying. Satellite geodesy has made important advances by providing a means for interconnecting continental datums and establishing reference points within individual datums. Current achievable (satellite) accuracies range from 10 to 20 cm. Both the need and opportunity exist for achieving greater accuracies of about an order of magnitude.

Bossler, J. D.

Status report of the North American Subcommission of Commission X. Proceedings of the Sixth International Symposium on Geodetic Networks and Computations, International Association of Geodesy/International Union of Geodesy and Geophysics, Aug. 1981.

Two major projects continue to dominate the North American geodetic scene during 1981. These are the readjustment and redefinition of the North American horizontal datum and the redefinition of the North American vertical reference system. The successful completion of the two ventures will require unprecedented resources and sophisticated instrumentation compared to previous geodetic projects of a similar nature. This report summarizes the status of the projects in Canada and the United States, and includes a brief description of other current geodetic activities.

Carter, W. E.

Frequency modulation of the Chandlerian component of polar motion. Journal of Geophysical Research, Vol. 86, No. B3, Mar. 1981, p. 1653-1658.

Detections of variations in the frequency of the Chandlerian component of polar motion have been reported by several investigators, starting at least as early as Chandler's (1892) report. The concept has never gained general acceptance because no credible cause has been identified. Investigations reported in this paper suggest that the Chandlerian component may be frequency

modulated as a linear function of the polar motion magnitude. The variation in frequency is estimated to be -0.03 to 0.06 cycles per year increase per 0.1 second of arc decrease in the polar motion magnitude. Nonequilibrium response of the oceans to polar motion, which takes the form of a pole tide that varies with time in enhancement and phase lag, is suggested as a possible cause of the frequency modulation.

Carter, W. E., and Pettey, J. E.

Report of survey for McDonald Observatory, Harvard Radio Astronomy Station, and vicinity. NOAA Technical Memorandum NOS NGS 32, May 1981, 83 pp.

A special purpose three-dimensional geodetic survey was conducted in the vicinity of the McDonald Observatory and Harvard Radio Astronomy Station (HRAS) near Ft. Davis, Texas. The observing program included astronomic positions and azimuths, zenith distances, electromagnetic distance measurements, leveling, gravity measurements, Doppler satellite positioning, and a variety of ancillary measurements. Particular care was taken in designing the survey to ensure the vectors connecting the reference points of the McDonald lunar laser ranging system, HRAS very long base interferometry, and the mobile laser ranging system were determined to uncertainties of a few centimeters (3-5 cm). This report contains descriptive information on the methods employed in the collection, reduction, and analysis of the survey data, tabulations of the observational data, and numerical and interpretive results of our analysis. Particularly significant are the excellent results attained in the zenith distance measurements that enable use to determine the vertical components of the longest vectors (about 8 km) with estimated accuracies of 2 to 4 cm.

Chovitz, B. H.

The influence of Hotine's Mathematical Geodesy. Presented at the Eighth Hotine Symposium, Sept. 1981. Proceedings (in press).

Hotine's Mathematical Geodesy has greatly influenced the course of geodetic research since its publication in 1969. Examples can be found in applications to physical geodesy, geodynamics, and pure mathematics.

Dillinger, W. H.

Subroutine package for processing large, sparse, least-squares problems. NOAA Technical Memorandum NOS NGS 29, Jan. 1981, 20 pp.

A package of subroutines has been compiled to make it relatively easy for application programmers to use several existing subroutines for forming and solving very large, sparse sets of normal equations. The package provides a method for reordering, solving, and computing a portion of the inverse for sparse matrices, including the step of building the normal equations from the observation equations.

The two sections of the package include (1) reordering the normal equations and (2) building the normal equations. The program then reduces, solves, and computes the inverse. Although the two sections can be used independently, they were designed to be used together. Implementing each section involves three basic steps: (1) initialized some work space, (2) pass the observation equations to the system, and (3) call for the needed operation. The number of parameters passed in each call has been kept to a minimum to make the procedure easy to understand and use. A simple example demonstrates how quickly the package can be implemented.

Dodds, A. W., Jr.

Computer technology as applied to the management of terminal aeronautical chart production by the National Ocean Survey. Technical papers of the American Congress on Surveying and Mapping 41st Annual Meeting, Feb. 1981, p. 223-235.

The Instrument Approach Procedure Chart Branch of the Aeronautical Chart Division, National Ocean Survey, is charged with the maintenance of approximately 5,200 Terminal Instrument Procedures throughout the United States and its territories. Prior to November 30, 1978, these charts were produced in a biweekly single sheet format. Each chart represented one side of a sheet of paper, and a 'Revision Notice' detailed the revised, canceled, and original changes to these sheets. That 'Revision Notice' was relatively simple to create as it detailed only the charts that were changed for the week's production. With the introduction of the National Ocean Survey's 'Bound Volume' concept requirements surfaced which would not permit continued usage of the manual system. The individual charts were not included in regionalized bound volumes supplemented every 28 days by a 'Change Notice' volume. Volume indexing, pagination, summary listing, and chart scheduling requirements necessitated the development and implementation of an automated data processing procedure to replace the manual techniques. This procedure has been implemented and serves a total chart production management system.

Douglas, B. C.; and Cheney, R. E. (NASA)

Ocean mesoscale variability from repeat tracks of Geos-3 altimeter data. Journal of Geophysical Research, Vol. 86, No. C11, Nov. 1981, p. 10,931-10,937.

The Geos-3 satellite altimeter observed numerous sea surface profiles along nearly repeated tracks in the western North Atlantic during its 3.5-year lifetime, enabling observation of the variation of sea surface topography along these tracks. Analysis of 14 north-going and 13 south-going sets of repeated tracks has yielded the variability of the surface at a resolution of 1° from 25° to 41° N latitude and from 60° to 80° W longitude. The observed rms variation of surface topography ranges from about 8 cm in the Sargasso Sea to a maximum of 48 cm in the Gulf Stream meander region, in agreement with known mesoscale energetics of this region.

Embley, R. W.

The role of mass transport in the distribution and character of deep-ocean sediments with special reference to the North Atlantic. Marine Geology, Winter 1980-1981.

The distribution and character of mass flows, particularly on the North Atlantic margin, are described. On seismic records mass flow characteristics range from contorted internal reflectors and a hummocky surface to acoustically transparent, lens-shaped deposits. The acoustic character also partly depends on the degree of lithification of the sediment; lithified or semilithified material will form more irregular deposits than will unconsolidated muds even though translated over the same slopes and distances.

Mass flow structures found in cores are difficult to interpret, usually because of the small diameter of the sampler. In fact, mass flow deposits cored with a standard piston corer are sometimes not even recognized. The primary sedimentary structures found in mass flow deposits range from angular contacts to convoluted folds to clasts of lithified or semilithified sediment or sand inclusions. These structures are related to the amount of translation, the lithology of the parent material and the slope over which the flow moved.

At least 40 percent of the continental rise of eastern North United States from the New England Seamounts to the Blake-Bahama Outer Ridge is covered with a veneer of mass flow deposits including debris flows. The largest zones are (1) south of Long Island and Cape Cod, (2) off Maryland and Virginia, (3) off North Carolina opposite Abermale Sound, and (4) off South Carolina between the Blake-Bahama Outer Ridge and the Hatteras Canyon system. In the latter area, the flows onlap the Hatteras Abyssal Plain to a depth of 5,400 meters. On the Maryland-Virginia continental rise, a 10 x 100 km lobe has been discovered which is separated from the primary mass flow deposit upslope. This may represent either a detached flow or a coalescence of flows triggered by the sudden loading of the rise upslope.

Numerous cores taken on the continental rise contain mass flow structures. These units are usually capped by at least 30 cm of hemipelagic sediment and radiocarbon dates taken at the base of the hemipelagic units suggest that most of the mass flow deposits were emplaced in the Late Wisconsin during lowered sea level.

Mass flow deposits are an important Pleistocene passive continental margin sedimentary facies and are found overlapping or contiguous with turbidites even in very deep water and on very gentle slopes. The overall importance of this facies in the geologic record awaits a careful examination of CDP records.

Esteva, D.

The equilibrium range for waves in water of finite depth. Presented to the Symposium on Wave Dynamics and Radio Probing of the Ocean Surface, May 1981, Proceedings, (in press).

The validity of Kitaigorodskii et al's finite depth equilibrium spectrum is investigated by comparing the proposed equation with the best fit curve, in the least squares sense, to observed sprectra.

Two data sets consisting of simultaneous observations collected off the Corps of Engineers Field Research Facility (FRF) at Duck, N.C., are used. One data set was of observations from wave staffs along the FRF pier when the significant height at the end of the pier was either increasing or remained relatively stationary at around 1 m or above. The other data set consisted of observations from the staffs and from offshore Waverider buoys at the onset of a gale recorded during the Atlantic Remote Sensing Land Ocean Experiment (ARSLOE).

Measurements were made in water depths ranging from 2.4 to 23.5 m. All the staffs and one Waverider were deployed in less than 10 m of water, while the remaining five Waveriders were deployed in water deeper than 17 m.

A fit to a power law (af^b) is made from f_m, the frequency corresponding to the spectral maximum, to $2f_m$. To eliminate those spectra which are not appropriately described by a power law, only spectra with a correlation above 0.79 in the fit are considered. For those sprectra and for each sensor, an average value of the power (b) and of the coefficient (a) are computed. A table shows results from the two data sets and for the two water depth ranges. Results from a power fit to the proposed theoretical curve are also shown.

It can be seen from the table that the dependence of the power on water depth is in general agreement with Kitaigorodskii's equation, that a few spectra of observation in less than 10 m of water had a correlation above 0.79, and that a dependence of the coefficient (and thus Phillip's "constant") on wave steepness as well as on water depth is indicated.

Ethridge, M. M.

Launch wire drag refinements. Presented to the National Ocean Survey Hydrographic Survey Conference Eighth Annual Meeting, Jan. 1981, Proceedings, (in press).

Some improvements to the launch wire drag system used aboard the WHITING for clearing obstructions are described. The importance of standardized record keeping is stressed and an example of an area and depth diagram produced by launch wire drag is presented. The effectiveness, efficiency, and magnitude of a launch wire drag operation are also discussed.

Feldman, A. W.

The National Ocean Survey's aeronautical radar video map: a unique cartographic product. Technical papers of the American Congress on Surveying and Mapping 41st Annual Meeting, Feb. 1981, p. 443-454.

The National Ocean Survey is currently providing a unique cartographic product for safe air traffic control of this nation's airspace system. The moving aircraft are represented on the radar scope as blips which are superimposed over a radar video map. These maps are unique in that they have only point and line symbology of all equal weight. There is no type and all symbology appears in white against a black background. Most of the data depicted such as holding patterns, airways and intersections, approach and departure routes from airports, and various kinds of division of airspace have little tangible or phyiscal existence in relation to geographic reference points on the ground. Combined with the input from the radar, the controller has a new map showing precise aircraft location for every sweep of the radar equipment or approximately every 6 seconds.

Frey, H. R.

Physical oceanography on the Louisiana Shelf. Presented to the Research and Development Science Seminar Series, May 1981. NOAA-NOS, NOS Strategic Petroleum Reserve Support Project: Final Report, Vol. 1, Oct. 1981, 470 pp.

Physical oceanographic and meteorological measurements were made during a 12-month period beginning June 1978 at two sites on the Louisiana inner shelf. Circulation and stratification of the inner shelf waters are governed principally by wind stresses and river runoff and, to a lesser extent, by tidal influence and occasional coupling with the general circulation of the northwestern Gulf of Mexico.

Seasonal circulation and stratification characteristics, as well as observations made during four different types of storm events, were described. The relative importance of Ekman transport, inertial currents, coastal boundary currents, and Langmuir circulation were discussed.

Fritz, L.

Testing Procedures for Analytical Plotters. Photogrammetric Engineering and Remote Sensing, American Society of Photogrammetry (in press).

Performance and acceptance tests of equipment are procedures for quality control that are essential in any evaluation process. The wide variety of analytical plotters on the market today, and their basic differences from analog plotters, requires that we institute a new look at these procedures. This paper addresses many of the test procedures that should be applied and the underlying philosophy of these performance tests for analytical plotters. Included is, what should be tested, why it should be tested, and how it can

be tested. The approaches suggested are pragmatic in that they are addressed to the needs of the majority of analytical plotter users and are therefore designed to quantify performance. Practical, simplified tests are proposed that will enable a typical user to verify that a particular analytical plotter is suitable for his needs, or to provide a means for him to ascertain that his specifications for an analytical plotter have been met. An example from an actual analytical plotter acceptance is presented.

Fury, R. J.

Automated recognition of similarities between objects via correlation analysis. Proceedings Trends and Applications 1981: advance in software technology, Institute for Electrical and Electronics Engineers Society, May 1981, p. 63-70.

A frequent need in automated transactions is to recognized similarities between coded objects. Occasionally, it is not sufficient to determine whether or not two objects (descriptive names) are identical. Thus, some measure of similarity must be established. Difficulties in automated identification are caused by abbreviations and various qualifiers attached to the definitions. The development of a rigorous system for the distinction of similar objects would be cost-prohibitive, but experience shows that correlation analysis techniques that are built into an interactive system improve processing efficiency and reduce costs.

Fury, R. J.

Data bank techniques for the management of large volume geodetic and geophysical data at the National Geodetic Survey. Proceedings of the International Symposium, Management of Geodetic Data, Danish Geodetic Institute and International Association of Geodesy of the International Union of Geodesy and Geophysics, Aug. 1981, p. 58-76.

The National Geodetic Survey has established and maintains numerous data banks for the storage of large volumes of geodetic and geophysical data. The organizations of these data banks have been optimized for single-key retrieval. Physically separated data sets are linked via directories; economy in storage is achieved through data compression. Some data management methods chosen by the National Geodetic Survey are computer system dependent, although equivalent methods are available on other systems; others are completely independent from the system used. Access methods at various levels of sophistication are explored, and the relationship of these data banks to the geodetic network station data base discussed.

Gale, P., Mezera, D. F., and Stem, J. E.

Geodetic control surveying: roles of Federal, State, and local government. 24 pp. (LISD).

This report presents preliminary findings of a study group within the

Geodetic Surveying Committee of the American Society of Civil Engineering that is analyzing the role of geodetic surveying in the United States. After first defining some of the commonly used geodetic terms, the report reviews the history of geodetic leveling, lists the benefits to individual property owners and to Federal, State, and local governments. The study poses questions on the desirable density and accuracy of monumented control and the responsibility for the establishment and maintenance of that control. Preliminary recommendations are cited. Based upon further review, and taking into consideration readers' responses, a final report is scheduled to be prepared in 1982.

Garnett, D. M.

Design concepts for a cartographic information workshop. North American Cartographic Information Society, Madison, Wis., Sept. 1981.

A cartographic information model was constructed to advance the North American Cartographic Information Society's stated purposes, which are to: promote communication, coordination, and cooperation among the producers, disseminators, and users of cartographic information. The unique features of this model are its modular design concept. Mission objectives, policies, and requirements change of this model can be used to implement map information systems at other cartographic facilities without changes to its basic design concept.

Gergen, J. G.

The geodetic basis for precise photogrammetric densification. Technical Papers of the American Congress on Surveying and Mapping 41st Annual Meeting, Feb. 1981, p. 105-109.

Densification of horizontal control to support large-scale mapping of Ada County, Idaho, was performed by precise photogrammetric techniques. The precision of control points used for photogrammetric interpolation is important to assure highest possible accuracy of adjusted points. Horizontal network analysis provides specifications for future surveys, geodetic field operations, as well as office computations. Actual cost figures are quoted. The accuracy of horizontal control stations has shown to be well within expectations for this precise photogrammetric densification survey. A postmortem horizontal verification survey is scheduled for January 1981. Results of this survey will be important for the overall assessment of the quality of such a cooperative effort between geodesy and photogrammetry.

Gergen, J. G.

Modern observation techniques for terrestrial networks. Proceedings of the Sixth International Symposium on Geodetic Networks and Computations, International Association of Geodesy of the International Union of Geodesy, Aug./Sept. 1981.

Most countries have both a horizontal and a vertical control network. In

general, these networks are disjointed, although attempts have been made to upgrade individual points from both networks to points for which all three coordinates--latitude, longitude, and height--are known with precision. Since the advent of the first electronic distance measuring instrument, several new geodetic surveying techniques have emerged. Some depend on artificial satellites, satellite Doppler and satellite laser techniques, and the Global Positioning System. One method depends on extra-galactic radio sources (very long base line interferometry) and one is Earth-bound (the Inertial Survey System). During the next decade, all of these new techniques will have a major impact on the classical geodetic network.

Gibson, P. N.

Cooperative mapping products of the NOAA Coastal Hazards Program. Technical Papers of the American Congress on Surveying and Mapping 41st Annual Meeting, Feb. 1981, p. 337-344.

The NOAA Coastal Hazards Program has been developed in response to the multitude of threats posed by the environment to the coastal regions of the United States. In reply to the need for the development of local evacuation procedures and hazards research, the Coastal Hazards Program has undertaken several cooperative mapping projects. The first project, in cooperation within the State of Virginia, was a second-generation Storm Evacuation Map. The second project, in cooperation with the Coastal Engineering Research Center (Army Corps of Engineers) and the U.S. Geological Survey, is a historical shoreline movement study, covering the area from Cape Henlopen, Del. to Cape Hatteras, N.C. The mapping methods, procedures, and products are discussed and displayed.

Gittings, L. B.

Field evaluation of electronic tacheometers. Technical Papers of the American Congress on Surveying and Mapping 41st Annual Meeting, Feb. 1981, p. 63-64.

The National Geodetic Survey (NGS) performed a field test of three Electronic Tacheometer Instruments (ETI) to determine if these instruments are suitable for NGS's needs. The main objective of the test was to investigate the feasibility of performing second-order control surveys, rather than to test the many other surveying applications (cadastral, topographic, engineering, and others) of the ETI. The three ETI tested were the Zeiss Elta 2, Hewlett Packard 3820A, and Wild Tachymat TC1. Numerous observations and measurements were taken with these ETI at a test site established at the National Bureau of Standards (NBS) in Gaithersburg, Maryland, and at the NGS high precision base line in Corbin, Va. The intention of the author is not to rate these instruments, but to evaluate them by showing comparisons of the observations and measurements, and to discuss these comparisons, the test sites, equipment and procedures used, and other related events of the test.

Glover, C., and Lapine, L. A.

Methods and equipment used to obtain subcentimeter international accuracy on special surveys. Technical Papers of the American Congress on Surveying and Mapping 41st Annual Meeting, Feb. 1981, p. 83-91.

Occasionally, the National Geodetic Survey (NGS) performs projects of a special nature that require accuracies which are not achievable by classical methods and instrumentation. The complexity of such projects necessitates instrumentation which is neither on inventory or available from any commercial source. The solution to these needs lies in some combination of the following items: (1) modification of existing equipment or instrumentation, (2) design and fabrication of new equipment and instrumentation, (3) use of classical equipment and instrumentation for purposes other than those for which they were designed, and (4) development of new methods. The NGS recently undertook and completed a project at the Maryland Point Observatory that utilized these features.

Groten, E. (on leave from Technische Hochschule Darmstaadt, Federal Republic of Germany)

Determination of plumb line curvatures by astronomical and gravimetric methods. NOAA Technical Memorandum NGS 30, Feb. 1981, 20 pp.

The actual plumb line curvatures for several selected stations of the U.S. triangulation network in the Rocky Mountain area are estimated using two formulas by H. Bodemüller. By taking terrain inclination data from topographic maps, as well as elevations and conservative estimates of horizontal gravity gradients, it is shown that the determination of actual plumb line corrections is practically impossible. By varying the data to within reasonable limits totally different estimates for the constituents of the plumb line correction are found. Taking into account the 30" by 30" estimates for mean elevations in the United States, it seems that the only fairly reliable estimate of actual plumb line corrections is obtainable from topographic models. Also normal plumb line curavature is considered.

Groten, E. (on leave from Technische Hochschule Darmstaadt, Federal Republic of Germany)

Precise determination of disturbing potential using alternative boundary values. NOAA Technical Report NOS 90 NGS 20, Aug. 1981, 70 pp.

Advanced gravimetric techniques can be applied for the precise determination of geodetic parameters. Data from the Global Positioning System (GPS) and from GRAVSAT-type satellites lend themselves to combinations and comparisons with terrestrial data. Such comparisons are of special interest for well-known systematic distortions in terrestrial data. In addition, new types of data lead to new types of boundary value problems and imply fundamental changes in geodetic concepts.

Grunthal, M. C.

Constant tension wire drag system. Presented to the National Ocean Survey Hydrographic Survey Conference Eighth Annual Meeting, Jan. 1981, Proceedings (in press).

The Constant Tension Wire Drag System was developed to investigate obstructions to navigation in confined areas with heavy traffic, strong currents, and irregular bottom. It is a modification of the British Constant Tension Drift Sweep System, but differs from it in several features. The system incorporates off-the-shelf commercially available equipment and can be used on existing 20- to 30-ft launches. The system was developed by the NOAA Ships RUDE and HECK during 1980.

Guiler, R. P.

Military Training Routes: their application to National Ocean Survey aeronautical charts. Technical Papers of the American Congress on Surveying and Mapping 41st Annual Meeting, Feb. 1981, p. 407-412.

The National Ocean Survey's Office of Aeronautical Charting and Cartography is now adding Military Training Route (MTRs) symbology and information to several of its instrument and visual chart products. Brought about by an increased concern in the safety of the flying public, these depictions are the culmination of a cartographic evaluation of data selection, evaluation, processing, depiction, and update. In addition, manual and automated procedures were evaluated to ascertain optimal production implementation. The addition of MTRs to National Ocean Survey (NOS) charts provides an excellent example of the current complexities in Federal aviation cartography. The project is culminating with the accurate, timely, and aesthetic depiction of MTRs on select NOS chart products through a judicious selection of manual and automated cartographic techniques.

Henriksen, S. W.

The observation equations of inertial surveying. Proceedings of the Second International Symposium on Inertial Technology for Surveying and Geodesy, June 1981, p. 51-60.

An inertial surveying system consists of three rigidly connected accelerometers and two or more gyroscopes. The accelerometers and gyroscopes are connected in such a manner that the accelerations are measured in directions determined by the gyroscopes, and the gyroscopic directions are themselves measured. The observations are basically accelerations and changes in direction of the gyroscopic axes. For practical reasons, the observation equations are usually considered to be the weighted integrals of the accelerations. Examples are given of the observation equations now being used for reduction of data from various kinds of inertial surveying systems. The observation equations that have been developed at the U.S. National

Ocean Survey are given as an example of what may be used in the future. These equations take account not only of constant and linear time-dependent terms but also include terms that represent self-coupling and cross-coupling between accelerometers and gyroscopes. Terms are considered that account for changes in the thermal and geomagnetic fields in which the system operates.

Hicks, S. D.

Long-period sea level variations for the United States through 1978. Shore and Beach, Journal of the American Shore and Beach Preservation Association, vol. 49, no. 2, Apr. 1981, p. 26-29.

The average representative value of apparent secular sea level change for the United States as a whole (except Alaska and Hawaii) is 1.3 mm/yr. Neglecting Sandy Hook, N.J., and Galveston, Tex., as anomalous, the values range from 3.7 mm/yr. at Hampton Roads, Va., to -1.8mm/yr. at Neah Bay, Wash. The average is based on 37 stations divided into five areas; each unique in series coherence, equal coastal lengths, and tectonic characteristics. The rates are computed by least-squares lines of regression through annual means. Rates, standard errors, and variability are tabulated for the entire series at each station and for the common series, 1940 through 1978.

Hicks, S. D.

Sea level changes in Chesapeake Bay. Tars & Terns, Northern Virginia Power Squadron, vol. XV, no. 6, Oct. 1981, 13 pp.

Sea level is rising throughout Chesapeake Bay. The rates for several representative locations are: Baltimore, 0.13 inch per year; Annapolis, 0.15 inch per year; Washington, 0.12 inch per year; Solomons, 0.14 inch per year; Norfolk, 0.17 inch per year.

These values are for the actual rise that we experience (i.e. the observed rise of the Bay waters relative to the adjacent land). Each rate is composed of two parts. The first part is the addition of water to the world ocean. The second is local land sinking.

Water is being added to the world ocean at an average rate of about 0.12 inch per year. It is thought to be due to the slow melting of the west Antarctic ice sheet, principally.

The land is sinking at different rates throughout the Bay. Generally, the land is sinking faster at the southern end than at the northern. Actually, Chesapeake Bay is part of the general coastal subsidence pattern extending from Maine to North Carolina--the rate of sinking increasing from north to south.

Thus, the observed rates (from National Ocean Survey tide station series), listed above, are each the sum of the worldwide rise of 0.12 inch per year and the subsidence of the land at each location. Although the observed rise is comparatively small (0.14 inch per year at Solomons), this amounts to 2.8 inches in only 20 years! This, coupled with the relatively flat slopes of the beach and marsh areas of the Bay, warrants continued active management of our coastal zone.

Hicks, S. D.

Trend of sea level change. Presented to the American Shore and Beach Association, Wildwood Crest, N.J., Sept. 1981. (LISD)

Sea level at Atlantic City, N.J., is rising at the rate of 0.013 foot per year (± 0.001 foot per year standard error). The rate is computed by a least-squares line of regression through annual means. The variability, as represented by the standard error of estimate, is ± 0.098 foot (one standard error). Seasonal variability is presented by a monthly mean sea level graph with bars for monthly variability (± one standard error). The sea level series extends for 1912 through 1980. The station is exposed to the open ocean.

Holdahl, S. R.

Crustal movement studies: vertical control surveys. United States Earthquakes, 1979, NOAA and U.S. Geological Survey, p. 127.

The area of southern California surrounding Palmdale has been undergoing further study. In 1976, analysis of leveling data by the U.S. Geological Survey has indicated uplift near Palmdale to be up to 25 cm, according to Robert Castle of the U.S. Geological Survey. The National Geodetic Survey estimates of the uplift, using another method, were about half as large.

Holdahl, S. R.

A model of temperature stratification for correction of leveling refraction. NOAA Technical Memorandum NOS NGS 31, Apr. 1981, 30 pp.

Refraction causes leveled height differences to be too small. It is usually considered to be the largest known systematic error in leveling measurements, amounting to as much as a cm/km. In 1937, long before refraction was widely accepted as a significant error source, T. J. Kukkamaki developed a correction which is proportional to the temperature difference, Δt, between heights of 0.5 and 2.5 m. Δt was to be measured, requiring extra effort and equipment. Few countries adopted the correction, but it is now realized that the correction is necessary, especially in the middle and lower latitudes.

Removing refraction bias from old leveling measurements requires a temperature stratification model. The model described here is based on historical records of solar radiation, sky cover, precipitation, and ground albedo from many locations in the conterminous United States. The average difference between the predicted Δt and observed Δt is -0.12°, +0.14°, and -0.22°C for data sets from Maryland, California, and Arizona, respectively. This modeling method can be adopted by any country with records of solar radiation. The model is an important asset to leveling computation because it provides a means of eliminating extreme refraction bias in the absolute heights and makes profiles of relative vertical movements more reliable. An economic advantage is realized by eliminating the need to observe vertical temperature profiles during most leveling surveys.

Hothem, L. D.

Satellite radio positioning techniques and survey applications. Presented to American Society of Civil Engineers 1981 International Convention and Exposition, May 1981, 14 pp. (LISD)

This paper presents a broad overview of the TRANSIT Doppler system, Doppler surveying methods, typical accuracies that may be achieved, and various types of survey applications. Also, the developmental status of the Global Positioning System (GPS) is discussed, including a summary of proposed methods for using the GPS signals and accuracy estimates for point positioning and relative positioning surveys, based on simulated and limited test data results.

Hubbard, J. R.

NOS methods and procedures for the determination of marine boundaries through tidal datum computation. Presented to the American Congress on Surveying and Mapping Workshop, Nov. 1981. (LISD)

The National Ocean Survey (NOS) has officially adopted definitions and procedures which are the basis for the determination of marine boundaries. Analysis of tidal characteristics and the theory involved are important to the development of computational methods used for defining tidal datums with the accuracy required for marine boundary demarcation. Through a series of lectures, insight is provided into the NOS tidal program as it relates to tidal theory, analysis, and datum computation, as well as the problems associated with regions of complex tidal regimes.

Hull, W. V.

National Ocean Survey technical services and products. Presented to the New Jersey Society of Professional Land Surveyors, Conference '81, Feb. 1981, 5 pp. (LISD)

The National Ocean Survey was established by Congress in 1807 to chart the coastal waters of the United States. Since its establishment, the National

Ocean Survey has continually responded to public attitudes to improve its existing programs and develop new programs that meet public acceptability and genuine need. In meeting its legislated responsibility to produce nautical charts, the National Ocean Survey has made tidal measurements since the early 1800's. These tidal data, as well as other products and services of the agency, are provided for all private, State, and Federal interests without interference in the responsibilities or prerogatives of any person, organization, or other government unit. Technical services are offered to improve the quality and quantity of mapping products obtained by local organizations through a better understanding of requirements and available mapping capabilities. Methods of computation of the datum of mean high water from a short series of simultaneous tide observations were discussed.

Hull, W. V.

Oceanography. Presented to the American Congress on Surveying and Mapping Interdivisional Committee on Marine Surveying and Mapping, Jan. 1981, 22 pp. (LISD)

The text for a slide presentation that describes the mission and responsibilities of the NOS Office of Oceanography which was formed in January 1979 to establish an optimum alignment of direct and support resources within the National Ocean Survey (NOS) as they relate to ocean and coastal activities. The Office of Oceanography is the focal point for physical oceanography studies and ocean pollution monitoring in NOS and assists NOAA and DOC management in responding effectively and efficiently to the many diverse ocean and coastal initiatives to be addressed over the next decade.

Hull, W. V., Hicks, S. D., and Land, R. J.

The National Tidal Datum Convention of 1980. Technical Papers of the American Congress on Surveying and Mapping 41st Annual Meeting, Feb. 1981, p. 345-355.

For the first time in history, the United States has been provided with one consistent tidal datum system. Four actions, known collectively as the National Tidal Datum Convention of 1980, have been required to modify the existing system in order to achieve this consistency. The actions are: (1) to compute the tidal datums of Mean High Water and Mean Low Water as the average of all the high and low waters respectively; (2) to lower chart datum for Mean Low Water to Mean Lower Low Water along the Atlantic Coast; (3) to change the name "Gulf Coast Low Water Datum" to "Mean Lower Low Waters," and (4) to update the National Tidal Datum Epoch from the 1941 through 1959 series, to the 1960 through 1978 series.

The Convention provides a tidal datum system independent of computations based on type of tide. Thus, of great regional importance, a uniform and continuous tidal datum of Mean High Water (without vertical jumps due to change in computational method with type of tide) and a Mean High Water Line (without concomitant horizontal discontinuities) has been generated along the gulf coast. Likewise, Mean Higher High Water has been created in areas of predominantly diurnal tides, thus providing a uniform and continuous Mean Higher High

Water Line along the gulf. Lowering chart datum from Mean Low Water to Mean Lower Low Water along the Atlantic coast and changing the name "Gulf Coast Low Water Datum" to "Mean Lower Low Water" along the gulf has placed chart datum at a common elevation for all tidal water of the United States, U.S. possessions and territories, and U.N. Trust Territories under U.S. jurisdiction. Updating the National Tidal Datum Epoch adjusts all tidal datums for the effects of continuing long period sea level variations.

Isner, J. F.

The new adjustment of the North American Horizontal Datum. Article no. 23: another look at Helmert blocking. American Congress on Surveying and Mapping Bulletin No. 73, May 1981, p. 33-34.

The Helmert blocking algorithm is a useful mathematical tool for the new adjustment of the North American Datum (NAD) because it provides management with a high degree of flexibility in the allocation of problem-solving resources. Subproblems may be arbitrarily small, resulting in a set of small, independent subproblems, each of which may be much easier to solve than the original large problem. By combining separate solutions to the subproblem, the same results are obtained as if the original problem had been solved in one chunk. The design of the adjustment system for the new adjustment of the NAD fully exploits this potential.

Isner, J. F.

A programming methodology based on data abstraction. Proceedings of the International Symposium, Management of Geodetic Data, Danish Geodetic Institute and International Association of Geodesy/International Union of Geodesy and Geophysics, Aug. 1981, p. 94-113.

The notion of data abstraction has occupied the center of attention of programming language research since the mid-1970's. The results of this research have strongly influenced the design of recent programming languages, such as ADA, which are expected to attain widespread use in the 1980's. Often, however, the importance of data abstraction as a programming methodology has been overlooked. Large applications written in conventional programming languages such as FORTRAN and ALGOL can profit from the use of such methodology by increasing reliability and decreasing maintenance cost.

Data abstraction extends, into the realm of data, the principle of abstraction in programming, which seeks to separate specification from implementation. In the methodology, abstract data objects are identified, specified, and implemented in three distinct steps.

The software for the new adjustment of the North American Datum has been developed using this methodology. Nearly a dozen abstract objects have been identified, specified, and implemented.

Isner, J. F.

The redesign of the adjustment system for the North American Datum. Proceedings of the International Symposium, Management of Geodetic Data, Danish Geodetic Institute and International Association of Geodesy/International Union of Geodesy and Geophysics, Aug. 1981, p. 225-238.

The software system to be used in the North American Datum (NAD) readjustment has undergone a major redesign. It has been restructured in order to take advantage of information hiding, thereby increasing module independence. The modularization recognizes several important abstractions, including the Helmert block and the adjustment strategy. The system has also been improved by the addition of a fault-tolerant scheme for controlling the execution of the many individual tasks which make up a Helmert block adjustment and for managing their intermediate results. The DISPATCHER and a set of utility programs allow flexibility in scheduling and resource allocation policies.

Lapine, L. A.

The National Geodetic Survey and the Inertial Survey System. Presented to the Federation Internationale Geodaesie XVI International Congress, Aug. 1981, 7 pp. (LISD)

In April 1979, the National Geodetic Survey (NGS) established second-order horizontal control spaced at 7-kilometer intervals along a 450-kilometer stretch of the Louisiana Gulf Coast. The survey terrain, characterized by salt marshes, mud flats, and beaches, made conventional survey operations undesirable. Because of the inhospitable nature of the terrain, a classical survey would have taken 12 surveyors about 6 months to complete. Instead, the traverse was performed in 6 days at one-third the estimated cost, using only half the normal number of surveyors. The reduced cost and effort resulted from the use of an Inertial Survey System (ISS), which NGS employed for the first time.

This paper elaborates on the unique capabilities of the ISS for establishing geodetic control in support of hydrography, and explains how NGS plans to make the ISS data more compatible with existing classical control.

Leigh, G. E.

Preliminary data analysis of inertial survey system test in southwest Arizona. Proceedings of the Second International Symposium on Inertial Technology for Surveying and Geodesy, June 1981, p. 415-430.

The inertial surveying system (ISS) was tested against geodetic control in Arizona. The purpose, background, and operation of the test are outlined, and the final processed test data are compared to data obtained from a

minimally constrained adjustment of values from the National Ocean Survey's National Geodetic Survey (NGS) data base. Of the 28 NGS stations visited in the inertial survey, only three were used as known input to the ISS (updates). The other 25 stations, which were treated as unknowns (marks), were used to study the ISS data. An overall root mean square error(rms) of 0.245 meter was computed.

Lockwood, M., and Pearce, J. B.

Monitoring the health of the Northeast Continental Shelf: an update. The Coastal Society Bulletin, vol. 5, no. 1, Apr./Aug. 1981, p. 18-22.

In 1980 the National Oceanic and Atmospheric Administration began a program to monitor and assess the conditions of the coastal and nearshore waters of the Northeast United States. This activity titled the Northeast Monitoring Program (NEMP), is currently in its second year of operation and it is an appropriate time for significant findings to be announced. During the past year the program has identified a number of indicators of coastal pollution impacts. For example, certain species of fish collected far from immediate sources of pollutants showed elevated levels of substances such as PCB's and petroleum hydrocarbons. Chemical contaminants in sediments were likewise identified as extending further seaward than previously shown. While the consequences of these monitoring results have not been fully determined, a program to determine the levels and trends of key pollutants in the marine environment is in place and has potential for providing information necessary to manage that environment.

Love, J. D., and Spencer, J. F., Jr.

Explanation and availability of calibration base line data. Technical Papers of the American Congress on Surveying and Mapping Fall Technical Meeting, 80's Era of Change, Sept. 1981, p. 209-217.

The establishment of calibration base line began in 1974, in response to requests from this nation's surveying community. By June 1981, there were 161 calibration base lines established in 40 states. During FY's 1981-82, the National Geodetic Survey (NGS) plans to establish approximately 20 more. In addition, approximately 16 base lines are scheduled for verification meansurements in FY 81.

The base lines are used by surveying professionals to calibrate their electronic distance measurement instruments (EDMI). There are approximately 40,000 licensed land surveyors with their supporting staffs in the United States, who now use or will be using these base lines. In addition, local, State, and Federal government agencies also rely on these base lines.

Questions concerning the site location and the adjusted data results have continued to increase nationwide from surveying firms, individuals, and agencies. The publication and distribution of these calibration base line data are discussed, and an overview of the NGS calibration base line program is presented.

Lucas, J. R.

Results of photogrammetric control densification in Ada County, Idaho. NOAA Technical Report NOS 91 NGS 21, Dec. 1981, 74 pp.

The urgent need to integrate all land surveys in the United States into a unified coordinate system has been well documented, but the densification of existing geodetic control networks is an expensive and time consuming prerequisite. The National Ocean Survey (NOS) has developed a system for photogrammetric control densification that can provide a precision comparable to conventional ground survey methods at less than half the cost. To better serve the needs of the land surveyor this system incorporates a unique computer program developed by the National Geodetic Survey (NGS), which obtains both the geodetic positions of densification points and the distance, azimuth, and elevation difference between intervisible point pairs. A listing of the program is included in this report. The densification system was employed by NOS to obtain precise coordinates of 346 section corners in Ada County, Idaho. This project has shown that photogrammetry can be used for densification of control networks that were established by geodetic triangulation, with no significant compromise in accuracy and at a considerable saving in time and money.

McCaffrey, E. K.

A review of the bathymetric swath survey system. International Hydrographic Review, LVIII (1), Jan. 1981, p. 19-27.

The appearance in recent years of large ships with drafts approaching 30 meters has a serious impact on U.S. charting requirements. Previously, detailed harbor approach surveys were accomplished sufficient to define hazards within the 20-meter countour. The new, larger, commercial ships now require surveys to assure that all hazards and obstructions within 30 meters of the surface are located in charted channels, harbor approaches, and ship fairways. A multi-beam bathymetric swath survey system (BS^3) described here has the potential to meet these new survey needs.

The BS^3 employes a vertical fan-shaped array of 21 acoustic beams which forms a swath beneath the survey vessel with a width equal to 2.6 times the sounded depth. In addition to the usual vertical acoustic sounding, the oblique acoustic soundings are recorded and processed in real time to display contours of the bottom features shoaler than the vertical depth. A computer is part of the BS^3, utilizing a real time operating system to merge soundings, navigation inputs, real time telemetered tides and ship motions to output corrected soundings graphically and to a magnetic data tape. System development began

in July 1976 and was delivered in September 1977. Preliminary field tests on a government launch and aboard the NOAA survey ship DAVIDSON are now being evaluated and the data analyzed. Indications are that the system will soon be certified and delivered to the NOAA survey fleet as an operational marine chart survey system.

Malahoff, A.; Hammond, S., Naughton, J., and Richmond, R.

Post Iocene Tectonic rotation of the Island of Viti Levu, Fiji. Earth and Planetary Science Letters, Sept. 1981.

Geophysical studies of the island of Viti Levu, Fiji, show large amplitude magnetic anomalies of up to 1500 nannoteslas (nT) to be located above the Tavua volcanic center. Field sampling of the volcanic rocks from the intrusive and extrusive centers of the volcano show the rock sample to have initial intensities of natural remanent magnetization of up to 380 amps per meter (A/m). Radiometric dating of thirteen oriented samples shows an age range of 2.8 m.y.B.P. to 6.8 m.y.B.P. for the suite of rocks collected from the Mba basaltic group. Paleomagnetic analysis of the dated rocks shows declination vectors ranging from $334^{o} \pm 6^{o}$ for an age of 2.8 $\pm$0.2 m.y.B.P. to 290° for an age of 6.8 $\pm$0.44 m.y.B.P. As a group, the paleomagnetic declination values of the samples systematically decrease with age. This decrease is attributed to progressive anticlockwise rotation of Viti Levu during the process of formation of the North Fiji Basin. A linear least squares analysis of the paleomagnetic data indicates that the island has rotated in an anticlockwise direction through 90° during the past 6.8 million years at a rotational rate of 11.7^{o} per million years. Declination values as low as 245° measured for some sites (not dated) suggest that anticlockwise rotation of Viti Levu and development of the North Fiji Basin could have commenced as early as 10 m.y.B.P. following the breakup of the ancient Solomons-New Hebrides-Fiji-Lau Island arc. Large rotations of microplates may have occurred along other island arcs and marginal basin systems elsewhere in the Western Pacific and such rotational histories may reflect in detail the evolutionary development of these arcs and basins.

Masterson, R. P.

NOS water level measurement system integrated logistics support plan. Presented to the National Ocean Survey Hydrographic Survey Conference Eighth Annual Meeting, Jan. 1981. Proceedings (in press).

The National Ocean Survey Water Level Measurement System Integrated Logistics Support Plan (ILSP) is a systematic method of supporting the measurement system to ensure that the system's operational capability is maintained at an optimum level throughout the service life of the system. Implementation of the ILSP will impact hydrographic field units but should result in fewer instrument failures and other problems.

Milbert, D. G.

Validation of horizontal observations for the National Geodetic Survey data base. Proceedings of the International Symposium, Management of Geodetic Data, Danish Geodetic Institute and International Assoication of Geodesy/ International Union of Geodesy and Geophysics, Aug. 1981, p. 122-133.

The validation of horizontal observations prior to data base entry is reviewed. Validation consists of two validation phases followed by data base entrys. The project validation phase involved efforts in horizontal project, mark maintenance, length data set, and taped baseline automation and validation. These procedures involve processing the data through an extensive cross-checking program, as well as performing a minimally constrained adjustment. Block validation involves combination of projects in an area and cross-checking horizontal observations against data currently in the data base. Duplicate observations are deleted and a station adjustment is performed as a final effort to correct any unidentified observations. Station desciption and recovery notes are compared to the data to ensure completeness. An adjustment is also performed to identify any interior singularities or weaknesses. Data base entry imposes strict accounting of observations and positions. These processes result in thorough validation while maintaining progress toward the new adjustment of the North American Datum.

Moore, T. A.

Accuracy limitations of Multilateration Radiolocation Systems. Radio Technical Commission for Marine Services (RTCM) Annual Assembly Meeting, Apr. 1981, Present Systems/Future Trends, vol. 3, 3.D, p. 1-22.

This paper discusses (1) the basic trilateration system for marine position fixing with dependence on range accuracy and (2) geometric dilution--the influence of geometric angles on position location by ranging to two targets or survey points. Errors relative to the error parallelogram and error ellipse are compared. The expansion from trilateration to multilateration systems, the repeated application of trilateration, is then demonstrated with configurations, equations, processing techniques, and smoothing, to demonstrate accuracy limitations. The experience of companies and agencies using multilateration techniques is reported. Configurations for improved accuracy and benefits with multilateration and smoothing versus the normal trilateration techniques are noted.

National Geodetic Survey

National Geodetic Survey, NOAA Geodetic Newssheet, National Geodetic Information Center, NOS/NOAA, no. 6., Dec. 1981, 6 pp.

This issue highlights tests performed by NGS on the Inertial Survey System, a listing of completed control survey projects for which data have been adjusted and published, plus other regularly featured items.

Patchen, R. C., and Gottholm, B. W.

The response of the shelf to Hurricane Belle. NOAA Technical Report NOS 89, Aug. 1981, 36 pp.

On 10 August 1976 Hurricane Belle passed through the New York Bight; the data set included meteorological information from the National Weather Service, water level information from the National Ocean Survey, and current meter and Salinity/Temperature/Depth (STD) information from the Marine Ecosystem Analysis Program. Hurricane Belle can be classified as a fast-moving storm translating over a two-layer density structure. The temporal and spatial responses to the hurricane were determined by spectral and residual techniques. The STD information and the temperature records obtained at the current meter locations indicate that a cooling and mixing of the surface waters was observed at stations to the right of the storm, and that only weak mixing was observed at stations directly in the path of the storm. At current meter locations on deeper areas of the continental shelf (greater than 55 m), the baroclinic response of a generation of internal inertia-gravity waves in the lee of the hurricane can be seen in the two layers. For stations on the shallower area of the shelf (less than 55 m), a strong barotropic response indicated by the generation of localized quasi-geostrophic barotropic Rossby waves, 18 to 20 hours after the hurricane entered the New York Bight, is observed. The data compared favorably with the results of Chang and Anthes for a hurricane translating at 11 m s^{-1}. The topographic restraint on the velocity field for stations located in the Hudson Canyon is described.

Patchen, R. C., Bruce, J. T., and Connolly, M. J.

Cook Inlet circulatory surveys, 1973-75. NOS Oceanographic Circulatory Survey Report No. 4, June 1981, 89 pp.

This report presents a full description of the 3-year circulatory survey conducted by the National Ocean Survey in Cook Inlet, Alaska. Station location maps and station information tables for the physical parameters are provided. Results of the Harmonic analysis performed on the current meter records are included. A summary of the historical current water data collected by NOS is also presented.

Perry, L. H.

Photogrammetric summary of the Ada County Project. Technical Papers of the American Congress on Surveying and Mapping 41st Annual Meeting, Feb. 1981, p. 121-129.

The National Ocean Survey completed a geodetic densification of the section corners in Ada County, Idaho, through highly sophisticated photogrammetry. This paper deals with the photogrammetric effort and cost involved in completing this project. The project is looked at from specific phases: planning, field, mensuration, and data reduction. A separate discussion of the specialized equipment is also included. The Ada County Project covered

an area of 350 sq. mi. Within that area, fifteen first-order and second-order geodetic horizontal control stations were used to position 346 section corners to second-order geodetic accuracy. The resultant photogrammetric effort and cost per section corner is detailed.

Pfeifer, L.

ARTEMIS field test. Presented to the National Ocean Survey Hydrographic Survey Conference Eighth Annual Meeting, Jan. 1981. Proceedings (in press).

ARTEMIS is a single-user range-azimuth micro-wave positioning system manufactured in the Netherlands. The system is especially well suited for close inshore hydrography at large surveying scales, in which capacity it would fill an existing void as an electronic positioning system. This paper describes the execution of a field test of the ARTEMIS equipment.

Pfeifer, L.

MT MITCHELL and the Yucatan Straits. Presented to the National Ocean Survey Hydrographic Survey Conference Eighth Annual Meeting, Jan. 1981. Proceedings (in press).

The NOAA Ship MT. MITCHELL conducted two hydrographic surveys in the Yucatan Straits during July and August 1980. The surveys were conducted using Loran C as the positioning system interfaced to the standard Hydroplot system. This system worked effectively and efficiently.

Porter, D. L.; and Shih, H. H. (Ocean Technology & Engineering Services, NOAA)

Error models for still well-float type tide gages. Oceans 81 Conference Record, vol. 2, Institute for Electrical and Electronics Engineers Publication Number 81CH1685-7, Sept. 1981, p. 1118-1123.

Tidal measurements are subject to various errors. Because of the increasing emphasis on the accuracy of the data obtained by the Tide and National Water Level Network, the knowledge of these errors is of great importance. This paper summarizes the development of error models pertinent to tide measurement systems utilizing stilling wells and floats. The major error sources addressed include wind waves, water currents, float response, water density variation and marine fouling.

Laboratory experiments including a wave tank, tow tank, and oscillatory water tunnel tests were also conducted to validate the wave, current, and float response models. The error models developed can be useful tools for evaluating tide measurement systems utilizing stilling wells and floats and can also provide guidance to future design modifications to reduce tidal measurement errors.

Pyle, T. E.; Milliman, J. D., and Rawson, M.

Fine-scale morphology and structure of the ridge and trough province, upper continental slope, southwest Florida. Bulletin of Marine Science, 31 (1), 1981, p. 134-140.

The ridge and trough province is an eroded and dissected foreset sequence that occurs along a 5-to 9-km wide zone on the upper slope off southwest Florida. Observations from the submarine NR-1 show a series of three parallel ridges and intervening troughs within a water depth range of 384 to 436 m. Ridges consist of a series of vertical (or nearly vertical) sedimentary outcrops, each capped with what appears to be a manganese/phosphorite and/or limestone layer, and separated from one another by terraces of various widths. Contrary to previous speculation, no evidence of faulting was found. While the absence of rock samples precludes determination of age or composition of the sedimentary strata, it appears possible that these outcrops represent a continuation of the mid-Tertiary phosphoritic sequences found on the Pourtales Terrace and Blake Plateau.

Pyle, T. E.; Fanning, K. A., Byrne, R. H., Breland, J. A. II, Betzer, P. R. (University of Florida), Moore, W. S., and Elsinger, R. J. (University of South Carolina).

Geothermal springs of the West Florida continental shelf: evidence for dolomitization and radionuclide enrichment. Earth and Planetary Science Letters, 52, 1981, p. 345-354.

On the sea bed of the West Florida continental shelf about 45 km SSW of Ft. Myers, Florida, an 85-km^2 area has been discovered in which six thermal springs discharge warm, chemically altered seawater from vents and seepage zones. The spring water apparently originates in the subsurface ocean around the Florida Platform and penetrates the highly porous strata of the platform about 500-1000 meters below sea level. It percolates toward the interior of the platform and is geothermally heated to about 40°C en route. Then it rises along more vertical flow channels and is discharged in warm submarine springs.

Beneath the platform, several chemical processes alter the percolating seawater. One process seems to be a secondary dolomitization of the limestone of the platform because, in the discharging seawater, magnesium is lower by 2.7 mmole/kg and calcium higher by 3.6 mmole/kg than in normal seawater with the same chlorinity. Other reactions within the sediments of the platform enrich the spring effluents 1000-fold in ^{226}Ra, 10,000-fold in ^{222}Rn, and 90-fold in ^{228}Ra compared to the seawater surrounding the platform. Thus, the springs may be important sources of radionuclides for the Gulf of Mexico. The percolating seawater also loses all of its oxygen and nitrate to reduction processes, loses most of it phosphate and 40 percent of its ^{238}U, and roughly quadruples its silica content.

Coastal carbonate platforms are fairly common geological features. Thus, processes like those beneath the West Florida Shelf may function on a worldwide basis to play an important role in the diagenesis of carbonate sediments.

Richards, T. W.

The Royal Navy's Hydrographic Department. Presented to the National Ocean Survey Hydrographic Survey Conference Eighth Annual Meeting, Jan. 1981. Proceedings (in press).

The British Hydrographic Department produces a worldwide series of nautical charts and sailing directions. The organizational structure and the techniques used by the Royal Navy (RN) to gather and publish this hydrographic information are in many ways similar to that of the United States' National Ocean Survey (NOS). However, in a few very significant ways--such as the extensive British use of side scan sonar--they differ. This paper discusses the organizational and procedural similarities and differences between RN's Hydrographic Department and NOAA's NOS.

Robertson, D. S., and Carter, W. E.

Earth rotation information derived from MERIT and POLARIS VLBI observations. Presented to the International Astronomical Union Colloquium No. 63, May 1981. Proceedings of the IAU Colloquium No. 63, Reidel, Dordrecht, Holland (in press).

In September and October 1980, the National Geodetic Survey, jointly with the National Aeronautics and Space Administration and several other agencies and institutions, conducted a series of astronomical radio interferometry (VLBI) observing sessions to support the IAU/IUGG MERIT short campaign. A total of 14 days of observations, organized into two 7-day sessions, was collected by three observatories in the United States--Harvard Radio Astronomy Station (HRAS), Haystack Observatory, and Owens Valley Radio Observatory--and the Onsala Space Observatory in Sweden. Chilbolton Observatory, England, and Effelsberg Observatory, West Germany, also participated on some days. Immediately following the MERIT campaign, NGS initiated a series of 24-hour observing sessions, spaced at approximately 2-week intervals, as a pilot program to project POLARIS. All of these sessions utilized two observatories, HRAS and Haystack, and Onsala has participated in about half the sessions The MERIT and POLARIS observations were made with the third generation MARK III VLBI system using procedures and schedules designed to yield high quality geodetic information, including Earth rotation values. This paper briefly traces the planning, observing, and data processing activities, and presents the Earth rotation information thus far derived from the data.

Schaefer, G. R.

Use of National Ocean Survey hydrographic survey data. Presented to the National Ocean Survey Hydrographic Survey Conference Eighth Annual Meeting, Jan. 1981. Proceedings (in press).

The National Ocean Survey (NOS) has traditionally conducted hydrographic surveys for the purpose of acquiring data for charting coastal waters for the mariner. An increasing awareness and interest in environmental concerns has generated a greater demand for bathymetric maps. It is important to note

that bathymetric maps produced from hydrographic survey smooth sheets normally will result in inaccurate bathymetric maps. However, bathymetric maps can be produced from the unrounded digital sounding data acquired during a hydrographic survey. The differences between hydrographic survey smooth sheet and a bathymetric map are discussed.

Schwarz, C. R.

The geodetic requirements for commercial data base management systems. Proceedings of the International Symposium, Management of Geodetic Data, Danish Geodetic Institute and International Association of Geodesy and the International Union of Geodesy and Geophysics, Aug. 1981, p. 27-40.

There are many data base management systems (DBMS) now available as commercially marketed software packages. Although most of these packages were initially aimed at business or administrative data processing applications, they may frequently also be the right tool for a scientific data processing task. This becomes more apparent as we notice that scientific computer programs are spending more time on data management requirements than on the coding of mathematical algorithms.

In a scientific environment, a generalized data base management package is best viewed as a tool for programmers, rather than a tool for direct, independent use by end users or by agency management. To the end user, the most attractive feature of a commercial DBMS is usually the interactive retrieval and update language. To the programmer, the most attractive feature is more likely to be the strong support for various types of keyed access. All of the manipulations necessary to build and maintain indices and other tables can be treated as procedural abstractions. Coupled with a procedural language, a DBMS offers the programmer a higher level (in the sense of more abstract) language. The most important geodetic requirement on a commercial DBMS is therefore that the package contain a strong Data Manipulation Language, with strong support for the algorithmic language used for scientific processing.

Simpson, D. C., and Lockwood, M.

Pollution monitoring: its role in marine environmental management. OCEANS 81 Conference Records, Vol. 2, Institute of Electrical and Electronic Engineers and Marine Technology Society, no 81CH1685-7, Sept. 1981, p. 715-719.

In 1980-1981 the National Oceanic and Atmospheric Administration set out to determine the potential role of the Federal government in ocean pollution monitoring. A series of monitoring workshops were conducted and the results are being analyzed to determine a suitable role for the Federal government.

By using the preliminary findings from the workshop, a summary of prior and ongoing pollution monitoring attempts, overall goals and objectives for a national monitoring scheme are presented.

Recommended as a first step is that an agreed upon set of sediment sampling measurements be adopted and serve as the nucleus of the proposed national monitoring network. These data will serve as an integrating element to which other local and regional monitoring elements can relate. The resultant monitoring information must subsequently be translated into a form which assists decision makers having authority to manage oceanic resources.

Snay, R. A.

Horizontal deformation in California's Imperial Valley between 1934 and 1980. United States Earthquakes, 1979, NOAA and U.S. Geological Survey, 1981, p. 128.

A triangulation-trilateration survey was performed by the National Ocean Survey/National Geodetic Survey 4 months prior to October 15, 1979, Imperial Valley earthquake (M=6.6). The survey was repeated in February-March 1980, to gage the coseismic displacement. The data combined with triangulation surveys performed in 1934, 1939, 1941, 1954, and 1967, provide a historical record of crustal deformation over a time period that also includes the 1940 El Centro earthquake (M=7.1). The total data set was analyzed in terms of a dislocation model that relates the observed surface deformation to slippage on prescribed geologic faults. According to the model, the 1941-80 fault slippage of depths 10 km and greater is 1.9 $\pm$ 0.3 m. This approximately twice the amount of estimated movements, 1.0 $\pm$ 0.1 m, for the 1941-80 slippage on the Imperial fault in the 0- to 10-km depth range. This discrepancy can be explained by a range of possibilities, some of which were postulated by Wayne Thatcher of the U.S. Geological Survey (1979) in his study of triangulation throughout southern California. These possibilities include: (1) the existence of permanent inelastic deformation (2) massive post-seismic slippage at depth following the 1940 event (3) distribution of the shallow slippage over several subparallel faults (4) a mechanism other than slippage to accommodate deformation at depth.

Spencer, J. F.

Geodetic network diagrams and data for Hawaii. Technical Papers of the American Congress on Surveying and Mapping Fall Technical Meeting 1981, 80's Era of Change, Sept. 1981, p. 347-361.

Mapping and charting of the Hawaiian Islands began in the early 1800's Geodetic networks have been depicted on nautical chart bases since 1943. Today, there are 241 geodetic charts showing network control for the United States; six of these are for Hawaii. Until recently there were no geodetic control diagrams (maps) for Hawaii on which the geodetic networks were shown. In 1978, NGS began preparing diagrams of the Hawaiian Islands with a scale of 1:250,000 in order to represent vertical and horizontal control on one source and to facilitate ordering data by quad. Today, the National Geodetic Information Center (NGIC) provides geodetic control for Hawaii, which is illustrated on four base maps (Hawaii, Kauai, Maui, and Oahu) originally obtained from the U.S. Geological Survey (USGS) along with the necessary data depicting their control. Information on available control in these areas from other agencies is also provided.

The establishment of geodetic horizontal control in Hawaii began in 1871. These data are contained in the Old Hawaiian Datum. A complete readjustment and redefinition of these data are planned in conjunction with the new North American Datum (NAD 1983). This paper includes information on present and future formats, availability of data, and costs. Satellite-derived positions and astronomic information, as they pertain to the horizontal control networks, are also included.

Geodetic leveling began in Hawaii in 1926. A complete readjustment and releveling of these networks are planned, with the final adjusted results becoming available in the 1980's. Formats of present data and future readjusted data are presented in this paper. Tidal bench marks and gravity information pertaining to the vertical control network are also included.

Spencer, J. F., and Horn, N. B.

The new adjustment of the North American Horizontal Datum. Article no. 25: automatic mailing service, American Congress on Surveying and Mapping Bulletin, vol. 75, Nov. 1981, p. 50-52.

A subscriber to the National Geodetic Survey's Automatic Mailing Service purchases the latest geodetic data for a specific area, and then automatically receives revised information for that particular area as it becomes available. The computerized system contains the following files: diagram codes, state map codes, chart codes and quadrangle areas, quadrangle data, users' addresses, and prices.

Spillman, D. M.

National Ocean Survey next generation tide and water level measurement system. Presented to the National Ocean Survey Hydrographic Survey Conference Eighth Annual Meeting, Jan. 1981, Proceedings (in press).

The present National Ocean Survey tide and water level measurement system is labor-intensive to operate and maintain with relatively high maintenance costs and low reliability. These factors, coupled with recent measurement and recording technology advances, have led to the development of a next generation tide and water level measurement system.

Stanley, W. A.

Benjamin Banneker's contribution to American cartography. Technical Papers of the American Congress on Surveying and Mapping 41st Annual Meeting, Feb. 1981, p. 571.

Benjamin Banneker, born free in 1731 in the Crown Colony of Maryland, was a farmer in the Patapsco Valley in what is now called Howard County located on the southern end of Baltimore. Largely self-educated, he was Maryland's first scientist. As a free black man he became familiar with the Ellicott

family of Ellicott Mills, who encouraged him to pursue higher education. Banneker, mathematician, surveyor, and astronomer prepared and published almanacks, instructed in the field of mathematics, and was chosen by Major Andrew Ellicott to assist him in the survey for the seat of government of the United States. In 1792, when President Washington replaced the French engineer Pierre Charles L'Enfant with Andrew Ellicott to complete the survey for the new Federal city, Banneker was appointed Ellicott's assistant in charge of the survey.

Of Banneker, Thomas Jefferson wrote that same summer of 1791 to the French scientist Antoine Condorecet, "We now have in the United States a Negro who is a very respectable mathematician. I procured him to be employed under one of our chief directors in laying out the new Federal City. . . Earlier, the Georgetown Weekly Ledger had announced the arrival of surveyor Ellicott, architect L'Enfant, and Benjamin Banneker, an Ethiopian."

To Banneker, the assignment--the Federal appointment granted to a Negro--was more than an honor and responsibility. For some years he had been a member of the Free African Society of Baltimore. He was keenly aware of the need to aid his fellow blacks and to demonstrate the Negroes were not inherently inferior in intellect. This, especially, in an era when that same Ledger could write of Banneker himself that "his abilities as surveyor and astronomer" had already proved "to be without foundation" the opinion that "that race of men were void of mental endowment."

Stem, J.

Geodetic monuments for eccentric property corners. Presented to the American Society of Civil Engineers Spring Convention, May 1981. (LISD)

The search for solution to land information problems has influenced programs and research in government, universities, industry, and in professional societies that operate within these groups. The problems are national in scope and have far-reaching consequences. Proposed solutions have encountered very little opposition. Yet, very little progress has been made.

Three problem areas for which solutions are required include (1) a method of equitable property taxation, (2) replacement of an archaic land conveyance system, and (3) implementation of intelligent land use and resource planning. The independent solutions proposed for these complicated issues state that a dense National Geodetic Horizontal Control Network is a prerequisite. Although the lack of this surveying and mapping base is the foremost drawback to solving these three national problems, there are some immediate steps surveyors should consider.

A multipurpose cadastre (with aliases such as Modern Land Data System, Records System, or Information System) is proposed for the United States. The multipurpose cadastre would be a land conveyance system, a property taxation system, and a data base for land use and resource planning. The unit of incremental change in each of these areas is the legal land parcel. For this reason each individual parcel needs to be identified and described in the cadastre. The

geographic portion of the cadastre is conceptualized as a local system containing geodetic and cadastral survey data capable of describing legal boundaries within the jurisdiction. The operation of the geographic portion of the cadastre must be contained in a local office responsible for surveying and mapping activities. Only then can sufficient survey measurement data be collected, maintained, and updated to provide the parcel geometry essential for proper communication with other subsystems of the cadastre.

Strange, W. E.

The impact of refraction correction on leveling interpretations in southern California. Journal of Geophysical Research, vol. 86, no. B4, April 1981, p. 2809-2824.

Recent investigations show that the refraction corrections in leveling are large but can be adequately modeled. The corrections are proportional to the temperature differences and the square of the sight lengths. Changes in sight length with time have resulted in apparent crustal movements when non-refraction-corrected data were used. Applying refraction corrections to leveling data in southern California significantly alters the size and configuration of the southern California uplift. Uplift at Palmdale and Gorman-Lebec relative to Los Angeles (BM V32) during the 1953-1978 time period is no greater than 10 cm. The bulk of the motion, about 6 cm, occurs as localized motion along the San Gabriel fault during the 1953-1964 time period. This motion along the San Gabriel fault and uplift of 8 cm directly north of the San Fernando fault between 1955 and 1968 may represent precursors to the 1971 San Fernando earthquake.

Tolzman, A. M.

The Cooperative Topographic Bathymetric Mapping Program at the National Ocean Survey. Presented to the National Ocean Survey Hydrographic Survey Conference Eighth Annual Meeting, Jan. 1981. Proceedings (in press).

The National Ocean Survey (NOS) has entered into a joint mapping program with the U.S. Geological Survey, The Bureau of Land Management, and state agencies. The program was undertaken to produce maps depicting the topographic and hydrographic details of the coast of the United States and the Great Lakes. This paper presents the techniques employed by NOS to produce these manuscripts depicting the hydrography, shoreline, and nearshore features. The difficulties involved in this type of program are outlined. The efforts of the other Federal and State agencies in this program are also discussed. The various uses of these maps are presented as end product of the use of hydrography.

Vandermeulen, J. P.

Shipboard Data System III--the replacement for Hydroplot. Presented to the National Ocean Survey Hydrographic Survey Conference Eighth Annual Meeting, Jan. 1981. Proceedings (in press).

The NOAA Fleet's Shipboard Data System III (SDS III) in its hydrographic application is seen as the replacement for HYDROPLOT. The objective for this application and functional characteristics of the system are described.

Whalen, C. T.

Results of leveling refraction tests by the National Geodetic Survey. NOAA Technical Report NOS 92 NGS 22, Nov. 1981, 23 pp.

The National Geodetic Survey (NGS), a component of the National Ocean Survey, NOAA, conducted leveling refraction tests at a site near Gaithersburg, Md., during July-September 1979, and at a site near Tucson, Ariz., in April 1980. The tests were designed to measure refraction errors between bench marks at sight distances of 30, 45, 50, and 60 m by comparing nominal 2-meter refraction-free elevation differences to observed elevation differences containing refraction errors. The refraction-free elevation differences were determined using sight distances of 13 m or less.

The effectiveness of the refraction correction equations developed by T. J. Kukkamaki and B. Garfinkel was evaluated using temperature differences computed from air temperatures observed at 0.5, 1.5, and 2.5 m above the ground surfaces at the test sites. S. R. Holdahl's modeled temperature differences were also evaluated. Single-sight refraction equations by Garfinkel and Kukkamaki, when used with differences computed from daytime-observed air temperatures and with Holdahl's modeled temperature differences, reduced the sum of the differences between observed and standard (O-S) nominal 2-m elevation differences for Gaithersburg and Tucson by at least 85 percent. Holdahl's modeled air temperature differences, based on meteorological data obtained from NOAA weather stations and on wind and sun codes recorded during the NGS vertical control surveys, performed as well as differences computed from air temperatures observed during the test.

The excellent test results indicate that leveling observations from past surveys (where temperature differences cannot be computed from observed air temperatures) can be greatly improved by applying refraction corrections based on Holdahl's modeled air temperature differences. Application of the Garfinkel and Kukkamaki equations to differences computed from observed air temperature reduced the sum of the (O-S) values for nighttime observations by 70 and 89 percent, respectively.

White, H. H.

Bioassays: use and misuse in marine pollution studies. Presented to the Oceans 81 Conference, Institute of Electrical & Electronic Engineers and Marine Technology Society, Sept. 1981, 3 pp. (LISD)

In the past decade, laboratory bioassay tests have been abused by marine monitoring and regulatory programs. Present state-of-the-art precludes using bioassays to predict or measure the impact of a particular contaminant on a

marine ecosystem or population. The poor predictive power of bioassay tests stems from their extreme sensitivity to a host of confounding factors that accrue in laboratory and other non-natural situations. Over 200 primary papers published after 1975 have been reviewed to categorize such confounding factors. These categories include, but are not limited to, the age, gender, acclimation, and marine environmental history of the test organism; the length of the test exposure; and a large number of experimental artifacts. Variation in bioassay test results arising from each of these factors ranges from one to five orders of magnitude. In the future, practitioners of bioassay testing must be more responsible than to extrapolate indiscriminately from their controlled, simplistic test regimes to the uncontrolled, complex, and highly interactive marine ecosystems.

White, H. H.

The potential role of remote sensing in marine pollution monitoring. Sea Technology Magazine, vol. 22, no. 10, Oct. 1981, p. 15-19.

A review of state-of-the-art capabilities is presented for the remote sensing of oil slicks; pollutant transport via water circulation and suspended solids; chlorophyll; phytoplankton assemblages; and dissolved organic pollutants. Direct measurement of most pollutants with remote sensors is not presently feasible, and there is little research in progress. Measurements of a few ocean parameters that sometimes indicate pollution should be operational in the near future, but will require concomitant in-situ observations. Insufficient depth penetration and resolution severely limit the application of remote sensors to ocean pollution measuremens; resolution of this problem promises to be difficult. The most helpful role that remote sensing will play in ocean pollution monitoring in this decade is to support in-situ measurements, rather than replace them.

Williscroft. R. G.

Diver underwater survey and object location state-of-the-art. Presented to the National Ocean Survey Hydrographic Survey Conference Eighth Annual Meeting, Jan. 1981. Proceedings (in press).

Underwater surveying falls into two distinct categories, direct and indirect. Indirect surveying is subdivided into non-acoustic and acoustic methods. Non-acoustic surveying consists of optical and electrical techniques. Acoustic surveying is accomplished with an acoustic grid or by phase measurement techniques. The state-of-the-art in each is discussed, with special attention being paid to the electronic based indirect methods most prevalent today. The special requirements for diver safety generated by unique underwater environments such as high current, low visibility, very cold water, and polluted water are looked at in detail. Special situations requiring the use of sophisticated diving methods such as saturation diving and mixed gas diving are reviewed. The use of divers for underwater survey and object location is compared to other modern methods with particular attention being paid to the suitability of divers and to their cost effectiveness.

Wilson, J. M.

The feasibility of incorporating computer generated shaded relief with the aeronautical visual navigation format. (LISD)

A feasibility study was performed to determine if computer generated shaded relief could be utilized in the construction of relief representations for Visual Aeronautical Charts produced by the National Ocean Survey (NOS). Although the desired effect of three dimensional relief compatible with the NOS concept can be obtained, the technique in its present form cannot be utilized in direct reproduction processes. Extensive time required for photo-mechanical and artistic manipulation negates the advantage of having an initial computer generated display. Potential value of computer generated relief is considered to be very high and the state-of-the-art should be monitored for future developments.