APSG 41 SPRING MEETING

LOOKING TO THE FUTURE

FUTURE-PROOFING DATA, SERVICES, & BEYOND

TUESDAY, MAY 14, 2019

OCEANEERING | HOUSTON, TX

APSG 41 SPRING MEETING

MEETING AGENDA

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START	END	ITEM	SPEAKER
8:00 AM	8:30 AM	Registration & Light Breakfast	
8:30 AM	8:45 AM	Welcome Remarks	Kelly Kore, APSG Chair
8:45 AM	9:30 AM	Keynote: Earth's Moving Magnetic Poles, Tectonics Plates, and Mantle Revealed from Coring in the Ocean Basins	Gary Acton, Texas A&M University
9:30 AM	10:00 AM	The Future of Navigation for Ultrahigh Resolution Seismic Surveying	Brandon Mattox, NCS Subsea Larry Scott, NCS Subsea Noel Zinn, Hydrometronics
10:00 AM	10:10 AM	Vendor Presentation	OARS-HPSG
10:10 AM	10:40 AM	Break	
10:40 AM	11:10 AM	Student Presentation: Visualizing and Transforming 2D Data to a 3D World	Catherin Franklin, Texas A&M University Liam Lyle, Texas A&M University
11:10 AM	11:20 AM	Vendor Presentation	Zupt
11:20 AM	11:50 AM	Modern Data Processing Challenges and the Promise of Remote Data Services	Ryan Brown, OARS-HPSG Kevin Tomanka, OARS-HPSG
11:50 AM	12:00 PM	Vendor Presentation	Texas A&M University
12:00 PM	1:00 PM	Lunch	
1:00 PM	1:30 PM	TRF2022: Low Distortion Projections Proposals for Onshore and Offshore Exploration	Stacey Lyle, Texas A&M University Dennis Middleton, National Geodetic Survey Felicia Retiz, Texas Deputy Geographic Information Office
1:30 PM	2:00 PM	Rectification of Oblique Aerial Imagery in Support of Marine Spill Response	Robert Frost, BP
2:00 PM	2:30 PM	APSG Highlights & Updates	APSG Executive Committee APSG Education Foundation
2:30 PM	3:00 PM	Break	
3:00 PM	3:30 PM	Know It Before It Happens and Act Accordingly: How to Use Digital Twins to Maintain Production and Optimize Operations in Oil and Gas	Ross MacLeod, Ashtead
3:30 PM	4:00 PM	Putting It Into Perspective - The Fine Art of Measurement	Jonathan D. Miller, Welaptega/Ashtead
4:00 PM	4:15 PM	Closing Remarks	Kelly Kore, APSG Chair

SOCIAL TO BE HELD AT
COACHES SPORTS BAR & GRILL
FOLLOWING THE MEETING

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PAPERS & TALKS

KEYNOTE: EARTH'S MOVING MAGNETIC POLES, TECTONICS PLATES, AND MANTLE REVEALED FROM CORING IN THE OCEAN BASINS

GARY ACTON, TEXAS A&M UNIVERSITY

Similar to an array of geomagnetic stations that record variations in the direction and strength of the geomagnetic field over modern times, marine sediments and rocks record Earth's ancient geomagnetic field, referred to as the paleomagnetic field. The resolution of that record is largely controlled by the sedimentation rate, in which thick sedimentary sections deposited at high sedimentation rates give long continuous magnetic records that can reveal both long and very short-term changes in the geomagnetic field. Scientific ocean drilling has selectively targeted these sedimentary sections at many sites around the globe, providing essentially a constellation of paleomagnetic stations. Rather than a fairly stable geomagnetic field punctuated only by the randomly occurring geomagnetic reversals, the paleomagnetic data from these sites show continual dynamic variations in both the direction and magnitude of the geomagnetic field. Even during stable intervals, the instantaneous geomagnetic pole can move at rates of several tens of kilometers per year about Earth's spin axis, even though the long-term average geomagnetic pole coincides with the spin axis, hence conforming to the hypothesis that Earth's long-term field can be approximated by a geocentric axial dipole. These long-term average poles when computed back in time over millions of years provide the paleomagnetic poles that compose apparent polar wander paths (APWPs). The polar motion displayed in APWPs for tectonic plates primarily reflects the motion of the plate relative to the spin axis. Comparison of plate motion predicted by APWPs with plate motion observed over mantle hotspots, which produce hotspot tracks like the Hawaiian-Emperor Chain and the Ninetyeast Ridge, illustrates that the entire Earth has shifted relative to the spin axis during true polar wander events.

THE FUTURE OF NAVIGATION FOR ULTRAHIGH RESOLUTION SEISMIC SURVEYING

BRANDON MATTOX, NCS-SUBSEA | LARRY SCOTT, NCS-SUBSEA | NOEL ZINN, HYDROMETRONICS

In addition to pushing the boundaries of traditional seismic data processing, ultrahigh resolution seismic surveys are pushing the boundaries in navigation and positioning software and data processing. Issues encountered and some of their solutions during our recent surveys include:

- Positioning accuracy required for small bin sizes (1.5625 to 3.125 meters).
- Timing accuracy required for high temporal sampling frequencies (0.25 to 0.5 msec sampling interval, 2000 to 4000 Hz sampling frequencies).
- Short offsets between the energy source and hydrophone groups can create operational challenges for positioning equipment.
- Precision levels needed for pre-plot coordinates and binning grid definitions.
- Small surveys translate into short duration survey lines, with little time between lines to perform QC, end of line reports, etc.
- Small shot intervals tax real-time navigation systems, with time intervals between shots between 0.5 to 2 sec.
- Traditional seismic source arrays can be too large spatially and inadvertently filter data collected by ultrahigh resolution seismic systems.

VISUALIZING AND TRANSFORMING 2D DATA TO A 3D WORLD

LIAM LYLE, TEXAS A&M UNIVERSITY (STUDENT) | CATHERIN FRANKLIN, TEXAS A&M UNIVERSITY (STUDENT)

Ways to display data are always evolving. The new frontier of GIS lies in the realm of 3-dimensional (3D) mapping. 3D modeling can be beneficial as it effectively visualizes data and displays a vertical dimension. Thus, there is a critical need to create a versatile process to transform 2D data into 3D. This can give users the ability to see the data in context and evaluate where issues may occur. This presentation aims to showcase the evolution of Texas A&M University's Aggiemap from 2D to 3D. This process was completed using software including ArcGIS Pro, ArcMap, FME, SketchUp Pro, and CAD. This presentation will also discuss data visualization through forms of "game engines" such as Unity and the Unreal Engine with an example of a fully modeled building with plumbing, electrical, and mechanical systems all integrated into the "game".

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PAPERS & TALKS

MODERN DATA PROCESSING CHALLENGES AND THE PROMISE OF REMOTE DATA SERVICES

RYAN BROWN, OARS-HPSG | KEVIN TOMANKA, OARS-HPSG

Given force multipliers like multiple AUV/ASV spreads, project data loads are growing, and personal resources are not keeping pace. Automating the processing of large data sets are crucial to survival in hydrographic surveying. As computers handle the large volumes of calculations, QC experts are going to become more valuable than ever. Placing these experts on a vessel waiting on AUV's to surface or projects to start or weather to clear, will no longer be an efficient use of their time. Using shore-based data centers to QC and remotely process multiple jobs will soon become the norm for offshore processing, like the new OARS Processing-On-Demand Service or PODS. Data processors and Geos can work away on QC and processing for multiple projects in various parts of the world, with the client being charges only for the time they are working on the project data.

Using tools such as EIVA's workflow manager will allow the computers on the vessel to prepare the data for human QC. Then the work of QC and interpretation can begin from shore, or take place on the vessel, depending upon requirements. The limiting factor for this progression to utilizing shore-based processors is vessel internet and communications. Low bandwidth or high latency still allow processing to be started remotely, but full remote capability cannot yet be achieved as at least one QC personnel is required on the vessel. In these situations, condensing the data into what is needed to begin the QC process and uploading it from the vessel will be required.

This presentation will address the methodologies available or under development for executing remote data processing projects, the issues facing remote operations, and benefits of remote Processing-On-Demands Services (PODS).

TRF2022: LOW DISTORTION PROJECTIONS PROPOSALS FOR ONSHORE AND OFFSHORE EXPLORATION

STACEY LYLE, TEXAS A&M UNIVERSITY | DENNIS MIDDLETON, NATIONAL GEODETIC SURVEY |
FELICIA RETIZ, TEXAS DEPUTY GEOGRAPHIC INFORMATION OFFICE

To reduce the scale factors for onshore and offshore, new multi-layered Low Distortion State Plane Projections are being considered for the new TRF2022 datum as part of the National Spatial Reference System (NSRS). This discussion will gather a consensus of APSG members' positions on creating and proposing new State Plane Projections. North American Datum 1983 and North American Vertical Datum 1988 is currently the horizontal and vertical datums used in the United States. A hybrid geoid, Geoid12b, is the current geoid to obtain orthometric heights. A new proposed datum Terrestrial Reference Frame 2022 (TRF2022) is currently being proposed and will be based on the International GNSS Service (IGS) reference frame. TRF2022 datum will be both a new horizontal and vertical datum with time dependent 3-D velocity values. Geoid2022 will be a geometric/geopotential model where orthometric are called North American Pacific Geopotential Datum 2022 (NAPGD2022 is HNAPGD2022(t) = hTRF2022 (t) – NGEOID2022(t)). All federal civilian agencies with geographic data will be required to use the new reference frames when they are adopted as part of the NSRS. These agencies must use geodetic control to accurately register spatial data, and the NSRS is the fundamental geodetic control for the United States. NGS will provide new transformation tools to transform NAD 83 and NAVD 88 coordinates into the new reference frames. Through a concerted outreach effort by NGS, each state will be given the opportunity to update their State Plane Coordinate system, with the roll-out of the four new terrestrial reference frames.

APSG 41 SPRING MEETING

PAPERS & TALKS

RECTIFICATION OF OBLIQUE AERIAL IMAGERY IN SUPPORT OF MARINE SPILL RESPONSE

ROBERT FROST, BP

During the DWH Response, millions of oblique photographs were acquired by thousands of responders and trained and untrained observers. A large potion of these photographs were geotagged and did provide useful qualitative information about the character and composition of local surface slick conditions at a given time and place. But over open water, and in the absence of any external orientation information or perspective reference, their full use in a quantitative sense was not as easily realized.

Given the ubiquity and low cost of consumer-grade positioning and orientation sensors today and their incorporation into devices such as the iPhone and Digital SLR cameras, the standard photographic kit for any future responder – especially any airborne marine spill observer – ought to include the capability to log both Internal and External Orientation data for each image captured (preferably in the Exif header and/or imprinted on the image; in MISB-compliant metadata for FMV).

This information (although relatively coarse or crude by ordinary photogrammetric standards) would enable the analytical rectification/2D projective transformation of that imagery and greatly enhance its quantitative value in a marine spill response. The computational effort in the transformation is straightforward and could be easily automated. Observer imagery thus rectified could then be easily consumed, integrated, and evaluated in a GIS along with other response data and observations.

This could be very useful in both an operational and a forensic context, as it would: help plan and direct recovery operations; provide ground truth/training samples for other aerial and satellite observation systems/modes; provide uniquely detailed documentation of surface slick conditions at key locations; provide spatial/temporal “infill” to the standard satellite/aerial image products; provide quantitative information on surface slick conditions – location, distances, areas/sizes and shapes, orientations, textures, etc.

Examples of the rectification process flow and output for still and video imagery from a marine spill response will be presented. A detailed example of analytical rectification of iPhone imagery based solely on available internal and external orientation data and its application in future marine spill responses will also be presented.

PUTTING IT INTO PERSPECTIVE - THE FINE ART OF MEASUREMENT

JONATHAN MILLER, WELAPTEGA/ASHTEAD

In Surveying and Geomatics, the use of Long Base Line (LBL) and Short Base Line (SBL) arrays for position in offshore installation work is a critical technology which makes precise placement of spudded wells, mooring anchors, manifolds, jumpers, and other important subsea infrastructure possible. While these examples deal with “Macro” precision, other applications require length and position on the “Micro” scale.

Risers extending from the seabed to the surface are considered the most important steel component in the offshore installation. Housing the oil and gas produced from the well, their integrity is significant. When it comes to maintaining risers, one best practice is to minimize riser fatigue by limiting the vessel offset due to the environment. This is accomplished in the design phase by choosing the best mooring system (i.e. taut-leg) and then in operations by monitoring it during its useful service life. Mooring integrity is directly linked to riser integrity.

Common practice for mooring chains is to add 0.2mm/year to the designed diameter requirement. Many systems are designed for at least a 20-year service life, and precise measurement is critical to assess the corrosion rate. Subsea calipers are a common tool for this type of measurement, however, they do not adequately provide the precision required to consistently observe the difference in diameter across the grip region of the chain or the length of the link. Those who have used calipers before can appreciate differences in readings based on how the measurement is taken.

A better way to measure exists. Welaptega has developed an “optical” caliper which is configured for the nominal chain diameter and uses subsea cameras to measure the diameter of the chain in locations of interest. This tool measures with a precision of +/- 0.5mm. Furthermore, for severe corrosion cases, equipment which can generate 3D models for FEA analysis of the corroded equipment also exists.

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MEETING LOCATION

TUESDAY, MAY 14, 2019
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APSG 41 will be held at the Oceaneering Corporate Office.

Attendees may park in the building's parking facilities. Specific instructions to be provided prior to the event.

OCEANEERING
11911 FM 529
HOUSTON, TX 77041
(SEE MAP BELOW)

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AFTER THE MEETING:**

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17460 NORTH WEST FWY
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