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Long-term acoustic monitoring off Central California

Collins, Curtis A.; Joseph, John E.; Chiu, Ching-Sang; Colosi, John; Miller, Christopher W.

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Session 2aAB

Animal Bioacoustics and Acoustical Oceanography: Acoustics as Part of Ocean Observing Systems

Ana Sirovic, Cochair
Scripps Institution of Oceanography, La Jolla, CA 92093-0205

Lora J. Van Uffelen, Cochair
Ocean and Resources Engineering, University of Hawaii at Manoa, Honolulu, HI 96815

Chair's Introduction—7:55

Invited Papers

8:00

2aAB1. Acoustic tomography as a component of the Fram Strait observing system. Brian D. Dushaw, Hanne Sagen, Stein Sandven (Nansen Environ. and Remote Sensing Ctr., N-5006, Norway, brian.dushaw@nersc.no), and Peter Worcester (Scripps Institution of Oceanography, UCSD, La Jolla, CA)

The Fram Strait, a deep constriction between Svalbard and Greenland, is the primary location for the exchange of heat, mass and freshwater between the Arctic and Atlantic Oceans. With existing data and ocean modeling, current estimates of these exchanges, critical for understanding the Arctic Ocean climate, are inaccurate. To try to improve these estimates, during 2008-9 the DAMOCLES project deployed a test tomography path spanning the deep, ice-free part of the northward-flowing West Spitzbergen Current (WSC). Small-scale scintillations of sound speed due to eddies, fronts, and internal waves, are an important aspect of acoustic propagation of the region. Variability within Fram Strait, and the WSC in particular, is characterized by ubiquitous mesoscale eddies with 20-km scale. These eddies extend to depths of several hundred meters. Understanding the forward problem is essential for the inversion of acoustic data. The sound speed environment of Fram Strait generally prevents individual ray arrivals from being resolved in O(100-km) acoustic paths. An accurate inversion of these data for path-averaged sound speed (temperature) can be still be obtained, however. An objective mapping study, combining acoustic and existing data types, demonstrates that tomography will be a valuable and effective addition to the Fram Strait observing system.

8:20

2aAB2. Long-term acoustic monitoring off Central California. Curtis A. Collins, John E. Joseph, Ching Sang Chiu, John Colosi, and Christopher W. Miller (Oceanography, Naval Postgraduate School, 833 Dyer Rd, Monterey, CA 93943-5122, collins@nps.edu)

The use of moored ocean arrays for environmental acoustic measurements off Central California is discussed. A cabled array off Point Sur, CA, which was designed for long-range, low-frequency listening was used by NPS and collaborators from late 1997 through mid-2000 and provides examples of a wide range of activities including use for student laboratories, faculty and student research, as well as monitoring, e.g. ambient acoustic noise, test ban treaty activities. From mid-2006 to present, passive acoustic data have continued to be collected off Pt. Sur using single hydrophone moored autonomous listening stations which record data intermittently at sampling rates of 200 kHz. We have recently considered re-establishment of cabled passive acoustic measurements using MARS, an example of an observatory which was designed and located for more traditional oceanographic studies. The utility of MARS for acoustic measurements depends both on how well it can characterize the regional acoustic environment as well as local oceanographic processes that can be resolved acoustically (canyon effects, geography, sound speed variability, sediments and local vessel traffic). These can be contrasted with existing cabled and autonomous data from Point Sur.

8:40

2aAB3. Acoustics at the ALOHA Cabled Observatory. Bruce M. Howe (Ocean and Resources Engineering, University of Hawaii at Manoa, 2540 Dole St, Holmes Hall 402, Honolulu, HI, bhowe@hawaii.edu), Fred Duennebier (Geology and Geophysics, University of Hawaii at Manoa, Honolulu, HI), Roger Lukas (Oceanography, University of Hawaii at Manoa, Honolulu, HI), and Ethan Roth (Ocean and Resources Engineering, University of Hawaii at Manoa, Honolulu, HI)

Since 6 June 2011, the ALOHA Cabled Observatory (ACO) has been collecting ocean acoustic data, continuing an earlier data set covering February 2007 - October 2008. The ACO is at Station ALOHA 100 km north of Oahu, the field site of the Hawaii Ocean Time-series (HOT) program that has collected biological, physical, and chemical oceanographic data since 1988. At 4728 m water depth, it is the world's deepest operating cabled observatory. ACO provides power and communications to user instrumentation. Among the instrumentation there are two hydrophones 1 m off the bottom separated by 1 m. One is an OAS Model E-2PD meant for low frequencies (0.014 Hz to 8 kHz). A second (uncalibrated) hydrophone is meant for higher frequencies. Current sampling rates for both hydrophones are 96 kHz; subsampled 24 kHz data are streamed to the Web in real-time. The system will be described and examples of acoustic events and signals presented, including local and distant earthquakes, marine mammals, surface waves, wind, rain, ships, sonars, and implosions. Plans for future acoustics research will be discussed. [Work supported by the National Science Foundation.]