samples, from Facies F4, demonstrates oxygen-stratified water conditions. The samples of the second group, belonging to F6, show a significant content of woody and coaly organic matter components, which represent an important terrestrial input. The thermal maturity estimation derived from measured vitrinite reflectance (%Ro) and the thermal alteration index (TAI) places the studied interval in the early oil-generation window. These results correlate to similar values obtained in nearby study areas.

The entire succession shows three cycles: two complete transgressive-regressive cycles overlying a third, incomplete, cycle at the base of the local stratigraphic column, within a succession deposited in an external mixed marine ramp setting. Each cycle comprises an initial set of retrogradational parasequences, followed by a maximum flooding surface (MFS) and a subsequent progradational parasequence set. The MFS was recognized on the basis of parasequence stacking patterns and the abundance of amorphous organic matter components, which indicate oxygen-stratified marine conditions and limited sediment input. The uppermost cycle is truncated by an erosive surface, which defines a sequence boundary, below the fluvial facies of the Lower Troncoso Member (Huitrín Formation). ■

Bioturbation on Antarctica's Explorers Cove Seafloor: Why Animal Activity has a Greater Impact on the Sedimentary Record than Animal Abundance

Kimberly Mead

Little is known about the sedimentologic and taphonomic processes occurring under semi-permanent sea ice in Explorers Cove (EC), Antarctica. We analyzed the amount of seafloor bioturbation by point-counting disruption on a cm-scale grid superimposed on 26 quadrants ($1m^2$) and by assessing the Bedding Plane Bioturbation Index (BPBI) for each quadrant. All quadrants had BPBI of 5 and averaged 77% points disrupted. Two epifaunal animals, the scallop, *Adamussium colbecki,* and the ophiuroid, *Ophionotus victoriae*, are responsible for this disruption. *A. colbecki* produces "divots" 3 cm deep. *O. victoriae* leaves 2 mm deep imprints.

Bioturbation rate is a function of animal density and animal activity. Range of scallops per 20 m^2 transect (n=16) is 4 to 192. Rates of animal activity are poorly constrained. The estimated minimum number of divots that *A. colbecki* would produce is $2m^{-2}y^{-1}$, the maximum $24m^{-2}y^{-1}$. This translates to 157 to 1884 cm^2 reworked per m^2y^{-1}. *O. victoriae* is estimated to disrupt 281 to 5900 cm^2 per m^2y^{-1}. The activities of *O. victoriae* and *A. colbecki* together could produce a 100% bioturbated quadrant in 5 to 61 years, consistent with the absence of lamination in EC cores.

Bioturbation by *A. colbecki* and *O. victoriae* is pervasive in EC quadrants and decoupled from the abundance of these organisms. As demonstrated in this study, the record of animal activity is more likely to be encountered in the stratigraphic record than is skeletal material. This underscores the importance of linking animals to their bioturbation when documenting climate change. ■

Analysis of Seismic Attenuation in Porous Layered Fluid-Saturated Medium

Elmira Chabyshova

Petroleum reservoirs are usually described as porous fluid-saturated media. Seismic wave attenuation in such media can be described using Biot theory.

The values of attenuation at seismic frequencies obtained from calculations using Biot theory are much lower than those predicted by experimental data. Such discrepancies are typically explained by the presence of fractures, a second fluid, second rock inclusions, layered structure, etc., in otherwise homogeneous isotropic porous media saturated with fluid.

Some of the most popular models of porous, fluid-saturated media modified by the introduction of different kinds of heterogeneities are described in this paper. Seismic attenuation values calculated using such models with heterogeneities are closer to the values observed in experimental data. However, those heterogeneities introduce new medium parameters necessary in order to describe the modified model mathematically. Those parameters are difficult or impossible to estimate in practical applications.

The proposed method of attenuation estimation at seismic frequencies is based on asymptotic analysis initially introduced by Silin and Goloshubin (2010). Such asymptotic analysis gives a simplified solution to Biot media. It allows calculation of

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attenuation at low frequencies in porous fluid-saturated media without involving many medium parameters which are difficult or impossible to estimate. An analysis of attenuation will be performed using a thinly-layered reservoir model which was obtained using the petrophysical data from a real petroleum reservoir. ■

Melt Stagnation in Peridotites from Godzilla Megamullion

Matthew Loocke

The Godzilla Megamullion (GM) Massif is the largest known example of an Oceanic Core Complex (OCC) or the exhumed footwall of a low angle-large offset oceanic detachment fault. It lies on the extinct Parece Vela Rift spreading center within the Parece Vela back-arc basin of the Philippine Sea. This has thus allowed for sampling of a young back-arc mantle section. Sampling of the massif has returned a dominantly ultramafic lithology, divided petrographically into depleted, fertile, and melt-percolated groups. Petrographic analysis of the extant peridotite thin-section collection found that 44% of all GM peridotites (71 out of 161) exhibit evidence of plagioclase impregnation compared to the worldwide abyssal peridotite average of 20%. The mullion is divided up into three regions, the proximal region (closest to termination of spreading), the medial region, and the distal region (furthest from the termination of spreading). Observations by region show that 53% (62 out of 116 samples) in the proximal region (15 dredges), 12% (2 out of 17 samples) in the medial mullion (3 dredges), and 25% (7 out of 28) in the distal mullion (5 dredges) show evidence of plagioclase impregnation. Major element analyses of spinels were completed using the Cameca SX-50 Electron Microprobe facility at the University of Houston. The Cr# [100 x Cr/(Cr + Al)] ranges from 10 to 65 with TiO_2 concentrations ranging from less than 0.01 up to 1.6 wt%. When the Cr#s of the samples are plotted along the massif, a pattern of melt depletion exists that is consistent with the degree of plagioclase impregnation. In the distal region, Cr#s start at around an average of 35 and range up to 65 for melt percolated samples. In the medial region, a drop-off in Cr# of about 1 Cr# per kilometer is observed with the trend bottoming out at around a Cr# of 10. In the proximal region, Cr#s closer to the medial region are observed as having more fertile values of around 20 but are found amongst melt-impregnated samples with values ranging up to 50. This range is seen as having increasing minimum and maximum values with distance away from the medial section until it reaches its peak at a base Cr# of 30 with a maximum of 65. From this trend, a general model for the secular evolution of the GM mantle section can be established. The ridge segment experienced normal mid-oceanic ridge growth with robust mantle melting during the time period represented by the distal region. At the boundary to the medial region, a steep drop-off in melt productivity was experienced, leading to minimal mantle melting during the time period represented by the medial region. Soon thereafter, melting began again, but was trapped in a thickened and cooling lithosphere, causing the melt to pool and react with its host peridotite. ■