these error estimates, we test whether 1) any taxon's score is statistically different from the 'norm' during a particular interval, and 2) whether a taxon's scores from any two intervals are statistically different from each other. Our empirical results demonstrate that although successive gradients are commonly correlated, many taxa exhibit ordination scores that are statistically significant deviations from the norm. The frequency and magnitude of deviations, however, do not necessarily scale with the strength of the correlation or the temporal length of compared intervals; instances of either gradient persistence or restructuring can be observed at the bed, member, or formation levels. The scale-independent nature of gradient (in)stability emphasizes the potential uniqueness of each interval, where epibole or invasion taxa, in particular, may substantially alter the milieu of an environmental gradient.

Session 37-4: Tuesday, 8:45 AM

Presenter: Amy Singer

THE INVERTEBRATE PALEOECOLOGY OF THE BEAR GULCH LIMESTONE

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The Late Mississippian Bear Gulch Limestone (BGL) is well exposed in central Montana, and stands as one of the outstanding marine konservat lagerstätten in the United States. The BGL is best known for soft-tissue preservation of fish, but there are abundant and diverse invertebrates remaining to be studied. Recent landowner relationships have reactivated collecting in the area for the University of Montana Paleontological Center. Over the past two field seasons (2012 and 2013), new excavations and systematic collecting techniques have revealed an even more abundant invertebrate fauna than previously recorded. The BGL is a plattenkalk, a finely laminated micritic limestone, which may record tidal, seasonal, or climatic signals. To discern which signal is controlling deposition of this plattenkalk, high-resolution composite sections are being measured at the mm-scale. Additionally, samples are being collected for physiochemical and microfacies analysis. This information will be integrated with paleoecological and stratigraphic information gained from systematic excavations of benthic invertebrate macrofossils to clarify the model of basin-wide processes, which remain controversial. Current stratigraphic models place the BGL within or very close to the Serpukhovian stage, a time of great global climatic fluctuation. The BGL likely preserves a unique snapshot into this critical time in Earth's history, which may further our understating of the Serpukhovian Biodiversity Crisis (SBC). Changes to the biotic composition and forms common to other Mississippian faunas that are missing in BGL, may shed light on a biosphere in transition due to an unstable climate. Alternation of flinz and flaune bedsets may reflect these climatic shifts, and an integrative approach that includes detailed paleoecology, geochemistry, and sedimentology can elucidate these changes and their effects on the biosphere, which will place the BGL within a regional setting and global context.

Session 37-5: Tuesday, 9:00 AM

Presenter: Steven M. Holland

THE STRATIGRAPHIC PALEOBIOLOGY OF MARINE VERTEBRATES

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Numerical and conceptual models have made numerous predictions about the structure of the marine invertebrate fossil record, and these predictions have been confirmed in an ever-growing set of field studies. These studies demonstrate the overarching importance of depth-related and substrate-related facies variations, coupled with sequence stratigraphic architecture. The marine invertebrate record is controlled by the interplay of sampling bias (reflecting the rarity of species), facies bias (reflecting the degree to which species are tied to particular facies), and unconformity bias (reflecting the rate of evolutionary turnover, the duration of non-deposition, and the duration and extent of erosion). Controls on the occurrence of marine vertebrate fossils, are far more poorly known than those of invertebrates, and it is possible that the controls might differ substantially. One principal difference between vertebrates and many marine invertebrates is abundance. Although the relative rarity of vertebrates should increase the effect of sampling bias relative to facies bias and unconformity bias, the magnitude of this effect is not yet known. Second, the degree to which the ecology of marine vertebrates is tied to benthos is not well understood, particularly for extinct taxa, and as such, the importance of bathymetric-related and substrate-related facies for the occurrence of marine vertebrates is largely unknown. Third, the general extent of out-of-habitat transport of marine vertebrates is also not generally understood, even though the potential for bloat-and-float transport may be great. If the ecology of marine vertebrates is generally only weakly tied to the benthos, or if out-of-habitat transport is both common and extensive, facies bias would be substantially less than for marine invertebrates. Finally, differences in evolutionary rates between vertebrates and invertebrates would affect the relative importance of unconformity bias. The importance of these differences is examined in light of the fossil vertebrate record of the Ordovician Harding Formation of Colorado, the Jurassic Sundance Formation of Wyoming, the Cretaceous Judith River Formation of Montana, and the Miocene Calvert and Choptank formations of Maryland.

Session 37-6: Tuesday, 9:15 AM

Presenter: Kathlyn M. Smith

TEMPORAL AND PALEOENVIRONMENTAL DISTRIBUTION OF *BASILOSAURUS* (MAMMALIA: CETACEA) IN THE SOUTHEASTERN UNITED STATES: NEW EVIDENCE FROM THE EOCENE OF SOUTHWEST GEORGIA

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Basilosaurus is a fully aquatic archaeocete characterized by elongated posterior thoracic, lumbar, and anterior caudal vertebrae. The genus was present in North America by the late Eocene, with most occurrences within the Gulf Coastal Plain. In Georgia, there are only three confirmed reports of *Basilosaurus*, two of which are of isolated elements. Here we report a fourth *Basilosaurus* from Georgia, found on the banks of the Flint River in Albany. This specimen appears to be the most complete *Basilosaurus* known from Georgia, and upon initial discovery, consisted of a series of seven elongate vertebrae (five complete and two partial) and some probable rib fragments. Since the discovery, three vertebrae have been stolen, but excavation is ongoing, and there is potential for recovery of additional material beyond what has been identified. The specimen is encased in the Ocala Limestone, a fine-grained, white to cream-colored limestone that formed during the late Eocene (Priabonian: 37.2–33.9 Ma) in the shallow open waters of the continental shelf. The goal of this study is to investigate the facies, temporal, and geographic distribution of *Basilosaurus* in North America in order to identify paleoenvironmental and geographic limitations to its distribution. To address this goal, *Basilosaurus* occurrences and depositional environment for each site were plotted on a paleogeographic reconstruction of Eocene North America for four time intervals (middle to late Priabonian, early Priabonian, Bartonian/Priabonian boundary, and Bartonian). Occurrences of *Basilosaurus* are rare near the Bartonian/Priabonian boundary, which coincides with a sea-level lowstand. Following this lowstand, the Jackson Sea transgressed, and *Basilosaurus* dispersed from Florida to as far north as South Carolina and as far west as Louisiana. The North American *Basilosaurus* population reached its peak during the height of the Jackson transgression, just prior to the Eocene/Oligocene boundary, with specimens found as far north as Arkansas and Tennessee, and in abundance in Mississippi and Alabama. There are no apparent associations between geography and paleoenvironment, or time and paleoenvironment, as *Basilosaurus* fossils are typically found in nearshore, shallow-marine environments regardless of age or location. There is, however, some association between geography and age, as specimens track the movement of the shoreline through time. *Basilosaurus* fossils also indicate the presence of an embayment leading to Arkansas and Tennessee, a feature that is absent in many paleogeographic reconstructions of the Eocene. Continuation of this study will ultimately provide a better understanding of the habitat preference and timing of dispersal of *Basilosaurus*, with implications for the evolution of archaeocetes in southeastern North America.

Session 37-7: Tuesday, 9:30 AM

Presenter: Alessandro Amorosi

MILLENNIAL-SCALE SEQUENCE STRATIGRAPHY OF LATE QUATERNARY DEPOSITS AS REVEALED BY HIGH-RESOLUTION SEDIMENTOLOGICAL AND MICROPALEONTOLOGICAL DATA

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One of the most intriguing applications of sequence-stratigraphic concepts is to predict realistic scenarios of future environmental evolution under changing sea level and sediment supply. In this regard, coastal depositional systems of Lateglacial to early Holocene age, which developed under conditions of predominantly sea-level rise, may represent invaluable archives where the record of higher-frequency (millennial-scale) climatic oscillations can be preserved. Incised-valley fills, in particular, represent stratigraphically expanded, almost continuous successions where synchronous climatic-eustatic events of global significance are most likely to be deciphered. Detailed sequence-stratigraphic studies based on integrated sedimentological and micropaleontological (benthic foraminifer and ostracod) investigations provide evidence for the widespread occurrence of millennial-scale, shallowing-upward depositional cycles (parasequences), about 2–10 m thick, bounded by flooding surfaces and fingerprinted by diagnostic climatic (pollen) signatures. Transgressive (TST) parasequences exhibit significantly higher correlation potential than parasequences formed under low accommodation conditions (HST). Identification and lateral tracking of separate flooding surfaces within the TSTs of several Mediterranean deltaic and coastal systems is performed on the basis of subtle vertical changes in paleodepth and paleosalinity. Stratigraphic correlations enable the characterization of short-term (millennial to sub millennial-scale) depositional cycles with distinctive transgressive-regressive internal architecture. The lower, transgressive portions of such high-frequency cycles denote abrupt shifts from freshwater to increasingly mixed, brackish-marine and then marine environments under conditions of rapid sea-level rise. In contrast, the upper, 'regressive' portions represent the filling of newly formed accommodation space via extensive crevasse to bay-head delta processes or coastal progradation. Although parasequence correlation can be limited by a number of factors (fragmentary record, ambiguous positioning of parasequence boundaries, mixing of conventional and calibrated ages, local interplay between climate, eustasy, and sediment flux, and possible decoupling or diachroneity of major events), the most prominent climatic and eustatic events of Lateglacial to early Holocene age are identified throughout the deltaic record of the Western Mediterranean.

Session 37-8: Tuesday, 9:45 AM

Presenter: Jacalyn Wittmer

QUANTITATIVE BATHYMETRIC MODELS AND THEIR APPLICATIONS FOR LATE QUATERNARY TRANSGRESSIVE-REGRESSIVE CYCLES OF THE PO PLAIN, ITALY

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