Diana Ortega-Ariza is a PhD student at the University of Kansas. Her dissertation work proposes to develop absolute age-constrained sequence stratigraphic frameworks and construct rock-based quantitative relative sea-level histories for Miocene-Pliocene carbonate-dominated systems in Puerto Rico and the Dominican Republic to evaluate global, regional, and local controls on development of carbonate systems. Her advisor is Dr. Evan Franseen.

Although eustacy is commonly invoked as a major control on sequence development, its current evaluation largely relies on proxy curves, some of which do not separate data from interpretations or include high-frequency oscillations. The pinning point method (Goldstein and Franseen, 1995) is a rock-based approach for identifying ancient positions of sea level and constructing relative sea-level curves. It has resulted in detailed quantitative relative sea-level curves for Miocene-Pliocene strata in southeats Spain (Fig. 1). Importantly, the pinning point method is scale-independent, distinguishes data from interpretations, and reflects confidence level of data, which in turn, provides an objective and testable methodology for comparison to other areas. I hypothesize that this method can be used as an aid to distinguish relative contributions of eustacy and tectonism to sea-level history. I will reconstruct paleotopography, develop chronostratigraphies, and use the pinning point method for relatively undeformed Miocene-Pliocene carbonate-dominated exposures in Puerto Rico and the Dominican Republic. Comparison of relative sea-level histories between these two areas, and to already existing data in Spain (Franseen *et al.*, 1998), will help distinguish the contributions of eustacy and tectonism. Constraints on sea-level history allow evaluation and quantification of other controls on the carbonate systems, such as magnitudes and rates of sea-level fluctuations, climate, paleoceanography, and rates of accumulation.

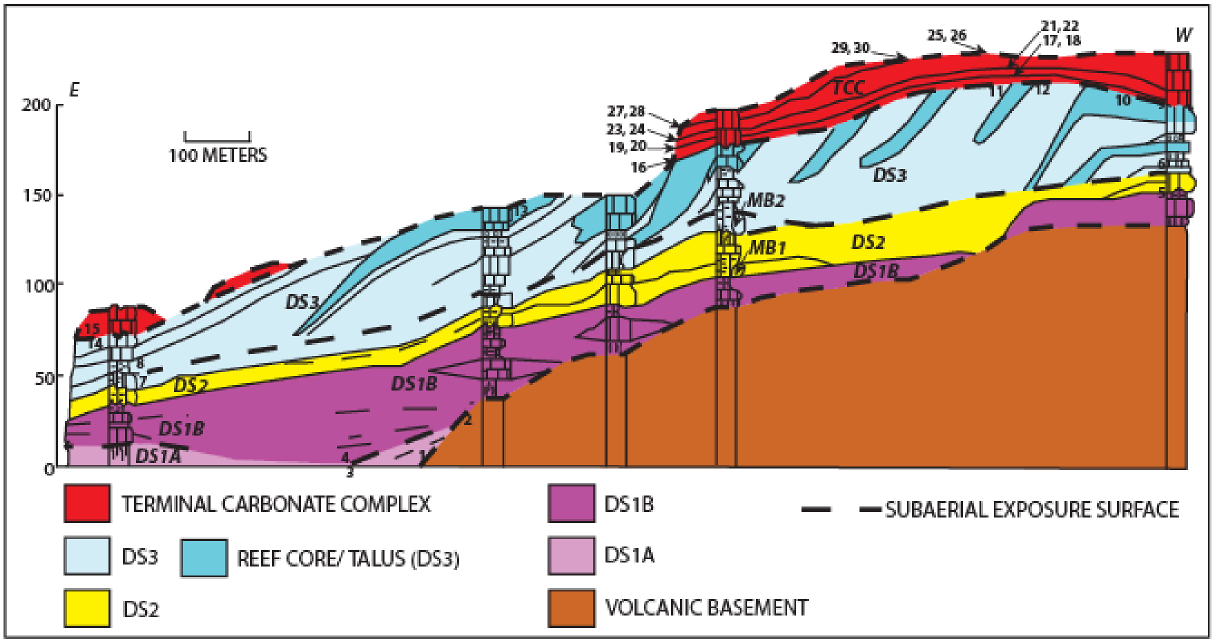
Although the exposures in Puerto Rico and the Dominican Republic are excellent and accessible, very few studies have been conducted on the strata. Therefore, age control, detailed correlations, and understanding of controls on these Miocene-Pliocene sequences are lacking. My studies in Puerto Rico and the Dominican Republic will aid in construction of an absolute-age constrained sequence stratigraphy framework and quantifying the variables that contributed to sequence development. Quantifying relative sea-level history, based on rock data from different areas around the world (the Dominican Republic and Puerto Rico proposed in my study), and comparison of curves from each area (including those already constructed for Spain), provides ground-truthing for establishing a quantitative record of eustatic (global), regional, and local controls on the carbonate systems. These results can be of importance to advancing sequence stratigraphic concepts for carbonate systems. They are also significant towards the advancement of forward, inverse, and reservoir modeling applications. Furthermore, each area proposed in my study will require some reconstruction of paleotopography so that sea-level history can be evaluated. Another result of my study will be to demonstrate approaches and methodologies for reconstructing paleotopography for adaptation of the pinning point method to complex geologic settings.

My project is divided into three phases. Phase 1 involved 2 months of detailed field work during the summer of 2010 on exceptional outcrops of the Ponce Limestone on the south coast of Puerto Rico and one week of reconnaissance work on the Late Miocene-Pliocene strata in the Cibao Valley, northern Dominican Republic in preparation for Phase 2 of this project. Funding requested in this proposal is for Phase 2 field work and sample collection. Phase 2 (summer 2011) focuses on the Dominican Republic locations identified during reconnaissance as ideal for construction of pinning point sea-level curves (Fig. 2).

Previous work has established a basic stratigraphic and chronostratigraphic framework in the Dominican Republic field area (McNeill *et al.*, 2008; Klaus *et al.*, 2011). I will build upon this existing work, specifically collecting additional *Kuphus incrassatus* and oyster material identified during reconnaissance in 2010 for strontium isotope analysis to supplement and refine the existing chronostratigraphy. Because construction of quantitative relative sea-level curves based on the pinning point method (Goldstein and Franseen, 1995) is proposed in different locations, specific steps need to be performed for each study area.

My approach to field study in the Dominican Republic will mirror that done this past summer in the Ponce area of Puerto Rico. Field work will focus on measuring stratigraphic sections, physically tracing strata (facies distribution, stratal geometries, stacking patterns) and surfaces (*e.g.*, sequence boundaries), and collecting samples for petrographic analysis. Importantly, I will collect structural data (including timing evidence) and way-up indicators (*e.g.*, geopetals) for paleotopographic reconstruction. In addition, I will pay particular attention to collecting quantitative data that can be used to document sea-level positions (pinning points), such as facies, sedimentary structures, and diagenetic data. Data on sequences and sequence boundaries, depositional environments, chronostratigraphy, paleotopography, and sea-level position, will be integrated to identify and quantify pinning points. Pinning points will form the basis for construction of relative sea-level curves for each of the study areas. Each of these curves, in turn, will be compared, including with those already constructed for southeast Spain. This should provide a better understanding of the contributions of eustacy and tectonism in each area, and a basis for subsequent analyses of the other controls on facies and sequence patterns.

Phase 3 of my study will incorporate about one month in each of the Puerto Rico and the Dominican Republic field areas to collect additional data and samples to finalize the construction of sequence stratigraphic frameworks, relative sea-level histories, chronostratigraphic frameworks, and evaluate the influence of other controls within those known constraints.



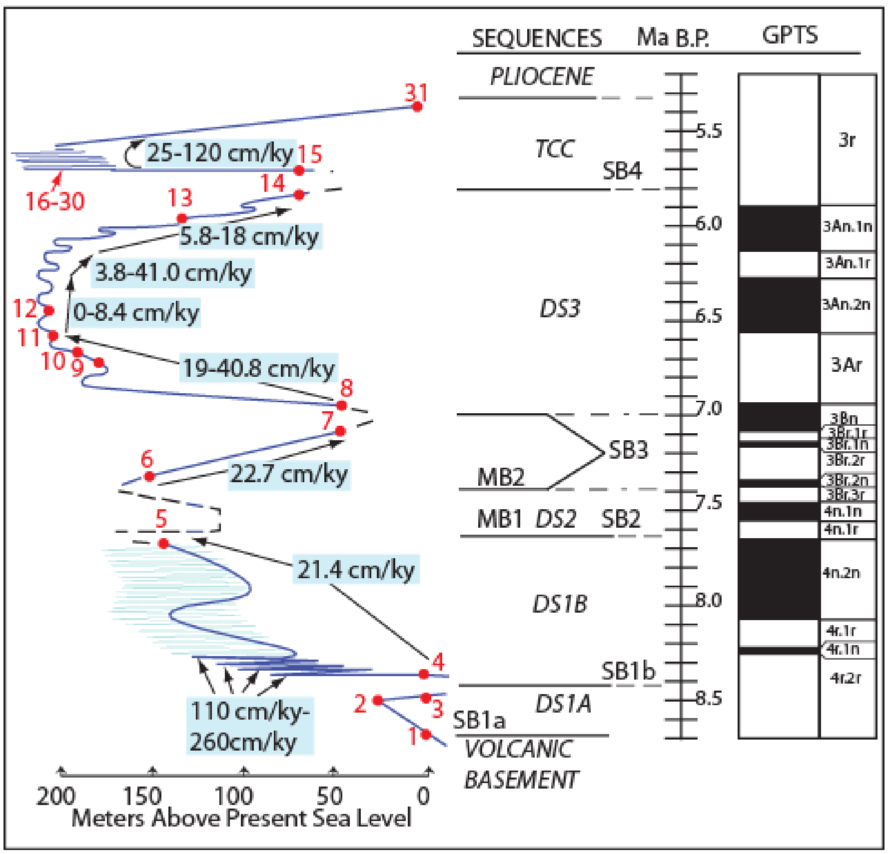


Figure 1. A. *Composite cross section of depositional sequences, modified from actual cross-section and outcrop sketch of La Molata locality, Las Negras area (Franseen et al., 1998). Numbered pinning point positions are illustrated; their relative elevations reflect differences in relative sea-level elevation (Figure 8 in Franseen et al., 2007).*

B. *Relative sea-level curve based on the pinning point method and calibrated to the geomagnetic polarity time scale (GPTS) of Cande and Kent (1995). Solid dots and numbers on the relative sea-level curve are the pinning points (Figure 10 in Franseen et al., 2007).*

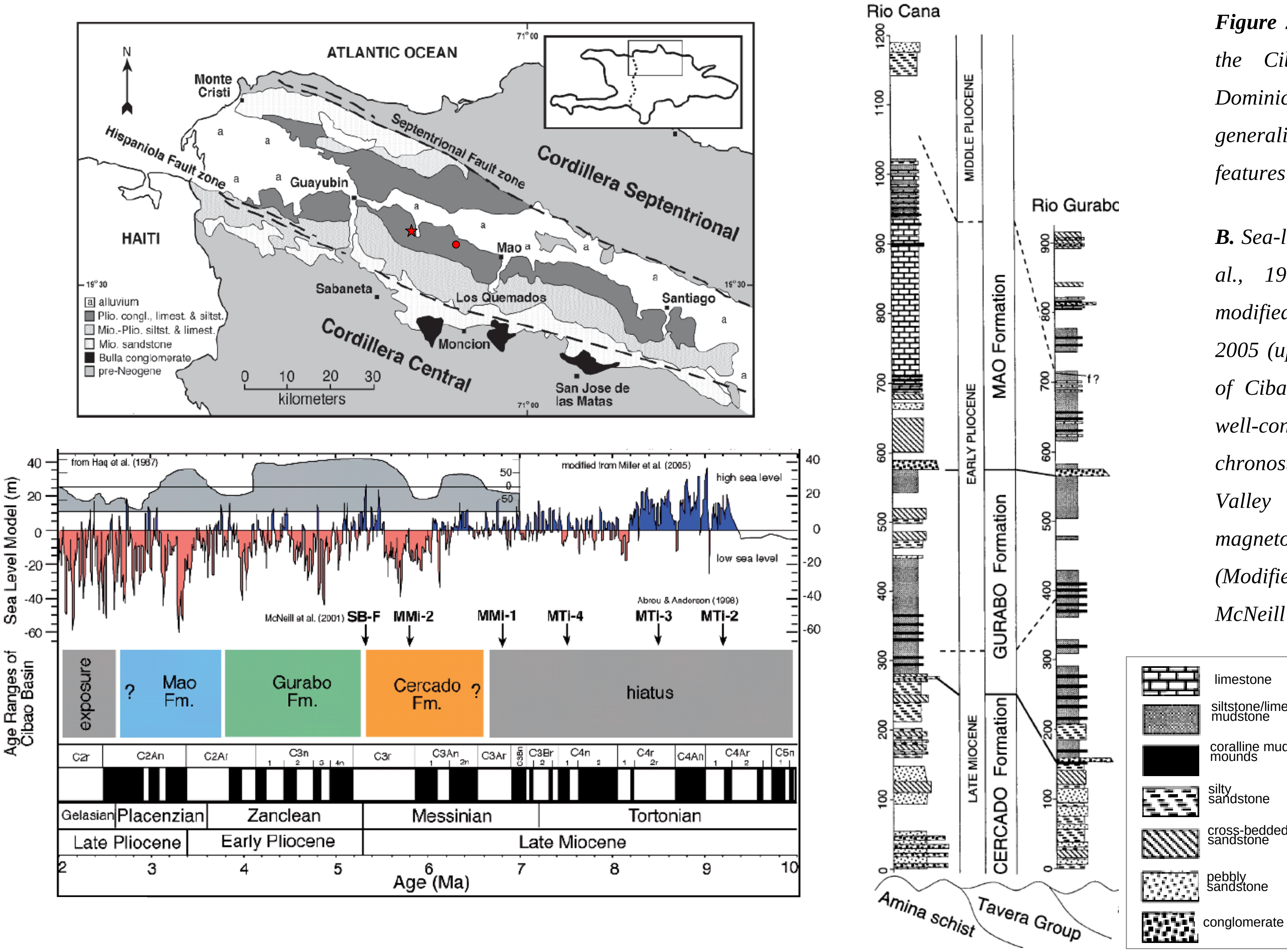


Figure 2. A. *Location map for the Cibao Valley, northern Dominican Republic with generalized geology and major features (Erikson et al., 1998).*

B. *Sea-level curves from Haq et al., 1987 (upper left) and modified from Miller et al., 2005 (upper right); age ranges of Cibao Basin (middle); and well-constrained chronostratigraphy for Cibao Valley deposits based on magnetostratigraphy (below) (Modified from Figure 2.8 in McNeill et al., 2008).*

C. *Rio Cana (red star on A) and Rio Gurabo (red circle on A) stratigraphic sections (Erikson et al., 1998). These rivers dissect the southern flank of the Cibao basin providing access to the target units.*