Geophysical Research Abstracts
Vol. 18, EGU2016-9451, 2016
EGU General Assembly 2016


# Cenomanian-Turonian Bentonites of the Boquillas Formation, Texas, USA: keys to understanding Carbonate Shelf deposition in a Greenhouse Climate

Steve Bergman (1), James Eldrett (2), Chao Ma (3), Daniel Minisini (1), Calum Macaulay (1), Aysen Ozkan (1), and Amy Kelly (1)

(1) Shell, Houston, United States (steven.bergman@shell.com), (2) Shell, Rijswijk, Netherlands , (3) University of Wisconsin, Madison, United States

The Boquillas Formation (Fm.) (equivalent to the Eagle Ford Group) was deposited at the Southern end of the Cretaceous Western Interior Seaway (KWIS) and the northwestern margin of the Gulf of Mexico Carbonate Shelf (passive margin) in a starved retroarc foreland basin setting during part of the Cenomanian and Turonian Stages (CT; 97-90 Ma). The Boquillas Fm. includes several Oceanic Anoxic Events (OAE) marked by global Carbon Isotope Excursions (CIE) and trace metal anomalies. Here we provide a robust zircon U/Pb geochronologic framework used to accurately interpret and predict variability in facies distribution. The Boquillas Fm. consists of a succession of cyclic marlstone and limestone beds and over 300 bentonites deposited in a distal, restricted, suboxic setting mostly below storm wave base. Bentonites are generally homogenous clay-rich layers 1-10 cm thick (average 5 cm, up to 1 m) showing sharp contacts and strong yellow-orange mineral fluorescence under UV light. In addition to detailed logging of roadcuts, two research wells drilled behind outcrops, Shell IONA-1 and Shell INNES-1, recovered >330 m of continuous core from the Austin Chalk at surface through the Boquillas and Buda Limestone Fm. The bentonites form ∼5% of the 60-111 m thick Boquillas Fm. intervals and are interpreted as distal pyroclastic fall deposits from large volume (>10-100 km3) Plinian eruptions from calderas associated with the subduction-related Western North American Cordilleran magmatic arc. Some of the Boquillas Fm. bentonites can be correlated using cores, petrophysical logs, geochemistry, and biostratigraphy for more than 1000 km to the north within the Western Interior Seaway at the CT global stratotype (GSSP) section at Pueblo, CO as well as many other sections in the KWIS.

This contribution integrates new high-precision zircon U/Pb TIMs age data ($2\sigma$ as low as 0.05 Myr) from both core and outcrop samples with independent proxies derived from sedimentology, biostratigraphy, cyclostratigraphy, isotope stratigraphy and trace element geochemistry. We present a robust chronostratigraphic framework for the CT stages, key to interpret sediment accumulation rates (compacted rates=1.4-6.5 cm/kyr, lowest in the Boquillas and highest in the Buda and Austin Chalk), lateral variability and character of depositional environments, diagenetic effects, and sequence stratigraphy in a ∼10 Myr long Greenhouse climate-driven carbonate shelf influenced by explosive volcanism. We show that the OAE2 CIE coincided with an 187Os/188Osi excursion at 95.0±0.1 Ma, probably related to eruption of a Large Igneous Province (LIP).