Paleogeographic Reconstruction

The Faeroe Islands flood basalt pole of Riisager et al. [2002] considers minor dip of the flows and applies extensive alternating-field demagnetization, thermal demagnetization, and principal component analysis to at least 43 distinct flows, most of which are ^{40}Ar-^{39}Ar dated, directly and by correlation, between 56.0 and 55.1 Ma, effectively coincident with the PETM, best estimated at 55.6 Ma [Storey et al., 2007]. Other North Atlantic Igneous Province (NAIP) poles informing synthetic apparent polar wander paths (APWPs) used for conventional paleogeographic reconstruction [e.g., Besse and Courtillot, 2002; Torsvik, et al., 2001a; Torsvik, et al., 2001b; Torsvik, et al., 2002] were derived decades ago using blanket demagnetization, simpler statistical analysis, and more limited stratigraphic coverage, or they are subject to dating uncertainties. Riisager et al. [2002] attribute the $\sim$10 degrees steeper mean of those results to paleofield-undersampling or failure to remove present field contamination completely in the laboratory. Riisager et al. also note that expected-coeval NAIP poles are sometimes statistically distinct, attesting to some measure of ambiguity in the old results.

We rotate the new Faeroe Islands flood basalts pole from the Rockall Plateau microplate to North America using the "56.0" Ma Euler pole specified by Royer et al. [1992], citing Srivastava and Roest [1989] (Table S2; application of conventional, $\sim$55 Ma synthetic APWP poles in Table S3). Applying the "55.0" Ma Eurasian Euler pole with same source would yield a shallower paleolatitude for New Jersey by $\sim$1 degree, and a less westward facing direction by a similar amount. While Torsvik et al. [2001a] note that conventional continent reconstructions across the North Atlantic neglect tectonism prior to successful Atlantic rifting, rotation prescribed by marine magnetic anomalies and fracture zones are preferred at ages younger than or equal to $\sim$55 Ma.

To offer a measure of uncertainty in each calculated paleolatitude, we assign A_{95} for each reference pole as α_{95} at Ancora's location for the prescribed declination and inclination. This is not robust but in this case it is conservative, overestimating paleolatitude uncertainty slightly. Robust uncertainty analysis would require distribution analysis of site-level paleomagnetic data yielding the constituent reference poles, which is beyond the scope of this paper. In any case, uncertainty in Euler pole location for rotating the most robust, Faeroe Islands paleomagnetic pole onto North America is probably of similar magnitude to the paleolatitude uncertainty overestimate introduced by applying A_{95} as α_{95}.

We follow Besse and Courtillot [2002] and many other authors in noting that temporal and spatial coverage in the global paleomagnetic database is generally insufficient to demonstrate or to deny short and/or fast bursts of true polar wander (TPW). It is possible that such TPW accounts for the apparent $\sim$10 degrees anomalous paleolatitude indicated by application of the new Faroe Islands pole relative to the expected paleolatitude based on synthetic APWPs and old (here considered superseded) NAIP poles. Full consideration of this possibility and description of a global paleogeography determined by application of Riisager et al. [2002]'s Faeroe Islands pole are beyond the scope of this paper.