Appendix 1. Kerogens were extracted from the mineral matrix of the source rock samples by National Petrographic Services, Inc., following typical HF/HCl acid digestion and separation procedures (Durand, 1980). Kerogen isolates were then sent to SGS Laboratories for a 55 Element ICP-AES-MS (individually coupled plasma-atomic emission spectrometry and -mass spectrometry) analysis package for 55 major, minor, and trace element abundances. Element concentrations were used in mass balance calculations to distinguish organic sulfur from inorganic (pyritic) sulfur. Elemental analysis (CHNS) of the isolated kerogens was then determined by the USGS EGL, following EGL Method #05. (For details of this and other methods listed below, see http://energy.usgs.gov/GeochemistryGeophysics/GeochemistryLaboratories/GeochemistryLaboratoriesMethods.aspx).

Soxhlet extraction of bitumen (solvent-soluble organic matter) from the source rock samples, and subsequent compound class separation of bitumen extracts with gravimetric determination of SARA fractions, was performed at the USGS EGL following EGL Methods #03 and #04, respectively. Analysis of saturated and aromatic hydrocarbon fractions was then performed at the USGS EGL on an Agilent 6890 GC with a Flame Ionization Detector (FID), following EGL Method #08. Stable carbon isotope ratios of the saturated and aromatic hydrocarbon fractions were determined via GC-IRMS at the USGS EGL, according to EGL Method #17.

Biomarker distributions were analyzed on a JEOL/HP7890 GC/MS at the USGS EGL, following EGL Method #09, operating in selected ion monitoring (SIM) mode. Selected ions included m/z 191.1800 (terpanes), m/z 217.1956 (steranes), and m/z 231.1174 (triaromatic steroids). Peak heights were used to measure biomarker concentrations, as opposed to areas, to avoid potential interference of co-eluting compounds.

REFERENCE

DURAND, B., 1980. *Kerogen, Insoluble Organic Matter from Sedimentary Rocks*. Paris: Editions Technip, 512 pp.