APPENDIX A

<u>Specifications of the aeromagnetic survey and method of modeling the aeromagnetic data</u>

SPECIFICATIONS OF THE AEROMAGNETIC SURVEY

Selected specifications of the aeromagnetic survey are listed below. A more detailed list of specifications are available through Brian Molyneaux at the University of South Dakota. The survey started on November 27, 2001, and was completed on December 12, 2001.

<u>Equipment Specifications</u>

The survey was carried out using a twin engine aircraft Piper Navajo PA-31-325 modified to support a composite tail stinger. A cesium vapor magnetometer, Scintrex model CS-2, was mounted in the tail stinger. The resolution and sensitivity of the magnetometer is 0.001 nT counting at 0.1 per second $\pm$ 0.005 nT.

A global positioning system was used to document geographic position along each flight line. The NAD27 ellipsoid for Mean Continental USA was used with x-y-z delta shifts of 8, -160, and -176, respectively. The UTM zone is 14.

<u>Survey Specifications</u>

A total of 4,530 km was flown with 4,303 km of survey lines and 227 km of tie lines. The survey line interval was 100 m and the tie line interval was 2 km. The survey line direction was 113 degrees, the tie line direction was 42 degrees, average terrain clearance was 80 m, average ground speed was 80 m/s, and the data point interval was 8 m.

METHOD OF MODELING THE AEROMAGNETIC DATA

The following explanation of the modeling procedure was kindly provided by Ron Bell.

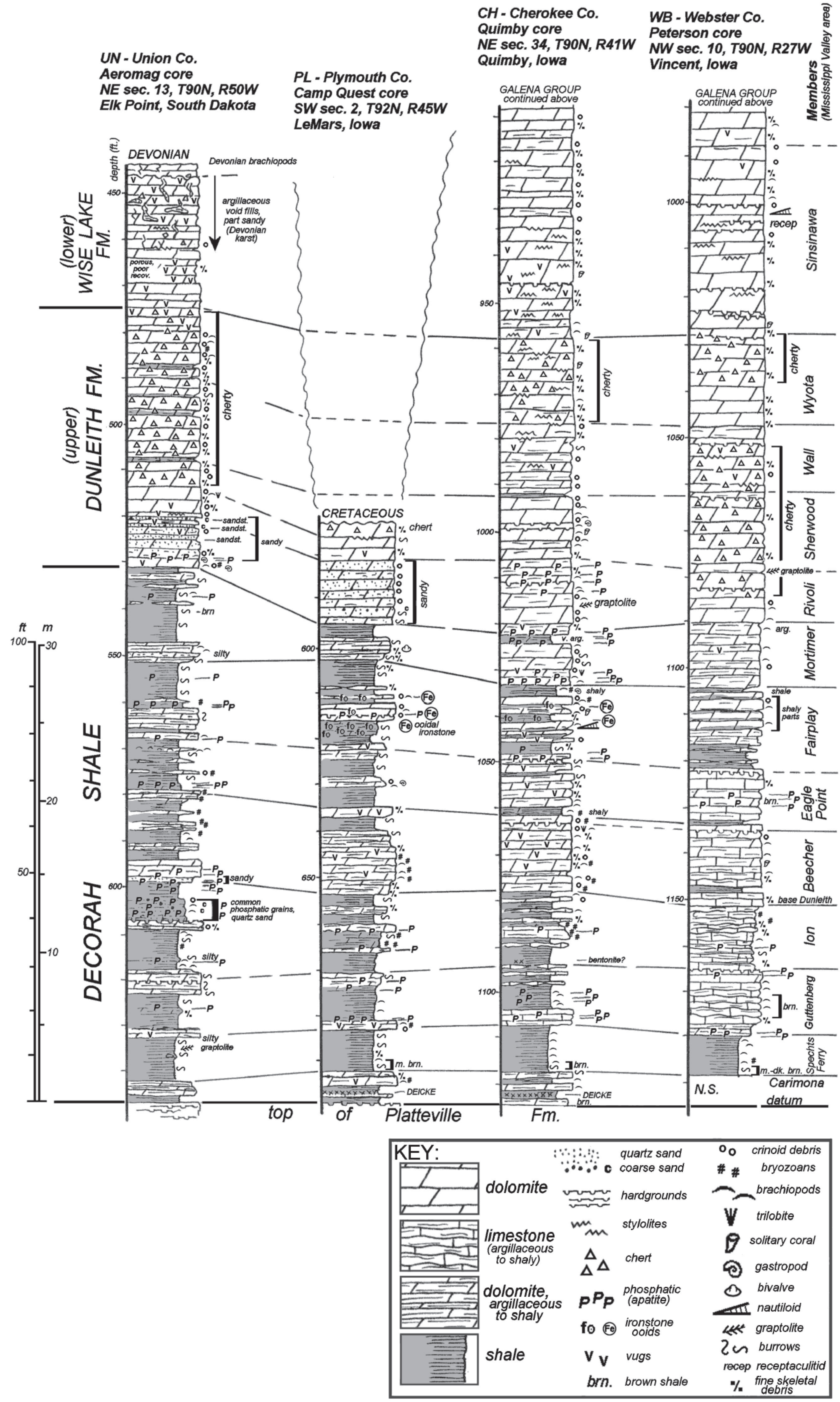
The modeling procedure began with the calculation of the response for a simple block body. The width of the body extends 500 meters to each side of the traverse line (line 5). The top surface of the body was set at 300 meters below the sensor (the sensor is set at 80 meters above the ground surface; see above specifications of the aeromagnetic survey), and the bottom surface was set at about 20,000 meters depth. The north and south extents of the body were set at the inflection points of the profile. The magnetic susceptibility was initially set at 3,500 micro-cgs, with the background at 0. The regional field of 55,600 nT was applied to provide the background response. The inducing field was set at 56,000 nT with an inclination of 70 degrees and a declination of 0 degrees.

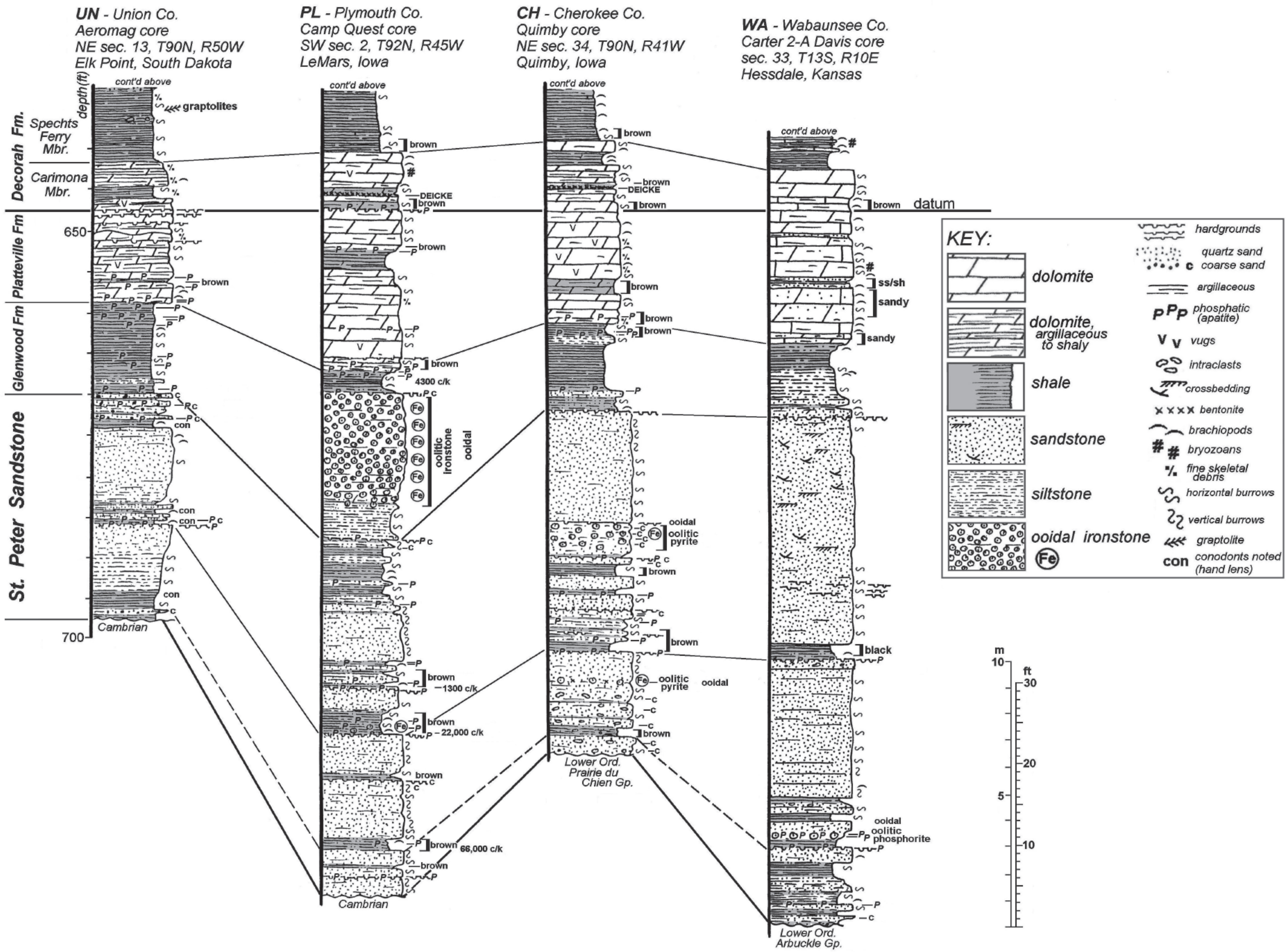
The magnetic susceptibility was allowed to vary through the inversion process of the software package to achieve a reasonable fit between the calculated profile and the observed profile. This resulted in a susceptibility of 4,426 micro-cgs units. The susceptibility was then fixed and numerous nodes were inserted into the top surface of the body. These nodes were allowed to vary spatially vertically. The nodes at the north and south edges of the body were also allowed to vary in the lateral direction during the inversion procedure. The forward model was then fit to the observed data using multiple iterations of the inversion process until a “best fit” was achieved.

APPENDIX B

Stratigraphic column of the R20-2002-1 core and correlation with cores from Iowa and Kansas

The following figures were kindly provided by Brian Witzke of the Iowa Geological Survey.


UN - Union Co.
Aeromag core
NE sec. 13, T90N, R50W
Elk Point, South Dakota
PL - Plymouth Co.
Camp Quest core
SW sec. 2, T92N, R45W
LeMars, Iowa
CH - Cherokee Co.
Quimby core
NE sec. 34, T90N, R41W
Quimby, Iowa
WB - Webster Co.
Peterson core
NW sec. 10, T90N, R27W
Vincent, Iowa
Members
(Mississippi Valley area)
DEVONIAN
depth (ft.)
Devonian brachiopods
argillaceous void fills, part sandy (Devonian karst)
porous, poor recov.
(lower) WISE LAKE FM.
(upper) DUNLEITH FM.
SHALE
DECORAH
cherty
sandst.
sandy
brn
silty
common phosphatic grains, quartz sand
graptolite
CRETACEOUS
chert
ooidal ironstone
m. brn.
DEICKE
GALENA GROUP continued above
shaly
v. arg.
bentonite?
brn.
recep
arg.
shale
shaly parts
base Dunleith
m.-dk. brn.
N.S.
Sinsinawa
Wyota
Wall
Sherwood
Rivoli
Mortimer
Fairplay
Eagle Point
Beecher
Ion
Guttenberg
Spechts Ferry
Carimona
datum
top of Platteville Fm.
ft
m
KEY:
dolomite
limestone (argillaceous to shaly)
dolomite, argillaceous to shaly
shale
quartz sand
coarse sand
hardgrounds
stylolites
chert
phosphatic (apatite)
ironstone ooids
vugs
brn. brown shale
crinoid debris
bryozoans
brachiopods
trilobite
solitary coral
gastropod
bivalve
nautiloid
graptolite
burrows
recep receptaculitid
fine skeletal debris


UN - Union Co.
Aeromag core
NE sec. 13, T90N, R50W
Elk Point, South Dakota
PL - Plymouth Co.
Camp Quest core
SW sec. 2, T92N, R45W
LeMars, Iowa
CH - Cherokee Co.
Quimby core
NE sec. 34, T90N, R41W
Quimby, Iowa
WA - Wabaunsee Co.
Carter 2-A Davis core
sec. 33, T13S, R10E
Hessdale, Kansas
cont'd above
depth (ft)
Decorah Fm.
Spechts Ferry Mbr.
Carimona Mbr.
Platteville Fm
Glenwood Fm
St. Peter Sandstone
650
700
Cambrian
graptolites
brown
con
DEICKE
datum
4300 c/k
oolitic ironstone
ooidal
1300 c/k
22,000 c/k
66,000 c/k
ooidal
oolitic pyrite
Lower Ord. Prairie du Chien Gp.
ss/sh
sandy
black
oolitic phosphorite
Lower Ord. Arbuckle Gp.
m
10
5
ft
30
20
10
KEY:
dolomite
dolomite, argillaceous to shaly
shale
sandstone
siltstone
ooidal ironstone
Fe
hardgrounds
quartz sand
c coarse sand
argillaceous
phosphatic (apatite)
vugs
intraclasts
crossbedding
bentonite
brachiopods
bryozoans
fine skeletal debris
horizontal burrows
vertical burrows
graptolite
con conodonts noted (hand lens)