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TITLE: Midcontinent Interactive Digital Carbon Atlas and Relational Database (MIDCARB)

Cooperative Agreement No.: DE-FC26-00NT40936

Contractor Name and Address: The University of Kansas Center for Research Inc.

Date of Report: January 29, 2001

Award Date: September 28, 2000

DOE Cost of Project: \$ 835,931 (Budget Year 1) Revised \$594,745

Principal Investigators: Timothy R. Carr (Program Manager)
Scott W. White

Project Manager: Perry D. Bergman, NETL Pittsburgh, PA

Reporting Period: October 1, 2000 -- December 31, 2000

OBJECTIVES

Current federal energy policy assumes that hydrocarbons will continue to be the primary source of energy for the United States and the world well into the 21st century. However, there is concern about increasing atmospheric concentrations of carbon dioxide and its possible role in global climate change. For this reason, it may become necessary to manage anthropogenic CO₂. Sequestering CO₂ in geological reservoirs may be one way to safely sequester carbon over long periods of time, if the proper data and tools to analyze the geological feasibility as well as the associated costs can be developed.

The Midcontinent Interactive Digital Carbon Atlas and Relational DataBase (MIDCARB), a digital spatial database for five states (Indiana, Illinois, Kansas Kentucky and Ohio), will allow users to identify the amount of CO₂ available for sequestration in relation to a source supply, the

geologic security and safety of a sequestration site, the long-term effects on a reservoir, and the cost of compression and transport of CO₂ between source and sequestration site. MIDCARB will organize and enhance the critical information about CO₂ sources, and develop the technology needed to access, query, model, analyze, display, and distribute natural-resource data related to carbon management.

Large stationary sources of CO₂ emissions will be identified, located, and characterized by volume, temperature, pressure, and gas mix. Potential CO₂ sequestration targets, including producing and depleted oil and gas fields, unconventional oil and gas reservoirs, uneconomic coal seams, and saline aquifers, will be characterized to determine quality, size, and geologic integrity. All information will be available online through user query. Information will be provided through a single interface that will access servers in each state. The economic impact and possible value of the CO₂ sequestration to hydrocarbon recovery from oil and gas fields, coal beds, and organic-rich shales will be considered.

PROJECT STATUS: Project has just been initiated and an initial meeting was held. An organization and communication network that crosses institutional and geographic barriers is being created. Inventories of digital information pertinent to the MIDCARB project, and databases schemas at each participant are being assembled. Initial project web pages are being created and will be available at <http://www.kgs.ukans.edu/Midcarb>.

Scheduled Milestones:

Assessment of Potential CO ₂ Sources	06/01
Identify Geological Sequestration Locations	08/01
Compile Database Characterizing CO ₂ Sources	09/01
Characterize Oil, Gas and Brine Reservoir Properties	11/01
Characterize Coal Bed Fluid and Rock Properties	02/02
Characterize Unconventional Reservoir Properties	03/02
Assess Critical Reservoir Properties	06/02
Develop Web- Enabled Relational Database and GIS (First Products 02/01)	Ongoing
Evaluate Potential of Economic Modeling	11/01
Technology Transfer (First Products by 11/00)	Ongoing

Significant Scheduled Events

Presentation: Geological Society of America Annual Meeting, Reno, NV	11/00
Meeting to Discuss Database Issues, Lawrence, KS	03/01
Presentation: NETL Conference on Carbon Sequestration Washington, DC	05/01
Technology Transfer	Ongoing

SUMMARY OF TECHNICAL PROGRESS BUDGET PERIOD 1

Progress is reported for the period from 1 October 2000 to 31 December 2000.

In this first quarter, a Lead Developer, John Victorine, and a Data Manager, Melissa More, were hired to work part-time on the project. The Lead Developer is responsible for development of computer software in support of MIDCARB, while the Data Manager is responsible for the continuing development of the electronic databases. A paper outlining the project was presented

at the Annual Meeting of the Geological Society of America (Abstract Attached as Appendix A). Progress is described for selected tasks of the MIDCARB project:

Administrative: Subcontracts were finalized between the University of Kansas Center for Research and the four organizations in the four other states participating in the Project (i.e., Illinois, Indiana, Kentucky and Ohio). Organizational meetings were held with participants and detailed work plan for first contract year developed and first tasks assigned. A meeting to address computing and network aspects of the project is scheduled for 1 March. A revised budget for the project was recalculated based on the revised funding made available by the U. S. Department of Energy for the year 1 operations.

A distribution list was created to coordinate electronic mail communication among project participants. Electronic mail sent to the single address midcarb-1@lsv.uky.edu is broadcast to subscribers. This list is not open to the public; for information on subscribing to the list, contact bnuttall@kgs.mm.uky.edu. A bibliography of CO₂ sequestration and global warming as related to the petroleum was compiled from several sources including project participants, GeoRef, and Science Direct (<http://www.sciencedirect.com/>).

Task 1: Assessment of CO₂ Sources – *Identify the CO₂ sources across the region including CO₂ emission mass production rates from utility and non-utility power plants and the geographic distribution of these plants.*

An online mapping display of large CO₂ sources in Kansas has been completed and will be extended to cover all MIDCARB states.

Compile Database Characterizing CO₂ Sources – *Compile a database of CO₂ emission source characteristics, including concentration, pressure, temperature, trace gases, and output pattern (base, seasonal or peaking).*

Databases incorporating detailed emissions information have been identified and accessed. A relational database covering Kansas has been developed and will be extended to cover all the MIDCARB states.

Characterize Oil, Gas and Brine Reservoir Properties – *Compile a representative database of oil, gas, and brine reservoir properties.*

Kentucky: A description of the Tertiary Oil Recovery Information System and Gas Atlas oil and gas field level databases was compiled. The essential elements of the oil and gas well location point-source database were provided along with the web address for downloading a free version of the Kentucky location data (download [kyog83.zip](#) from <http://www.uky.edu/KGS/gis/geology.html>).

Characterize Coal Bed Fluid and Rock Properties – *Compile a representative database of coal bed fluid, rock properties, and enhanced coal-bed methane potential.*

Kentucky provided a detailed write-up of potential critical coal database elements — An evaluation of the database elements required to assess the carbon sequestration potential of coal beds was initiated and input sought from the consortium.

Develop Web-Enabled Relational Database and GIS – *Develop an online relational database and web-enabled geographic information system (GIS) that can be queried to evaluate and determine options for sequestration. Queries would have spatial capabilities, and be based on critical parameters for CO₂ sequestration.*

Work started to update Ohio Oil and Gas fields GIS coverage for use in current project. Various coal GIS coverage being investigated for potential use in project. GIS staffs from involved states have started coordinating efforts. Ohio has started work to generate an appropriate base map coverage for inclusion in the project GIS.

A generic linear/log Plot Applet has been completed. This Plot Servlet routine is a generic linear plot class that will accept any x-y array and labels. The following is an example of the Plot Routine using Oil Production Plot for Allen County in the Bronson-Xenia Oil & Gas Field (Figure 1). It will be used to provide display of data from distributed MIDCARB relational database management systems.

A meeting is scheduled for 1-2 March 2001 in Lawrence, Kansas to address computer, networking and database issues.

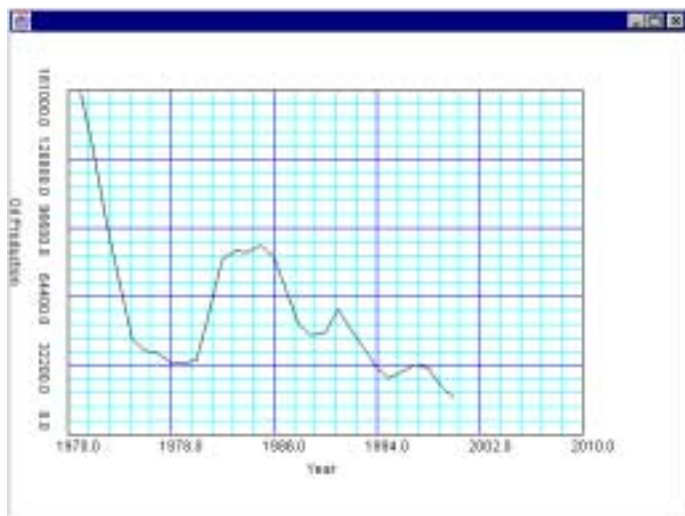


Figure 1- A generic linear/log Plot Applet that will accept any x-y array and labels. The following is an example of the Plot Routine using Oil Production Plot for Allen County in the Bronson-Xenia Oil & Gas Field. Data such as CO₂ production will be plotted from query to the MIDCARB databases

Technology Transfer – *The development of the MIDCARB atlas is in itself a technology transfer activity, and will be ongoing from project initiation.*

An initial project web site to facilitate communication amongst participating organizations has been developed (<http://www.kgs.ukans.edu/Midcarb/General/home.html>). As products are

developed they will be moved to this site. A paper was presented at the Annual meeting of the Geological Society of America. A copy of the abstract is attached as Appendix 1.

APPENDIX 1

Copy of Abstract of Paper presented at Geological Society of America 2000 Annual Meeting Abstracts, Abstract 51280, Abstract available online at <http://www.geosociety.org/pubs/abstracts/2000/51280.htm>. Slides of presentation available at <http://www.kgs.ukans.edu/Midcarb/Presentations/index.htm>

MIDCONTINENT INTERACTIVE DIGITAL CARBON ATLAS AND RELATIONAL DATABASE (MIDCARB)

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