

Geophysical Research Abstracts,  
Vol. 10, EGU2008-A-05895, 2008  
SRef-ID: 1607-7962/gra/EGU2008-A-05895  
EGU General Assembly 2008  
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## **Integrated Tectonic and Petrophysical Investigation of the Williston Basin Sediments in and around the Weyburn CO<sub>2</sub> Sequestration Reservoir, Canada (Part I: tectonic considerations)**

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As part of Phase I of the International Weyburn CO<sub>2</sub> Sequestration Project, regional seismic investigations have been conducted around a 100 km radius of the Midale (Mississippian) reservoir in Southern Saskatchewan. The objective was to answer the following question: Do the tectonic, petrophysical and rheological properties of the sedimentary fill guarantee the permanent storage (~10000 years) of CO<sub>2</sub> in the region?

To achieve this goal, 2000 km of industry-donated seismic reflection data and over 1000 boreholes and related wireline information, as well as a 15 km<sup>2</sup> 3D seismic coverage of the reservoir were analyzed.

Eleven seismically recognizable geologic (structural) horizons were mapped from top of the Cretaceous to the Precambrian basement unconformity. These are: 2nd White Specs, Lower Colorado, Manville, Upper Watrous, Lower Watrous top, Lower Watrous bottom /top of Midale/, Bakken, Prairie Evaporite, Winnipegosis, Winnipeg, Deadwood and Precambrian.

An integrated analysis of these structural horizons over 100 seismic sections was used

to map the regional structural setting of the sedimentary fill and the top of the Precambrian. By establishing a correlation between the basement structures and the disturbances in the sedimentary column, the influences of deep epirogenic movements on the development of the investigated part of the basin have been determined.

To date, the integration of seismic and borehole data has led to a better delineation of a number of prominent regional geologic structures. Furthermore this effort also yielded enhanced images of previously known and some newly identified ring-faults.

The resolution of the ages of the epirogenic movements in the region which generated the mappable structures is an important issue. All the faults recognized to date and the time period through which they were active will be illustrated on the seismic sections.

Moreover, within an area designated as a 'Risk Assessment area' in the immediate vicinity of the reservoir, several previously unknown fault zones were identified on the 3D seismic data set.

In the investigated area no large scale regional tectonic elements intersect the Weyburn field. There are, however, recognizable structural disturbances present; their properties and historical influences on the reservoir and its vicinity are under investigation.

*Comment: Some other details of the investigation are presented at the poster session.*