Geologists probe mystery behind Nova Scotia's fossil forests

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A University of Alberta geologist and his research associate in Nova Scotia have published new research which may answer long-standing questions about the formation of a world famous stand of fossilized trees near the Bay of Fundy.

Dr. John Waldron of the U of A and Michael Rygel of Dalhousie University published their paper, Role of evaporite withdrawal in the preservation of a unique coal-bearing succession, in the May issue of Geology Magazine, a publication of the Geological Society of America.

The Joggins Formation, on the coast of Nova Scotia, contains fossilized trees five to six metres in height preserved upright in layers of sandstone and shale, as well as numerous coal seams. The fossil trees, called lycopsids, grew during the Carboniferous period in tropical wetlands very different from Nova Scotia's current climate. Now, 300 million years later, the lycopsids can be seen in the cliffs overlooking the Bay of Fundy, exposed by erosion.

Though the formation has been studied since the 19th century - it's described in Sir Charles Lyell's Principles of Geology and in Sir Charles Darwin's The Origin of Species - questions have persisted about how the trees were preserved in standing position. The area must have sunken rapidly to allow great thicknesses of sediment to accumulate in a few decades.

"The main suggestion in the paper is that the subsidence in the basin and

the reason it sank so fast, was because of the flow of the salt, which is quite a lot of different from what most previous geological research anticipated," Waldron said. "A lot of the subsidence in the basin that allowed the sediment to accumulate and allowed these amazing fossil trees to be preserved was the result of rock salt flowing under the surface during the Carboniferous period. The subsiding areas filled up with sand and mud, forming swamps in which forests grew, and those trees were able to be entombed in sediments before they fell over."

The study also suggests that this movement of salt under the surface may have contributed to the conditions for coal formation.

"Geologists have historically focused on areas where salt appeared to be rising," Waldron said. "Our new perspective on the Cumberland basin reflects a more recent appreciation that subsidence is just as important for an understanding of salt tectonics.

Waldron said the findings in the paper are the result of a unique collaboration between geological researchers and industry. Devon Canada, a petroleum company based in Calgary, Alberta, was doing exploration work in the Cumberland Basin and allowed Waldron and Rygel access to their seismic profiles - "pictures" of the subsurface made by sending shockwaves into the ground and recording the reverberations from the layers of rock under the surface.

Currently the Joggins Formation is the subject of Canada's application to UN to have the area declared a UNESCO World Heritage Site. Waldron said he and Rygel hope to continue his collaboration with Devon Canada and extend his research to take in more of the region.

"We hope to produce a more thorough, longer analysis the differential subsidence in this part of the Cumberland Basin - what was subsiding when. And in the long term what I would like to do is relate this

particular area to the evolution of the whole of the Maritime basin, a much larger area that underwent subsidence during the same general time period."

Source: The Department of Earth and Atmospheric Sciences at the University of Alberta

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