Geologists Probe Buried Craton in Western Canada

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Precambrian cratons—the relatively stable areas of the Earth’s crust that form the core of continents—hold the key to understanding how continents evolve, but vast cratonic areas are concealed from scientific probing beneath Phanerzoic sediments. Working for the Alberta Basement Tectonic (ABT), a part of the Canadian Lithoprobe project, geologists are examining the evolution of the petroleum-rich Western Canada Sedimentary Basin (WCSB). Armed with a variety of techniques, the scientists are resolving features within the sedimentary basin and unraveling the genesis of the underlying Precambrian crust and upper mantle. This represents a new view of a significant and largely unknown part of cratonic North America.

The seismic reflection surveys revealed ancient, now eroded mountain belts that formed as blocks and slivers of continental crust were assembled to form the cratonic fabric of western Canada more than 1.8 Ga. Coincident magnetotelluric studies have led to unprecedented images of the mantle conductivity structure that allow, for the first time, a network through the sedimentary basin, over 2000 km long, allows us to examine the ca. 500 m.y. sedimentation history as a plate tectonic record of reactivation of the craton during the Phanerozoic. The results obtained thus far hold promise for better understanding of Precambrian continental assembly, the fate of mantle lithosphere, and the evolution of continental interiors.

Background

The crystalline basement beneath WCSB is an extension of the Canadian Shield, covered by 750,000 km² of Phanerozoic sedimentary rocks. A tectonic framework for the basement rocks has been established through synthesis of geochronologic and isotopic analyses of basement drill core, combined with interpretation of regional aeromagnetic and gravity data [Ross et al., 1991; Villeneuve et al., 1993]. These models expand on the theme of tectonic assembly for the Canadian Shield proposed by Hoffman [1989], invoking collisional and accretionary processes during the Paleoproterozoic and subsequently the Phanerozoic.
Scientists Assess Impact of Indonesia Fires

The fires burning in Indonesia over the past several months have increased the biomass and wildlife habitat of the tropical forests, spreading a dangerous unhealthy haze across the region and nearby nations in southeast Asia, causing transportation hazards and sending plumes of smoke up to the troposphere.

The fires have been set—by both landowners, commercial loggers, and small farmers—primarily to clear and cultivate the land, as people have done in the past. But this year’s drought has made the situation worse, as has the rainfall that could help extinguish the fires. In addition, some scientists say that smoke could be the main reason for the haze, which usually comes in early November.

Johann Goldammer, head of the Fire Ecology Research Group at the Max Planck Institute for Chemistry at Freiburg University, in Germany, says that he has seen similar situations before—such as in 1997, 1998, and 1999—and that the main difference this year is the amount of smoke.

Goldammer and other scientists say that the regional impacts of the fires are severe, but that the long-term, global atmospheric consequences will be limited. They say the smoke plumes will not reach far enough into the atmosphere to cause major health effects.

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