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HISTORY OF THE SUBSIDENCE INTEREST GROUP

By Keith R. Prince

Land subsidence is the loss of surface elevation as a result of the removal of subsurface support. The mechanisms by which this can occur may be natural in origin or induced by human activities. Common causes of land subsidence include the removal of oil, gas, and water from underground reservoirs; dissolution of limestone aquifers (sinkholes); underground mining activities; drainage of organic soils; and hydrocompaction (the initial wetting of dry soils). Overdraft of aquifers is the major cause of areally extensive land subsidence, and as ground-water pumping increases, land subsidence also will increase.

The U.S. Geological Survey (USGS) has a long-standing history of describing, mapping, and conducting process-oriented research in land subsidence. In 1955, the Geological Survey formed the "Mechanics of Aquifers Project" under the direction of Joseph F. Poland to study the processes that result in land subsidence due to the withdrawal of ground water. From 1955 to 1984, this research team gained international renown as they advanced the understanding of aquifer mechanics and land-subsidence theory. In addition to conducting pioneering research, this group also provided a focal point within the USGS for the dissemination of technology and scientific understanding in aquifer mechanics. In 1984, however, the "Mechanics of Aquifers Project" was terminated leaving no focal point for technology transfer in the USGS.

The USGS has continued to participate in a broad spectrum of cooperative and Federally funded projects in aquifer mechanics and land subsidence. These projects are designed to identify and monitor areas with the potential for land subsidence, conduct basic research in the processes that control land subsidence and the development of earth fissures, and develop new quantitative tools to predict aquifer-system deformation. In 1989, the "Aquifer Mechanics and Subsidence Interest Group" (referred to herein as the "Subsidence Interest Group") was formed to facilitate technology transfer and to provide a forum for the exchange of information and ideas among scientists actively working in subsidence and aquifer-mechanics projects. To stimulate technical interaction among the member scientists, periodic technical meetings are held in which the latest advances in monitoring and research are presented.

Introduction to Papers

This report is a compilation of short papers that are based on oral presentations summarizing the results of recent research that were given at the third meeting of the Subsidence Interest Group held in Las Vegas,

Nevada, February 14–16, 1995. The report includes case studies of land subsidence and aquifer-system deformation resulting from fluid withdrawal, geothermal development, and mine collapse. Methods for monitoring land subsidence using Global Positioning System technology for the rapid and accurate measurement of changes in land-surface altitude also are described. The current status of numerical simulation of land subsidence in the USGS is summarized, and several of the short papers deal with the development and application of new numerical techniques for simulation and quantification of aquifer-system deformation.

Not all oral presentations made at the meeting are documented in this report. Several of the presentations were of ongoing research and as such, the findings were provisional in nature and were offered at the meeting to stimulate scientific discussion and debate among colleagues. The information presented in this report, although only a subset of the proceedings of the meeting in Las Vegas, should help expand the scientific basis for management decisions to mitigate or control the effects of land subsidence. The short papers describing the results of these studies provide a cross section of ongoing research in aquifer mechanics and land subsidence and also form an assessment of the current technology and "state of the science." The analytical and interpretive methods described in this report will be useful to scientists involved in studies of ground-water hydraulics and aquifer-system deformation.